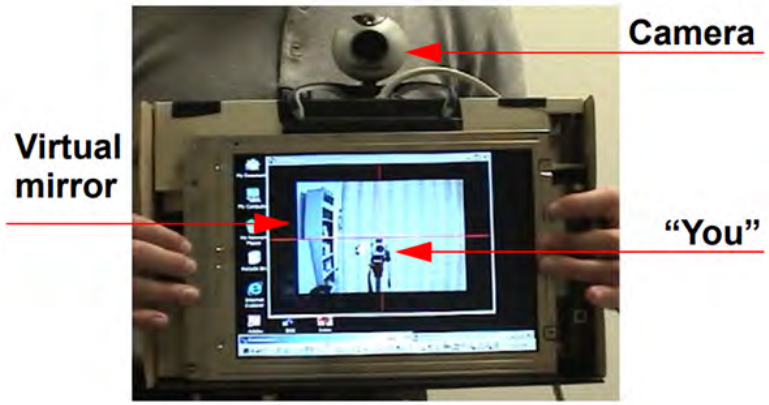
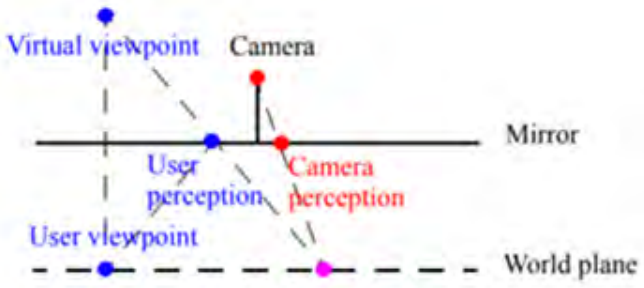
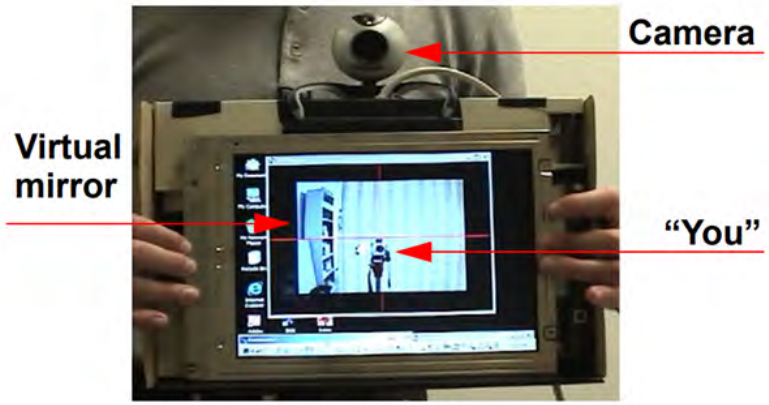
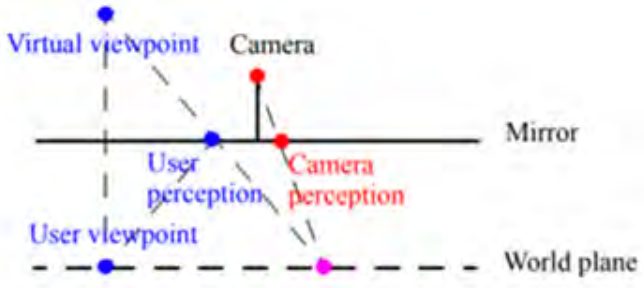
Asserted Claim of the ’109 Patent	Exemplary Citations to Francois III
	 Figure 2. Handheld virtual mirror device. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois III alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
7[b]. performing registration of the digital image with the reference image;	Francois III expressly and/or inherently discloses and/or renders obvious performing registration of the digital image with the reference image. *See*, *e.g.*, disclosures below. “Various computer vision techniques could be used to attempt to recover the 3-13 geometry of the world from images in some cases. Another solution would be to use a 3-D model of the environment, if available. For our first prototype, we followed a simpler approximate approach.” *See A Handheld Mirror Simulation*, Francois et al. (2003), 2.3 User view synthesis, page 747. “This sketch presents the design and construction of a handheld virtual mirror device. The perception of the world reflected through a mirror depends on the viewer's position with respect to the mirror and the 3-D geometry of the world. In order to simulate a real

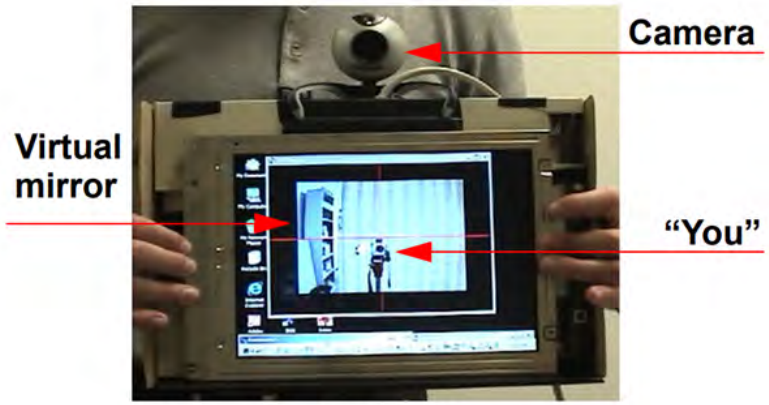
Asserted Claim of the ’109 Patent	Exemplary Citations to Francois III
	mirror on a computer screen, images of the observed world, consistent with the viewer's position, must be synthesized and displayed in real-time. Our system is build around a flat LCD screen manipulated by the user, a single camera fixed on the screen, and a tracking device. The continuous input video stream and tracker data is used to synthesize, in real-time, a continuous video stream displayed on the LCD screen. The synthesized video stream is a close approximation of what the user would see on the screen surface if it were a real mirror.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at the introductory paragraph. “When a person looks into a mirror, they see what they would see from the symmetrical (virtual) point of view (figure 1). A camera whose position and orientation are fixed with respect to the mirror produces a video stream that corresponds to this particular viewpoint. In order to synthesize the images corresponding to the user's viewpoint from the images captured by the camera, we must relate them geometrically. Such a transform cannot be formulated without assumptions or knowledge about the world geometry. In our case, the focus of attention is the user's own reflection in the mirror. We thus model the world as a plane parallel to the mirror, at the user's distance from the mirror. We have shown that under these assumptions, the transform relating the camera view and the user view depends only on the relative positions of the user viewpoint and the camera center, and is reduced to a scaling and a translation. The transform is exact when the user viewpoint lies on the camera axis. This model provides a straightforward and efficient way of synthesizing the viewer's image stream from the camera stream, and provides a good approximation when the viewer's position remains close to the camera axis.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 1.Problem formulation and geometric analysis. “We have implemented the mirror image transform as a module in the Modular Flow Scheduling Middleware [François 2001], the open source implementation of IMSC's software architecture for Integrated Media Systems. It is specifically designed for parallel processing of concurrent data streams in real-time, and its modularity dramatically reduces development and integration time. The actual handheld virtual mirror system is composed of a handheld 10" LCD flat screen fitted with a camera and

Asserted Claim of the ’109 Patent	Exemplary Citations to Francois III
	a magnetic tracker sensor (figure 2), a fixed processing unit, a fixed magnetic tracker transmitter, and a second magnetic tracker sensor placed on the user. Real-time camera and tracker inputs are used to synthesize the virtual mirror stream and display it in real-time on the LCD screen. The result is a very convincing handheld mirror simulation.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 2.2.System integration. “The design and construction of realistic virtual mirrors represents an original experiment in Human-Computer Interface, that opens the door to various interactive experiments in entertainment, arts and communication. Use of video analysis and graphics techniques will allow to explore and interfere with what has always been a private, solitary act of a person looking in a mirror.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 3.Perspectives. *See A Handheld Virtual Mirror* (2002), at Figure 1:  Figure 1. Basic mirror geometry. *See A Handheld Virtual Mirror* (2002), at Figure 2:

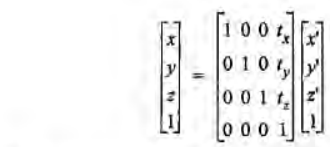
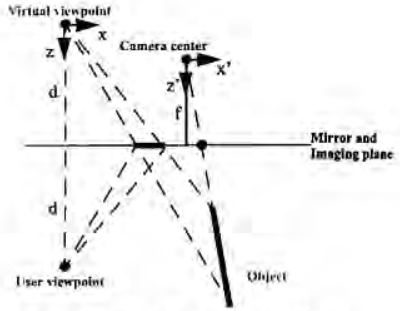
Asserted Claim of the ’109 Patent	Exemplary Citations to Francois III
	 Figure 2. Handheld virtual mirror device. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois III alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
7[c]. using data obtained from the registration to generate the transformation mapping.	Francois III expressly and/or inherently discloses and/or renders obvious using data obtained from the registration to generate the transformation mapping. *See, e.g.*, disclosures below. “Various computer vision techniques could be used to attempt to recover the 3-13 geometry of the world from images in some cases. Another solution would be to use a 3-D model of the environment, if available. For our first prototype, we followed a simpler approximate approach.” *See A Handheld Mirror Simulation*, Francois et al. (2003), 2.3 User view synthesis, page 747. “This sketch presents the design and construction of a handheld virtual mirror device. The perception of the world reflected through a mirror depends on the viewer's position

Asserted Claim of the ’109 Patent	Exemplary Citations to Francois III
	with respect to the mirror and the 3-D geometry of the world. In order to simulate a real mirror on a computer screen, images of the observed world, consistent with the viewer's position, must be synthesized and displayed in real-time. Our system is build around a flat LCD screen manipulated by the user, a single camera fixed on the screen, and a tracking device. The continuous input video stream and tracker data is used to synthesize, in real-time, a continuous video stream displayed on the LCD screen. The synthesized video stream is a close approximation of what the user would see on the screen surface if it were a real mirror.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at the introductory paragraph. “When a person looks into a mirror, they see what they would see from the symmetrical (virtual) point of view (figure 1). A camera whose position and orientation are fixed with respect to the mirror produces a video stream that corresponds to this particular viewpoint. In order to synthesize the images corresponding to the user's viewpoint from the images captured by the camera, we must relate them geometrically. Such a transform cannot be formulated without assumptions or knowledge about the world geometry. In our case, the focus of attention is the user's own reflection in the mirror. We thus model the world as a plane parallel to the mirror, at the user's distance from the mirror. We have shown that under these assumptions, the transform relating the camera view and the user view depends only on the relative positions of the user viewpoint and the camera center, and is reduced to a scaling and a translation. The transform is exact when the user viewpoint lies on the camera axis. This model provides a straightforward and efficient way of synthesizing the viewer's image stream from the camera stream, and provides a good approximation when the viewer's position remains close to the camera axis.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 1.Problem formulation and geometric analysis. “We have implemented the mirror image transform as a module in the Modular Flow Scheduling Middleware [François 2001], the open source implementation of IMSC's software architecture for Integrated Media Systems. It is specifically designed for parallel processing of concurrent data streams in real-time, and its modularity dramatically reduces development and integration time. The actual handheld virtual

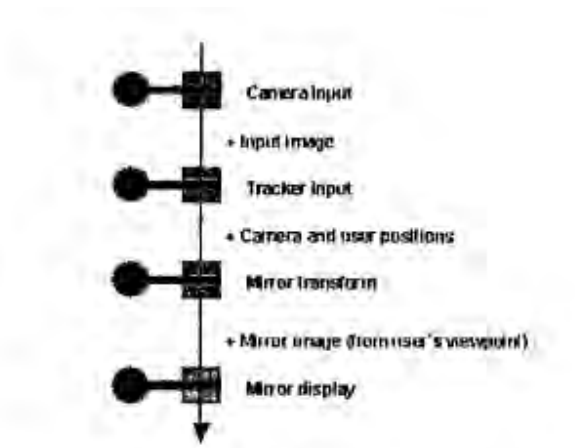
Asserted Claim of the ’109 Patent	Exemplary Citations to Francois III
	mirror system is composed of a handheld 10" LCD flat screen fitted with a camera and a magnetic tracker sensor (figure 2), a fixed processing unit, a fixed magnetic tracker transmitter, and a second magnetic tracker sensor placed on the user. Real-time camera and tracker inputs are used to synthesize the virtual mirror stream and display it in real-time on the LCD screen. The result is a very convincing handheld mirror simulation.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 2.2.System integration. “The design and construction of realistic virtual mirrors represents an original experiment in Human-Computer Interface, that opens the door to various interactive experiments in entertainment, arts and communication. Use of video analysis and graphics techniques will allow to explore and interfere with what has always been a private, solitary act of a person looking in a mirror.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 3.Perspectives. *See A Handheld Virtual Mirror* (2002), at Figure 1:  Figure 1. Basic mirror geometry. *See A Handheld Virtual Mirror* (2002), at Figure 2:

Asserted Claim of the ’109 Patent	Exemplary Citations to Francois III
	 Figure 2. Handheld virtual mirror device. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois III alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the ’109 Patent	Exemplary Citations to Francois III
Claim 8	
8. The method of claim 1, further comprising applying a translation transformation to move the image within display area of the monitor.	Francois III expressly and/or inherently discloses and/or renders obvious applying a translation transformation to move the image within display area of the monitor. *See*, *e.g.*, disclosures below.

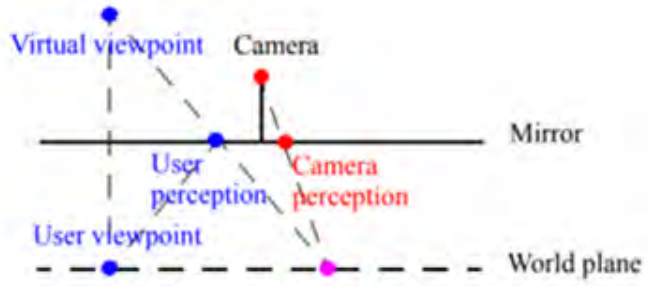
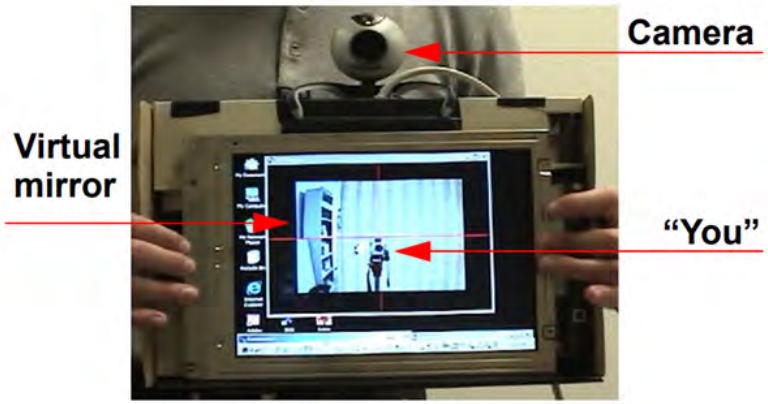
Asserted Claim of the '109 Patent	Exemplary Citations to Francois III
	"In order to synthesize the images corresponding to the user's view1point from the images captured by the camera, we must relate them geometrically, i.e. express x_p and y_p in terms of x'_p and y'_p.  $\begin{bmatrix} x \\ y \\ z \\ 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & t_x \\ 0 & 1 & 0 & t_y \\ 0 & 0 & 1 & t_z \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x' \\ y' \\ z' \\ 1 \end{bmatrix}$ The mirror projection equations become: $\begin{bmatrix} U_p \\ V_p \\ W_p \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & t_x \\ 0 & 1 & 0 & t_y \\ 0 & 0 & 1/d & t_z/d \end{bmatrix} \begin{bmatrix} x' \\ y' \\ z' \\ 1 \end{bmatrix}$ $x_p = d(x' + t_x)/(z' + t_z)$ $y_p = d(y' + t_y)/(z' + t_z)$  Figure 4. An underconstrained problem. Express xp and yp in terms of x'p and /p thus requires to recover the actual 3-D position of each point from its image projection. This is obviously an underconstrained problem, as an image pixel might potentially be the projection of any world point on a ray passing through the camera center and the pixel, as illustrated in figure 4. Various computer vision techniques could be used to attempt to recover the 3-13 geometry of the world

Asserted Claim of the '109 Patent	Exemplary Citations to Francois III
	from images in some cases. Another solution would be to use a 3-D model of the environment, if available. For our first prototype, we followed a simpler approximate approach. Since we are designing our mirror as a first person interaction tool, we assume that the center of interest is the user himself, and that the background is of lesser importance. We thus model the world as a plane parallel to the mirror/imaging plane, at the same distance as the user's viewpoint (see figure 5). The z' component of each world point is thus fixed to $z' = f + d$ in the camera centered coordinate system. We can now inverse the camera projection equations: $$x'_p = fx'/(f+d) \Leftrightarrow x' = (f+d)x'_p/f$$ $$y'_p = fy'/(f+d) \Leftrightarrow y' = (f+d)y'_p/f$$ The transformation equations that relate the user's view to the camera image are thus: $$x_p = d((f+d)x'_p/f + t_x)/((f+d) + t_z)$$ $$y_p = d((f+d)y'_p/f + t_y)/((f+d) + t_z)$$ The only parameters are f, d and [txtytz]. The theoretical focal length of the camera can be obtained by various calibration methods. The positions and orientations of the user's viewpoint and the camera center provided by the tracking devices, allow to compute both the distance d and the change of referential translation parameters. Note that under our assumptions, the transform relating the user's view to the camera view is reduced to a scaling and a translation. This model provides a straightforward and efficient way of synthesizing the viewer's image stream from the camera stream, while remaining a reasonable approximation for a large class of applications. The major field-of-view variations occuring when varying the angle of view and the distance to the mirror, are

Asserted Claim of the ’109 Patent	Exemplary Citations to Francois III
	convincingly simulated. *See A Handheld Mirror Simulation*, Francois et al. (2003), 2.3 User view synthesis, pages 746-47.  **Figure 6. Mirror simulation application graph.** *See A Handheld Mirror Simulation*, Francois et al. (2003), Fig. 6. “Adopting the simplifying pinhole camera and flat world models, we have shown that the transform relating the camera view and the user view depends only on the relative positions of the user viewpoint and the camera center, and is reduced to a scaling and a translation. This model provides a straightforward and efficient way of synthesizing the viewer’s image stream from the camera stream, and provides a reasonable approximation in a large class of applications. Beyond the inherent inability of the model to account for depth in the scene, a major limitation is the impossibility to simulate eye contact. This is due to the physical separation between the capture device (camera) and the visualization device (screen). More elaborate modeling and processing is required to achieve this

Asserted Claim of the ’109 Patent	Exemplary Citations to Francois III
	effect, e.g. with head modeling, tracking and synthesis.” *See A Handheld Mirror Simulation*, Francois et al. (2003), 5.CONCLUSION, page 748. “This sketch presents the design and construction of a handheld virtual mirror device. The perception of the world reflected through a mirror depends on the viewer's position with respect to the mirror and the 3-D geometry of the world. In order to simulate a real mirror on a computer screen, images of the observed world, consistent with the viewer's position, must be synthesized and displayed in real-time. Our system is build around a flat LCD screen manipulated by the user, a single camera fixed on the screen, and a tracking device. The continuous input video stream and tracker data is used to synthesize, in real-time, a continuous video stream displayed on the LCD screen. The synthesized video stream is a close approximation of what the user would see on the screen surface if it were a real mirror.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at the introductory paragraph. “When a person looks into a mirror, they see what they would see from the symmetrical (virtual) point of view (figure 1). A camera whose position and orientation are fixed with respect to the mirror produces a video stream that corresponds to this particular viewpoint. In order to synthesize the images corresponding to the user's viewpoint from the images captured by the camera, we must relate them geometrically. Such a transform cannot be formulated without assumptions or knowledge about the world geometry. In our case, the focus of attention is the user's own reflection in the mirror. We thus model the world as a plane parallel to the mirror, at the user's distance from the mirror. We have shown that under these assumptions, the transform relating the camera view and the user view depends only on the relative positions of the user viewpoint and the camera center, and is reduced to a scaling and a translation. The transform is exact when the user viewpoint lies on the camera axis. This model provides a straightforward and efficient way of synthesizing the viewer's image stream from the camera stream, and provides a good approximation when the viewer's position remains close to the camera axis.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 1.Problem formulation and geometric analysis.

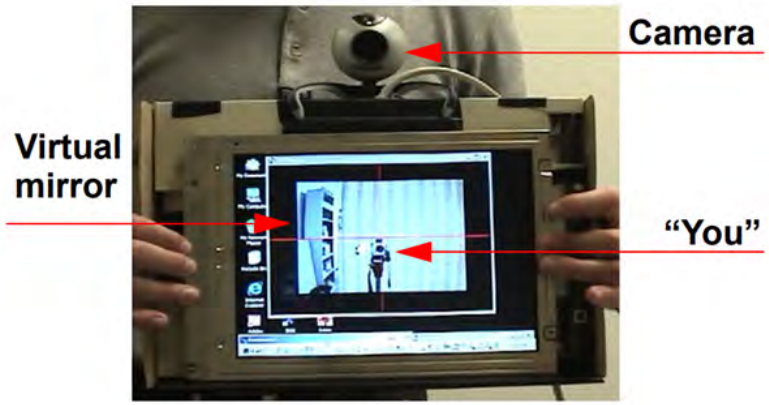
Asserted Claim of the ’109 Patent	Exemplary Citations to Francois III
	“We have implemented the mirror image transform as a module in the Modular Flow Scheduling Middleware [François 2001], the open source implementation of IMSC's software architecture for Integrated Media Systems. It is specifically designed for parallel processing of concurrent data streams in real-time, and its modularity dramatically reduces development and integration time. The actual handheld virtual mirror system is composed of a handheld 10" LCD flat screen fitted with a camera and a magnetic tracker sensor (figure 2), a fixed processing unit, a fixed magnetic tracker transmitter, and a second magnetic tracker sensor placed on the user. Real-time camera and tracker inputs are used to synthesize the virtual mirror stream and display it in real-time on the LCD screen. The result is a very convincing handheld mirror simulation.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 2.2.System integration. “The design and construction of realistic virtual mirrors represents an original experiment in Human-Computer Interface, that opens the door to various interactive experiments in entertainment, arts and communication. Use of video analysis and graphics techniques will allow to explore and interfere with what has always been a private, solitary act of a person looking in a mirror.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 3.Perspectives. *See A Handheld Virtual Mirror* (2002), at Figure 1:

Asserted Claim of the ’109 Patent	Exemplary Citations to Francois III
	 Figure 1. Basic mirror geometry. *See A Handheld Virtual Mirror* (2002), at Figure 2:  Figure 2. Handheld virtual mirror device. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois III alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of

Asserted Claim of the ’109 Patent	Exemplary Citations to Francois III
	Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

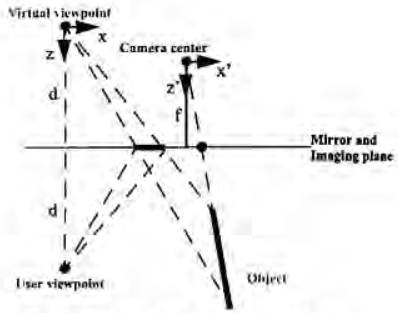
Asserted Claim of the ’109 Patent	Exemplary Citations to Francois III
Claim 9	
9. The method of claim 1, further comprising changing illumination intensity of individual or groups of pixels of the monitor, so as to enhance shading or illumination in the image.	Francois III expressly and/or inherently discloses and/or renders obvious changing illumination intensity of individual or groups of pixels of the monitor, so as to enhance shading or illumination in the image. *See*, *e.g.*, disclosures below. “This sketch presents the design and construction of a handheld virtual mirror device. The perception of the world reflected through a mirror depends on the viewer's position with respect to the mirror and the 3-D geometry of the world. In order to simulate a real mirror on a computer screen, images of the observed world, consistent with the viewer's position, must be synthesized and displayed in real-time. Our system is build around a flat LCD screen manipulated by the user, a single camera fixed on the screen, and a tracking device. The continuous input video stream and tracker data is used to synthesize, in real-time, a continuous video stream displayed on the LCD screen. The synthesized video stream is a close approximation of what the user would see on the screen surface if it were a real mirror.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at the introductory paragraph. “When a person looks into a mirror, they see what they would see from the symmetrical (virtual) point of view (figure 1). A camera whose position and orientation are fixed with respect to the mirror produces a video stream that corresponds to this particular viewpoint. In order to synthesize the images corresponding to the user's viewpoint from the images captured by the camera, we must relate them geometrically. Such a transform cannot be formulated without assumptions or knowledge about the world geometry. In our case, the focus of attention is the user's own reflection in the mirror. We thus model the world as a plane parallel to the mirror, at the user's distance from the mirror. We have

Asserted Claim of the ’109 Patent	Exemplary Citations to Francois III
	shown that under these assumptions, the transform relating the camera view and the user view depends only on the relative positions of the user viewpoint and the camera center, and is reduced to a scaling and a translation. The transform is exact when the user viewpoint lies on the camera axis. This model provides a straightforward and efficient way of synthesizing the viewer's image stream from the camera stream, and provides a good approximation when the viewer's position remains close to the camera axis.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 1.Problem formulation and geometric analysis. “We have implemented the mirror image transform as a module in the Modular Flow Scheduling Middleware [François 2001], the open source implementation of IMSC's software architecture for Integrated Media Systems. It is specifically designed for parallel processing of concurrent data streams in real-time, and its modularity dramatically reduces development and integration time. The actual handheld virtual mirror system is composed of a handheld 10" LCD flat screen fitted with a camera and a magnetic tracker sensor (figure 2), a fixed processing unit, a fixed magnetic tracker transmitter, and a second magnetic tracker sensor placed on the user. Real-time camera and tracker inputs are used to synthesize the virtual mirror stream and display it in real-time on the LCD screen. The result is a very convincing handheld mirror simulation.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 2.2.System integration. “The design and construction of realistic virtual mirrors represents an original experiment in Human-Computer Interface, that opens the door to various interactive experiments in entertainment, arts and communication. Use of video analysis and graphics techniques will allow to explore and interfere with what has always been a private, solitary act of a person looking in a mirror.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 3.Perspectives. *See A Handheld Virtual Mirror* (2002), at Figure 2:

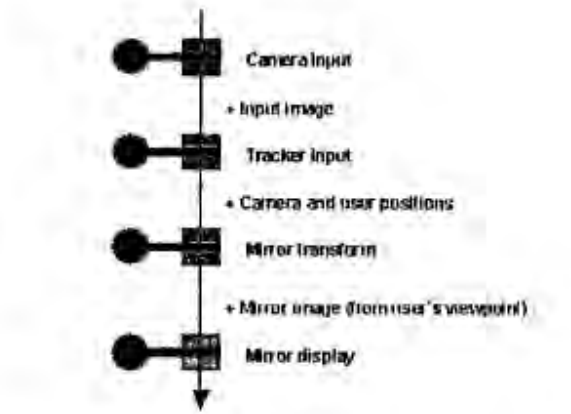
Asserted Claim of the ’109 Patent	Exemplary Citations to Francois III
	 Figure 2. Handheld virtual mirror device. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois III alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the ’109 Patent	Exemplary Citations to Francois III
Claim 11	
11[pre]. The method of claim 1, further comprising:	To the extent the preamble is limiting, Francois III expressly and/or inherently discloses and/or renders obvious this limitation. *See, e.g.*, disclosures below. *See* Claim Limitations 1[pre]-1[h].

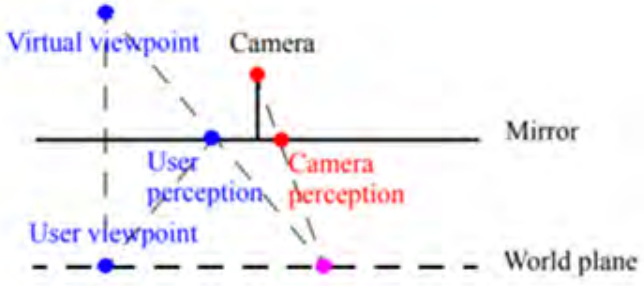
Asserted Claim of the '109 Patent	Exemplary Citations to Francois III
	This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois III alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
11[a]. determining distance to a user appearing in the image; and,	Francois III expressly and/or inherently discloses and/or renders obvious determining distance to a user appearing in the image. *See*, *e.g.*, disclosures below. *See* Claim Limitation 1[g]. *See also*: "This paper is organized as follows. In section 2, we outline the geometric analysis of mirror and camera imaging, leading to the image transform for mirror simulation, based on the flat world assumption. In section 3, we briefly explain the software and hard1ware design of our prototype. In section 4, we relate our work to other mirror experiments, and to upcoming applications. Finally, we conclude the paper in section 5." *See A Handheld Mirror Simulation*, Francois et al. (2003), 1.INTRODUCTION, page 745. "In order to synthesize the images corresponding to the user's view1point from the images captured by the camera, we must relate them geometrically, i.e. express x_p and y_p in terms of x'_p and y'_p.

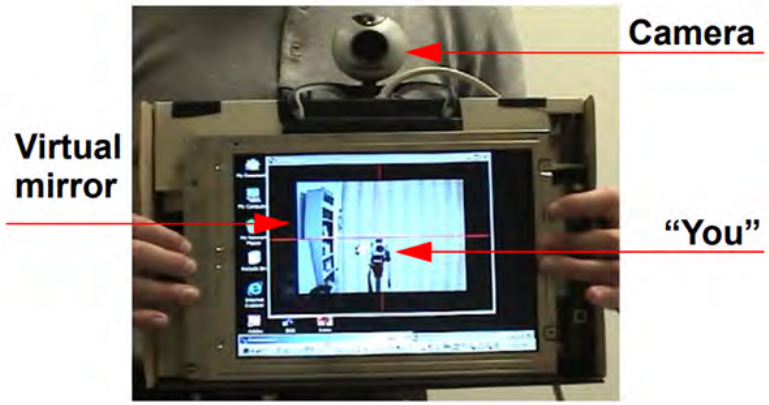
Asserted Claim of the ’109 Patent	Exemplary Citations to Francois III
	$\begin{bmatrix} x \\ y \\ z \\ 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & t_x \\ 0 & 1 & 0 & t_y \\ 0 & 0 & 1 & t_z \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x' \\ y' \\ z' \\ 1 \end{bmatrix}$ The mirror projection equations become: $\begin{bmatrix} U_p \\ V_p \\ W_p \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & t_x \\ 0 & 1 & 0 & t_y \\ 0 & 0 & 1/d & t_z/d \end{bmatrix} \begin{bmatrix} x' \\ y' \\ z' \\ 1 \end{bmatrix}$ $x_p = d(x' + t_x)/(z' + t_z)$ $y_p = d(y' + t_y)/(z' + t_z)$  **Figure 4. An underconstrained problem.** Express xp and yp in terms of x’p and /p thus requires to recover the actual 3-D position of each point from its image projection. This is obviously an underconstrained problem, as an image pixel might potentially be the projection of any world point on a ray passing through the camera center and the pixel, as illustrated in figure 4. Various computer vision techniques could be used to attempt to recover the 3-13 geometry of the world from images in some cases. Another solution would be to use a 3-D model of the environment, if available. For our first prototype, we followed a simpler approximate approach. Since we are designing our mirror as a first person interaction tool, we assume that the center of interest is the user himself, and that the background is of lesser

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	importance. We thus model the world as a plane parallel to the mirror/imaging plane, at the same distance as the user’s viewpoint (see figure 5). The z' component of each world point is thus fixed to $z' = f + d$ in the camera centered coordinate system. We can now inverse the camera projection equations: $x'_p = fx'/(f+d) \Leftrightarrow x' = (f+d)x'_p/f$ $y'_p = fy'/(f+d) \Leftrightarrow y' = (f+d)y'_p/f$ The transformation equations that relate the user's view to the camera image are thus: $x_p = d((f+d)x'_p/f + t_x)/((f+d) + t_z)$ $y_p = d((f+d)y'_p/f + t_y)/((f+d) + t_z)$ The only parameters are f, d and [txtytz]. The theoretical focal length of the camera can be obtained by various calibration methods. The positions and orientations of the user’s viewpoint and the camera center provided by the tracking devices, allow to compute both the distance d and the change of referential translation parameters. Note that under our assumptions, the transform relating the user’s view to the camera view is reduced to a scaling and a translation. This model provides a straightforward and efficient way of synthesizing the viewer’s image stream from the camera stream, while remaining a reasonable approximation for a large class of applications. The major field-of-view variations occuring when varying the angle of view and the distance to the mirror, are convincingly simulated. *See A Handheld Mirror Simulation*, Francois et al. (2003), 2.3 User view synthesis, pages 746-47.

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	 **Figure 6. Mirror simulation application graph.** *See A Handheld Mirror Simulation*, Francois et al. (2003), Fig. 6. “This sketch presents the design and construction of a handheld virtual mirror device. The perception of the world reflected through a mirror depends on the viewer's position with respect to the mirror and the 3-D geometry of the world. In order to simulate a real mirror on a computer screen, images of the observed world, consistent with the viewer's position, must be synthesized and displayed in real-time. Our system is build around a flat LCD screen manipulated by the user, a single camera fixed on the screen, and a tracking device. The continuous input video stream and tracker data is used to synthesize, in real-time, a continuous video stream displayed on the LCD screen. The synthesized video stream is a close approximation of what the user would see on the screen surface if it were a real mirror.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at the introductory paragraph. “When a person looks into a mirror, they see what they would see from the symmetrical (virtual) point of view (figure 1). A camera whose position and orientation are fixed with

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	respect to the mirror produces a video stream that corresponds to this particular viewpoint. In order to synthesize the images corresponding to the user's viewpoint from the images captured by the camera, we must relate them geometrically. Such a transform cannot be formulated without assumptions or knowledge about the world geometry. In our case, the focus of attention is the user's own reflection in the mirror. We thus model the world as a plane parallel to the mirror, at the user's distance from the mirror. We have shown that under these assumptions, the transform relating the camera view and the user view depends only on the relative positions of the user viewpoint and the camera center, and is reduced to a scaling and a translation. The transform is exact when the user viewpoint lies on the camera axis. This model provides a straightforward and efficient way of synthesizing the viewer's image stream from the camera stream, and provides a good approximation when the viewer's position remains close to the camera axis.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 1.Problem formulation and geometric analysis. “We have implemented the mirror image transform as a module in the Modular Flow Scheduling Middleware [François 2001], the open source implementation of IMSC's software architecture for Integrated Media Systems. It is specifically designed for parallel processing of concurrent data streams in real-time, and its modularity dramatically reduces development and integration time. The actual handheld virtual mirror system is composed of a handheld 10" LCD flat screen fitted with a camera and a magnetic tracker sensor (figure 2), a fixed processing unit, a fixed magnetic tracker transmitter, and a second magnetic tracker sensor placed on the user. Real-time camera and tracker inputs are used to synthesize the virtual mirror stream and display it in real-time on the LCD screen. The result is a very convincing handheld mirror simulation.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 2.2.System integration. “The design and construction of realistic virtual mirrors represents an original experiment in Human-Computer Interface, that opens the door to various interactive experiments in entertainment, arts and communication. Use of video analysis and graphics techniques will allow to explore and interfere with what has always been a

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	private, solitary act of a person looking in a mirror.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 3.Perspectives. *See A Handheld Virtual Mirror* (2002), at Figure 1:  Figure 1. Basic mirror geometry. *See A Handheld Virtual Mirror* (2002), at Figure 2:

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	 Figure 2. Handheld virtual mirror device. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois III alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
11[b]. varying resolution of the image according to the distance.	Francois III inherently discloses and/or renders obvious varying resolution of the image according to the distance. *See*, *e.g.*, disclosures below. “We have implemented the mirror image transform as a module in the Modular Flow Scheduling Middleware [François 2001], the open source implementation of IMSC's software architecture for Integrated Media Systems. It is specifically designed for parallel processing of concurrent data streams in real-time, and its modularity dramatically reduces development and integration time. The actual handheld virtual mirror system is composed of a handheld 10" LCD flat screen fitted with a camera and a magnetic tracker sensor (figure 2), a fixed processing unit, a fixed magnetic tracker transmitter, and a second magnetic tracker sensor placed on the user. Real-time camera and tracker inputs are used to synthesize the virtual mirror stream and display it in real-

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	time on the LCD screen. The result is a very convincing handheld mirror simulation.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 2.2.System integration. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois III alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Exhibit A-27: Invalidity of U.S. Patent No. 8,982,109 in view of Japanese Patent Pub. No. JP2007166529A ("Miyamoto")

This chart is subject to all reservations, objections, and disclaimers in Defendants' Invalidity Contentions and any amendment, supplement, or modification thereof, which are incorporated herein by reference in their entirety.

Miyamoto was originally filed September 16, 2005 and was published on June 28, 2007, and thus is available as prior art to U.S. Patent No. 8,982,109 (the "'109 Patent") under at least 35 U.S.C. §§ 102(b).

Miyamoto anticipates the Asserted Claims of the '109 Patent. To the extent it is found Miyamoto does not expressly disclose certain limitations in the Asserted Claims, such limitations are at least implicitly or inherently disclosed. Moreover, to the extent it is found that Miyamoto does not anticipate the Asserted Claims, Miyamoto renders obvious the Asserted Claims, either alone or in combination with other prior art identified in the cover pleading or herein, and/or in combination with the general knowledge of a person having ordinary skill in the art.

In these contentions, Defendants have relied in part on Plaintiff's Infringement Contentions. In those contentions, Plaintiff appears to pursue overly broad claim constructions in an effort to assert infringement where none exists, and to accuse products that do not infringe the claims. Defendants' assertion that a particular limitation is disclosed by a prior art reference and/or is disclosed in a particular manner may be based in part on Plaintiff's apparent claim interpretations. In relying on Plaintiff's apparent claim interpretations, Defendants do not admit that Plaintiff's apparent claim interpretations are supportable or proper or that the claim limitations in question are definite or otherwise amenable to construction.

Defendants have endeavored to provide as much detail as possible in these contentions and, in doing so, have exceeded the level of detail required. The inclusion of specific details in some areas is not a concession that such details are required or that the omission of similar details in other areas is a defect. These citations to portions of any reference in this chart are exemplary only. Defendants will rely on the entirety of the references cited in this chart to show that the Asserted Claims are invalid.

Asserted Claim of the '109 Patent	Exemplary Citations to Miyamoto
Claim 1	
1[pre]. A method for operating a system having a monitor, a camera, and a processor, so as to display a mirror-mimicking image on the monitor, by performing non-ordered steps comprising:	To the extent the preamble is limiting, Miyamoto expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. "The videophone device of the present invention is a videophone device comprising a camera unit for photographing a caller and a display unit for displaying an image of the other party sent through a communication network. The camera unit is incorporated in the display unit so as to photograph the caller from the position where the eye is displayed, and the eye detection unit detects the eye from the image of the other party, and the position of at least one eye of the other party Is provided with a coordinate conversion processing unit that performs coordinate conversion of the image of the other party of the call so as to coincide with the built-in position of the camera unit." Miyamoto at [0007]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Miyamoto alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[a]. obtaining a digital image from a camera;	Miyamoto expressly and/or inherently discloses and/or renders obvious obtaining a digital image from a camera. *See*, *e.g.*, disclosures below. "The videophone device of the present invention is a videophone device comprising a camera unit for photographing a caller and a display unit for displaying an image of the other party sent through a communication network. The camera unit is incorporated in the display unit so as to photograph the caller from the position where the eye is displayed, and the eye detection unit detects the eye from the image of the other party, and the position of at least one eye of the other party Is provided with a coordinate conversion processing unit that performs coordinate conversion of the image of the other

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	party of the call so as to coincide with the built-in position of the camera unit." Miyamoto at [0007]. "According to the videophone device of the present invention, the camera unit is incorporated in the display unit so as to photograph the caller from the position where the caller's eye of the display unit is displayed, and the eye is detected from the image of the caller. Since the coordinate conversion of the image of the other party is performed so that at least one of them matches the built-in position of the camera unit, users can talk in a natural state with their eyes aligned." Miyamoto at [0011]. "On the other hand, as shown in the flowchart of FIG. 6, the camera 15 takes a picture of the caller and takes a moving picture while the liquid crystal display unit 30 is in a transparent state (st11). This moving picture is taken at 30 frames / second, and during this non-shooting time, the caller does not feel uncomfortable because the liquid crystal display unit 30 displays the right eye of the other party." Miyamoto at [0030]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Miyamoto alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[b]. flipping the image about a vertical axis so as to reverse right and left sides of the image;	Miyamoto expressly and/or inherently discloses and/or renders obvious flipping the image about a vertical axis so as to reverse right and left sides of the image. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Miyamoto alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

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1[c]. applying a transformation mapping to the image to modify the image such that it appears to mimic a reflection of a mirror;	Miyamoto expressly and/or inherently discloses and/or renders obvious applying a transformation mapping to the image to modify the image such that it appears to mimic a reflection of a mirror. *See*, *e.g.*, disclosures below. "According to the videophone device of the present invention, the camera unit is incorporated in the display unit so as to photograph the caller from the position where the caller's eye of the display unit is displayed, and the eye is detected from the image of the caller. Since the coordinate conversion of the image of the other party is performed so that at least one of them matches the built-in position of the camera unit, users can talk in a natural state with their eyes aligned." Miyamoto at [0011]. "As shown in FIG. 4, the right eye of the image 45 (indicated by the alternate long and short dash line) for one frame before coordinate conversion is shifted from the installation position of the camera 15. This image 45 is converted into an image 45a (indicated by a solid line) by coordinate transformation, and the right eye of the other party is matched with the installation position of the camera 15. The images 45 and 45a are set to have an area larger than that of the screen of the liquid crystal display 12, and do not protrude from the screen of the liquid crystal display 12 even if the display position is moved by the coordinate conversion." Miyamoto at [0025]. "The image data that has undergone coordinate transformation by the coordinate transformation processing unit 43 is transferred to the frame memory 46. Image data is input to the frame memory 46 at a rate of 30 frames / second, and the image of the other party is displayed on the liquid crystal display unit 30 by the LCD driver 47. The CPU 44 executes a sequence such as the series of image processing described above." Miyamoto at [0026]. "On the other hand, as shown in the flowchart of FIG. 6, the camera 15 takes a picture of the caller and takes a moving picture while the liquid crystal display unit 30 is in a transparent state (st11). This moving picture is taken at 30 frames / second, and during

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	this non-shooting time, the caller does not feel uncomfortable because the liquid crystal display unit 30 displays the right eye of the other party." Miyamoto at [0030]. "The captured image data is subjected to predetermined image processing by the image signal processing unit 36, compressed by the compression / decompression processing unit 37, and transmitted to the videophone device 22 via the Internet 20 by the communication unit 38. (St12). This sequence of video shooting, image processing, compression, and transmission is repeated until the end of the call (st13)." Miyamoto at [0031]. "On the other hand, the image data of the communication partner transmitted from the videophone device 22 via the Internet 20 is decompressed by the compression / expansion processing unit 37 via the communication unit 38 and then temporarily input to the image memory 40. . Subsequently, the image data is read into the eye detection unit 42, and both eyes of the other party are detected. Thereafter, the position coordinates of both eyes, the installation positions of the cameras 53 and 54, and the image data are read into the coordinate conversion / resizing processing unit 60 so that the eyes of the other party of the call coincide with the installation positions of the cameras 53 and 54. Next, coordinate conversion and / or resizing processing of the image data is performed (see FIG. 9A)." Miyamoto at [0035]. "The image data of the image 70 (see FIG. 9A) that has undergone the coordinate conversion and / or resizing processing is transferred to the frame memory 46. Image data is input to the frame memory 46 at a rate of 30 frames / second, and the image of the other party is displayed on the liquid crystal display unit 30 by the LCD driver 47." Miyamoto at [0036]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Miyamoto alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of

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	Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[d]. resizing the image to reduce variations caused by changes in object's distance to the camera;	Miyamoto expressly and/or inherently discloses and/or renders obvious resizing the image to reduce variations caused by changes in object's distance to the camera. *See*, *e.g.*, disclosures below. "The image data that has undergone coordinate transformation by the coordinate transformation processing unit 43 is transferred to the frame memory 46. Image data is input to the frame memory 46 at a rate of 30 frames / second, and the image of the other party is displayed on the liquid crystal display unit 30 by the LCD driver 47. The CPU 44 executes a sequence such as the series of image processing described above." Miyamoto at [0026]. "On the other hand, the image data of the communication partner transmitted from the videophone device 22 via the Internet 20 is decompressed by the compression / expansion processing unit 37 via the communication unit 38 and then temporarily input to the image memory 40. . Subsequently, the image data is read into the eye detection unit 42, and both eyes of the other party are detected. Thereafter, the position coordinates of both eyes, the installation positions of the cameras 53 and 54, and the image data are read into the coordinate conversion / resizing processing unit 60 so that the eyes of the other party of the call coincide with the installation positions of the cameras 53 and 54. Next, coordinate conversion and / or resizing processing of the image data is performed (see FIG. 9A)." Miyamoto at [0035]. "The image data of the image 70 (see FIG. 9A) that has undergone the coordinate conversion and / or resizing processing is transferred to the frame memory 46. Image data is input to the frame memory 46 at a rate of 30 frames / second, and the image of the other party is displayed on the liquid crystal display unit 30 by the LCD driver 47." Miyamoto at [0036].

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	This limitation would have been obvious to a person of ordinary skill in the art based on (1) Miyamoto alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[e]. displaying the image on the monitor after performing the flipping, transformation mapping, and resizing;	Miyamoto expressly and/or inherently discloses and/or renders obvious displaying the image on the monitor after performing the flipping, transformation mapping, and resizing. *See*, *e.g.*, disclosures below. "The image data that has undergone coordinate transformation by the coordinate transformation processing unit 43 is transferred to the frame memory 46. Image data is input to the frame memory 46 at a rate of 30 frames / second, and the image of the other party is displayed on the liquid crystal display unit 30 by the LCD driver 47. The CPU 44 executes a sequence such as the series of image processing described above." Miyamoto at [0026]. "On the other hand, the image data of the communication partner transmitted from the videophone device 22 via the Internet 20 is decompressed by the compression / expansion processing unit 37 via the communication unit 38 and then temporarily input to the image memory 40. . Subsequently, the image data is read into the eye detection unit 42, and both eyes of the other party are detected. Thereafter, the position coordinates of both eyes, the installation positions of the cameras 53 and 54, and the image data are read into the coordinate conversion / resizing processing unit 60 so that the eyes of the other party of the call coincide with the installation positions of the cameras 53 and 54. Next, coordinate conversion and / or resizing processing of the image data is performed (see FIG. 9A)." Miyamoto at [0035]. "The image data of the image 70 (see FIG. 9A) that has undergone the coordinate conversion and / or resizing processing is transferred to the frame memory 46. Image data is input to the frame memory 46 at a rate of 30 frames / second, and the image of

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	the other party is displayed on the liquid crystal display unit 30 by the LCD driver 47." Miyamoto at [0036]. "As shown in FIG. 9B, when the face of the other party in the image 70 is tilted, if the coordinate position of both eyes matches the installation position of the cameras 53 and 54 by the coordinate conversion and / or resizing, the call is made. It becomes difficult to tell if the other person's face is tilted (the body is tilted if you look closely). Therefore, the CPU 44 calculates the amount of inclination of the call partner's eyes based on the correction data when the coordinate conversion and / or resizing is performed, and drives the motor 74 via the motor driver 72 so as to cancel out this. Then, the liquid crystal display 52 is rotated (see FIG. 5C). This clearly shows that the face of the other party is tilted." Miyamoto at [0037]. "When the liquid crystal display 52 is rotated, the cameras 53 and 54 are tilted and the caller's face is tilted. The image data of the caller is compressed / tilted after the tilt is corrected by the tilt correction processing unit 71. The data is compressed by the decompression processing unit 37 and transmitted to the videophone device 22 via the communication unit 38." Miyamoto at [0038]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Miyamoto alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[f]. wherein the non-ordered steps are performed on a series of images of a live video feed from the camera;	Miyamoto expressly and/or inherently discloses and/or renders obvious wherein the non-ordered steps are performed on a series of images of a live video feed from the camera. *See*, *e.g.*, disclosures below. "On the other hand, as shown in the flowchart of FIG. 6, the camera 15 takes a picture of the caller and takes a moving picture while the liquid crystal display unit 30 is in a transparent state (st11). This moving picture is taken at 30 frames / second, and during

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	this non-shooting time, the caller does not feel uncomfortable because the liquid crystal display unit 30 displays the right eye of the other party." Miyamoto at [0030]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Miyamoto alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[g]. determining distance to a user appearing in the live video feed; and	Miyamoto expressly and/or inherently discloses and/or renders obvious determining distance to a user appearing in the live video feed. *See*, *e.g.*, disclosures below. "After detecting the eyes of the other party, the position coordinates of both eyes, the installation position of the camera 15 (the position of the hole 31a of the light plate 31) and the image data are read into the coordinate conversion processing unit 43, and one side of the other party In this embodiment, the coordinate conversion of the image data is performed so that the right eye coincides with the installation position of the camera 15." Miyamoto at [0024]. "The image data that has undergone coordinate transformation by the coordinate transformation processing unit 43 is transferred to the frame memory 46. Image data is input to the frame memory 46 at a rate of 30 frames / second, and the image of the other party is displayed on the liquid crystal display unit 30 by the LCD driver 47. The CPU 44 executes a sequence such as the series of image processing described above." Miyamoto at [0026]. "On the other hand, the image data of the communication partner transmitted from the videophone device 22 via the Internet 20 is decompressed by the compression / expansion processing unit 37 via the communication unit 38 and then temporarily input to the image memory 40. . Subsequently, the image data is read into the eye detection unit 42, and both eyes of the other party are detected. Thereafter, the position coordinates of both eyes, the installation positions of the cameras 53 and 54, and the image data are

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	read into the coordinate conversion / resizing processing unit 60 so that the eyes of the other party of the call coincide with the installation positions of the cameras 53 and 54. Next, coordinate conversion and / or resizing processing of the image data is performed (see FIG. 9A)." Miyamoto at [0035]. "The image data of the image 70 (see FIG. 9A) that has undergone the coordinate conversion and / or resizing processing is transferred to the frame memory 46. Image data is input to the frame memory 46 at a rate of 30 frames / second, and the image of the other party is displayed on the liquid crystal display unit 30 by the LCD driver 47." Miyamoto at [0036]. "As shown in FIG. 9B, when the face of the other party in the image 70 is tilted, if the coordinate position of both eyes matches the installation position of the cameras 53 and 54 by the coordinate conversion and / or resizing, the call is made. It becomes difficult to tell if the other person's face is tilted (the body is tilted if you look closely). Therefore, the CPU 44 calculates the amount of inclination of the call partner's eyes based on the correction data when the coordinate conversion and / or resizing is performed, and drives the motor 74 via the motor driver 72 so as to cancel out this. Then, the liquid crystal display 52 is rotated (see FIG. 5C). This clearly shows that the face of the other party is tilted." Miyamoto at [0037]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Miyamoto alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[h]. varying rate at which the non-ordered steps are performed on the series of images according to the distance.	Miyamoto expressly and/or inherently discloses and/or renders obvious varying rate at which the non-ordered steps are performed on the series of images according to the distance. *See*, *e.g.*, disclosures below.

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	"The image signal is sent by the communication unit 38 to the videophone device 22 of the other party via the Internet 20. The photographing lens of the camera 15 is a wide-angle fixed focus lens having a focus position of 30 to 40 cm so that the face of the caller sitting in front of the videophone device 10 and looking at the liquid crystal display 12 can be photographed most clearly. It is." Miyamoto at [0021]. "The image data that has undergone coordinate transformation by the coordinate transformation processing unit 43 is transferred to the frame memory 46. Image data is input to the frame memory 46 at a rate of 30 frames / second, and the image of the other party is displayed on the liquid crystal display unit 30 by the LCD driver 47. The CPU 44 executes a sequence such as the series of image processing described above." Miyamoto at [0026]. "On the other hand, the image data of the communication partner transmitted from the videophone device 22 via the Internet 20 is decompressed by the compression / expansion processing unit 37 via the communication unit 38 and then temporarily input to the image memory 40. . Subsequently, the image data is read into the eye detection unit 42, and both eyes of the other party are detected. Thereafter, the position coordinates of both eyes, the installation positions of the cameras 53 and 54, and the image data are read into the coordinate conversion / resizing processing unit 60 so that the eyes of the other party of the call coincide with the installation positions of the cameras 53 and 54. Next, coordinate conversion and / or resizing processing of the image data is performed (see FIG. 9A)." Miyamoto at [0035]. "The image data of the image 70 (see FIG. 9A) that has undergone the coordinate conversion and / or resizing processing is transferred to the frame memory 46. Image data is input to the frame memory 46 at a rate of 30 frames / second, and the image of the other party is displayed on the liquid crystal display unit 30 by the LCD driver 47." Miyamoto at [0036]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Miyamoto alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3)

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	the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

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Claim 2	
2. The method of claim 1, wherein the transformation mapping renders an image appearing to have been taken from a camera positioned at eye-level height and pointing horizontally.	Miyamoto expressly and/or inherently discloses and/or renders obvious wherein the transformation mapping renders an image appearing to have been taken from a camera positioned at eye-level height and pointing horizontally. *See*, *e.g.*, disclosures below. “According to the videophone device of the present invention, the camera unit is incorporated in the display unit so as to photograph the caller from the position where the caller's eye of the display unit is displayed, and the eye is detected from the image of the caller. Since the coordinate conversion of the image of the other party is performed so that at least one of them matches the built-in position of the camera unit, users can talk in a natural state with their eyes aligned.” Miyamoto at [0011]. “The image data that has undergone coordinate transformation by the coordinate transformation processing unit 43 is transferred to the frame memory 46. Image data is input to the frame memory 46 at a rate of 30 frames / second, and the image of the other party is displayed on the liquid crystal display unit 30 by the LCD driver 47. The CPU 44 executes a sequence such as the series of image processing described above.” Miyamoto at [0026]. “On the other hand, the image data of the communication partner transmitted from the videophone device 22 via the Internet 20 is decompressed by the compression / expansion processing unit 37 via the communication unit 38 and then temporarily input to the image memory 40. . Subsequently, the image data is read into the eye detection unit 42, and both eyes of the other party are detected. Thereafter, the position coordinates

Asserted Claim of the '109 Patent	Exemplary Citations to Miyamoto
	of both eyes, the installation positions of the cameras 53 and 54, and the image data are read into the coordinate conversion / resizing processing unit 60 so that the eyes of the other party of the call coincide with the installation positions of the cameras 53 and 54. Next, coordinate conversion and / or resizing processing of the image data is performed (see FIG. 9A)." Miyamoto at [0035]. "The image data of the image 70 (see FIG. 9A) that has undergone the coordinate conversion and / or resizing processing is transferred to the frame memory 46. Image data is input to the frame memory 46 at a rate of 30 frames / second, and the image of the other party is displayed on the liquid crystal display unit 30 by the LCD driver 47." Miyamoto at [0036]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Miyamoto alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '109 Patent	Exemplary Citations to Miyamoto
Claim 7	
7[pre]. The method of claim 1, further comprising the steps:	To the extent the preamble is limiting, Miyamoto expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. *See* Claim Limitations 1[pre]-[1[h]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Miyamoto alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of

Asserted Claim of the '109 Patent	Exemplary Citations to Miyamoto
	Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
7[a]. obtaining a reference image;	Miyamoto expressly and/or inherently discloses and/or renders obvious obtaining a reference image. *See*, *e.g.*, disclosures below. "Further, since the display unit is rotated in accordance with the inclination of the face of the call partner, the state where the call partner has raised its neck can be clearly seen. In addition, the image data output from the camera unit is corrected so as to cancel the rotation angle of the display unit and then transmitted to the other party, so that the caller's face is tilted and displayed on the other party's display unit. Can be prevented." Miyamoto at [0015]. "On the other hand, as shown in the flowchart of FIG. 6, the camera 15 takes a picture of the caller and takes a moving picture while the liquid crystal display unit 30 is in a transparent state (st11). This moving picture is taken at 30 frames / second, and during this non-shooting time, the caller does not feel uncomfortable because the liquid crystal display unit 30 displays the right eye of the other party." Miyamoto at [0030]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Miyamoto alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
7[b]. performing registration of the digital image with the reference image;	Miyamoto expressly and/or inherently discloses and/or renders obvious performing registration of the digital image with the reference image. *See*, *e.g.*, disclosures below. "Further, since the display unit is rotated in accordance with the inclination of the face of the call partner, the state where the call partner has raised its neck can be clearly seen. In addition, the image data output from the camera unit is corrected so as to cancel the

Asserted Claim of the '109 Patent	Exemplary Citations to Miyamoto
	rotation angle of the display unit and then transmitted to the other party, so that the caller's face is tilted and displayed on the other party's display unit. Can be prevented." Miyamoto at [0015]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Miyamoto alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
7[c]. using data obtained from the registration to generate the transformation mapping.	Miyamoto expressly and/or inherently discloses and/or renders obvious using data obtained from the registration to generate the transformation mapping. *See*, *e.g.*, disclosures below. "Further, since the display unit is rotated in accordance with the inclination of the face of the call partner, the state where the call partner has raised its neck can be clearly seen. In addition, the image data output from the camera unit is corrected so as to cancel the rotation angle of the display unit and then transmitted to the other party, so that the caller's face is tilted and displayed on the other party's display unit. Can be prevented." Miyamoto at [0015]. "The image data that has undergone coordinate transformation by the coordinate transformation processing unit 43 is transferred to the frame memory 46. Image data is input to the frame memory 46 at a rate of 30 frames / second, and the image of the other party is displayed on the liquid crystal display unit 30 by the LCD driver 47. The CPU 44 executes a sequence such as the series of image processing described above." Miyamoto at [0026]. "On the other hand, the image data of the communication partner transmitted from the videophone device 22 via the Internet 20 is decompressed by the compression / expansion processing unit 37 via the communication unit 38 and then temporarily input to the image memory 40. . Subsequently, the image data is read into the eye detection

Asserted Claim of the '109 Patent	Exemplary Citations to Miyamoto
	unit 42, and both eyes of the other party are detected. Thereafter, the position coordinates of both eyes, the installation positions of the cameras 53 and 54, and the image data are read into the coordinate conversion / resizing processing unit 60 so that the eyes of the other party of the call coincide with the installation positions of the cameras 53 and 54. Next, coordinate conversion and / or resizing processing of the image data is performed (see FIG. 9A)." Miyamoto at [0035]. "The image data of the image 70 (see FIG. 9A) that has undergone the coordinate conversion and / or resizing processing is transferred to the frame memory 46. Image data is input to the frame memory 46 at a rate of 30 frames / second, and the image of the other party is displayed on the liquid crystal display unit 30 by the LCD driver 47." Miyamoto at [0036]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Miyamoto alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '109 Patent	Exemplary Citations to Miyamoto
Claim 8	
8. The method of claim 1, further comprising applying a translation transformation to move the image within display area of the monitor.	Miyamoto expressly and/or inherently discloses and/or renders obvious applying a translation transformation to move the image within display area of the monitor. *See*, *e.g.*, disclosures below. "The image data that has undergone coordinate transformation by the coordinate transformation processing unit 43 is transferred to the frame memory 46. Image data is input to the frame memory 46 at a rate of 30 frames / second, and the image of the other party is displayed on the liquid crystal display unit 30 by the LCD driver 47. The CPU

Asserted Claim of the '109 Patent	Exemplary Citations to Miyamoto
	44 executes a sequence such as the series of image processing described above." Miyamoto at [0026]. "On the other hand, the image data of the communication partner transmitted from the videophone device 22 via the Internet 20 is decompressed by the compression / expansion processing unit 37 via the communication unit 38 and then temporarily input to the image memory 40. . Subsequently, the image data is read into the eye detection unit 42, and both eyes of the other party are detected. Thereafter, the position coordinates of both eyes, the installation positions of the cameras 53 and 54, and the image data are read into the coordinate conversion / resizing processing unit 60 so that the eyes of the other party of the call coincide with the installation positions of the cameras 53 and 54. Next, coordinate conversion and / or resizing processing of the image data is performed (see FIG. 9A)." Miyamoto at [0035]. "The image data of the image 70 (see FIG. 9A) that has undergone the coordinate conversion and / or resizing processing is transferred to the frame memory 46. Image data is input to the frame memory 46 at a rate of 30 frames / second, and the image of the other party is displayed on the liquid crystal display unit 30 by the LCD driver 47." Miyamoto at [0036]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Miyamoto alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '109 Patent	Exemplary Citations to Miyamoto
Claim 9	

Asserted Claim of the '109 Patent	Exemplary Citations to Miyamoto
9. The method of claim 1, further comprising changing illumination intensity of individual or groups of pixels of the monitor, so as to enhance shading or illumination in the image.	Miyamoto expressly and/or inherently discloses and/or renders obvious changing illumination intensity of individual or groups of pixels of the monitor, so as to enhance shading or illumination in the image. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Miyamoto alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '109 Patent	Exemplary Citations to Miyamoto
Claim 11	
11[pre]. The method of claim 1, further comprising:	To the extent the preamble is limiting, Miyamoto expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. *See* Claim Limitations 1[pre]-[1[h]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Miyamoto alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
11[a]. determining distance to a user appearing in the image; and,	Miyamoto expressly and/or inherently discloses and/or renders obvious determining distance to a user appearing in the image. *See*, *e.g.*, disclosures below. *See* Claim Limitation 1[g]. *See also*: "After detecting the eyes of the other party, the position coordinates of both eyes, the installation position of the camera 15 (the position of the hole 31a of the light plate 31)

Asserted Claim of the '109 Patent	Exemplary Citations to Miyamoto
	and the image data are read into the coordinate conversion processing unit 43, and one side of the other party In this embodiment, the coordinate conversion of the image data is performed so that the right eye coincides with the installation position of the camera 15." Miyamoto at [0024]. "The image data that has undergone coordinate transformation by the coordinate transformation processing unit 43 is transferred to the frame memory 46. Image data is input to the frame memory 46 at a rate of 30 frames / second, and the image of the other party is displayed on the liquid crystal display unit 30 by the LCD driver 47. The CPU 44 executes a sequence such as the series of image processing described above." Miyamoto at [0026]. "On the other hand, the image data of the communication partner transmitted from the videophone device 22 via the Internet 20 is decompressed by the compression / expansion processing unit 37 via the communication unit 38 and then temporarily input to the image memory 40. . Subsequently, the image data is read into the eye detection unit 42, and both eyes of the other party are detected. Thereafter, the position coordinates of both eyes, the installation positions of the cameras 53 and 54, and the image data are read into the coordinate conversion / resizing processing unit 60 so that the eyes of the other party of the call coincide with the installation positions of the cameras 53 and 54. Next, coordinate conversion and / or resizing processing of the image data is performed (see FIG. 9A)." Miyamoto at [0035]. "The image data of the image 70 (see FIG. 9A) that has undergone the coordinate conversion and / or resizing processing is transferred to the frame memory 46. Image data is input to the frame memory 46 at a rate of 30 frames / second, and the image of the other party is displayed on the liquid crystal display unit 30 by the LCD driver 47." Miyamoto at [0036].

Asserted Claim of the '109 Patent	Exemplary Citations to Miyamoto
	This limitation would have been obvious to a person of ordinary skill in the art based on (1) Miyamoto alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
11[b]. varying resolution of the image according to the distance.	Miyamoto expressly and/or inherently discloses and/or renders obvious varying resolution of the image according to the distance. *See*, *e.g.*, disclosures below. "The image signal is sent by the communication unit 38 to the videophone device 22 of the other party via the Internet 20. The photographing lens of the camera 15 is a wide-angle fixed focus lens having a focus position of 30 to 40 cm so that the face of the caller sitting in front of the videophone device 10 and looking at the liquid crystal display 12 can be photographed most clearly. It is." Miyamoto at [0021]. "The image data that has undergone coordinate transformation by the coordinate transformation processing unit 43 is transferred to the frame memory 46. Image data is input to the frame memory 46 at a rate of 30 frames / second, and the image of the other party is displayed on the liquid crystal display unit 30 by the LCD driver 47. The CPU 44 executes a sequence such as the series of image processing described above." Miyamoto at [0026]. "On the other hand, the image data of the communication partner transmitted from the videophone device 22 via the Internet 20 is decompressed by the compression / expansion processing unit 37 via the communication unit 38 and then temporarily input to the image memory 40. . Subsequently, the image data is read into the eye detection unit 42, and both eyes of the other party are detected. Thereafter, the position coordinates of both eyes, the installation positions of the cameras 53 and 54, and the image data are read into the coordinate conversion / resizing processing unit 60 so that the eyes of the other party of the call coincide with the installation positions of the cameras 53 and 54.

Asserted Claim of the ’109 Patent	Exemplary Citations to Miyamoto
	Next, coordinate conversion and / or resizing processing of the image data is performed (see FIG. 9A).” Miyamoto at [0035]. “The image data of the image 70 (see FIG. 9A) that has undergone the coordinate conversion and / or resizing processing is transferred to the frame memory 46. Image data is input to the frame memory 46 at a rate of 30 frames / second, and the image of the other party is displayed on the liquid crystal display unit 30 by the LCD driver 47.” Miyamoto at [0036]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Miyamoto alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Exhibit A-28: Invalidity of U.S. Patent No. 8,982,109 in view of Japanese Patent Pub. No. JP2010250452A ("Hamamoto")

This chart is subject to all reservations, objections, and disclaimers in Defendants' Invalidity Contentions and any amendment, supplement, or modification thereof, which are incorporated herein by reference in their entirety.

Hamamoto was originally filed April 14, 2009, and was published on November 4, 2010, and thus is available as prior art to U.S. Patent No. 8,982,109 (the "'109 Patent") under at least 35 U.S.C. §§ 102(b).

Hamamoto anticipates the Asserted Claims of the '109 Patent. To the extent it is found Hamamoto does not expressly disclose certain limitations in the Asserted Claims, such limitations are at least implicitly or inherently disclosed. Moreover, to the extent it is found that Hamamoto does not anticipate the Asserted Claims, Hamamoto renders obvious the Asserted Claims, either alone or in combination with other prior art identified in the cover pleading or herein, and/or in combination with the general knowledge of a person having ordinary skill in the art.

In these contentions, Defendants have relied in part on Plaintiff's Infringement Contentions. In those contentions, Plaintiff appears to pursue overly broad claim constructions in an effort to assert infringement where none exists, and to accuse products that do not infringe the claims. Defendants' assertion that a particular limitation is disclosed by a prior art reference and/or is disclosed in a particular manner may be based in part on Plaintiff's apparent claim interpretations. In relying on Plaintiff's apparent claim interpretations, Defendants do not admit that Plaintiff's apparent claim interpretations are supportable or proper or that the claim limitations in question are definite or otherwise amenable to construction.

Defendants have endeavored to provide as much detail as possible in these contentions and, in doing so, have exceeded the level of detail required. The inclusion of specific details in some areas is not a concession that such details are required or that the omission of similar details in other areas is a defect. These citations to portions of any reference in this chart are exemplary only. Defendants will rely on the entirety of the references cited in this chart to show that the Asserted Claims are invalid.

Asserted Claim of the '109 Patent	Exemplary Citations to Hamamoto
Claim 1	
1[pre]. A method for operating a system having a monitor, a camera, and a processor, so as to display a mirror-mimicking image on the monitor, by performing non-ordered steps comprising:	To the extent the preamble is limiting, Hamamoto expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. "The present invention relates to an arbitrary viewpoint image composition device applicable to, for example, a video conference system or a video phone system, and subject images from a plurality of cameras arranged around a display device according to a user's viewpoint position. The present invention relates to an arbitrary viewpoint image composition device that composes an image. However, it is not easy to realize this with the current television dialogue system. In order to match the line of sight when the front faces each other in a one-to-one conversation, it is necessary to arrange a camera for photographing the user in the center of the display. In this case, an image facing the front direction can be obtained, but it cannot be said to be a practical arrangement because the camera blocks the image on the display. For this reason, the camera is arranged at the periphery of the display. In this case, an image that is not facing the front is obtained because of a deviation between the shooting direction of the camera and the viewing direction of the user. When an image in which the line of sight is shifted is used in the system, there arises a problem that the line of sight cannot be matched with the other party to talk with. This problem is particularly noticeable when using large displays." Hamamoto at pg. 1. "The present invention has been made in view of such circumstances, and an arbitrary viewpoint image synthesis device that generates an image in which a shooting direction and a line-of-sight direction are matched by combining images of a plurality of cameras having different shooting directions. The purpose is to provide. The present invention provides a camera that captures an image of a subject that is installed at at least three locations around the display unit of the display device, the right side surface, and the left side surface, and the line of sight of the subject based on each image captured by the camera. An image composition processing unit for compositing

Asserted Claim of the ’109 Patent	Exemplary Citations to Hamamoto
	images taken from a virtual camera in a direction, and the image composition processing unit changes from a camera coordinate system to a virtual camera coordinate system using camera parameters obtained by camera calibration of the camera. A coordinate conversion unit for conversion; a distance estimation unit for estimating a distance model of a subject with respect to an image converted by the coordinate conversion unit; and an image composition unit for combining a virtual camera viewpoint image from the distance model of the subject. Is an arbitrary viewpoint image composition device. Here, the distance estimation unit performs evaluation by block matching for each pair of images converted by the coordinate conversion unit, changes the virtual plane distance within a range in which distance estimation is performed, and evaluates at all distances. The distance model with the smallest evaluation value is obtained as the distance value of the target pixel, and the distance model of the subject is estimated. The distance estimation unit may perform the evaluation by the block matching using an irregular block. The image composition unit may extract and paste a color of a pixel corresponding to the distance model of the subject from the image converted by the coordinate conversion unit. In addition, the image composition unit obtains pixels of surrounding cameras corresponding to the pixels of the virtual camera from the distance value in a one-to-one relationship. According to the present invention, with the above-described configuration, it is possible to obtain an effect that the front image can be improved in image quality and the line-of-sight matching feeling is improved. In particular, by improving the image quality of the peripheral region of the eyes, it is possible to further improve the line-of-sight matching feeling, and it is possible to realize an arbitrary viewpoint image composition device applicable to a television conversation system.

Asserted Claim of the '109 Patent	Exemplary Citations to Hamamoto
	Further, according to the present invention, the distance estimation unit performs block matching on the image acquired from the camera with an irregular block, so that the influence of occlusion can be reduced and the synthesis result of the front image can be improved in image quality. Can do. That is, the effect that the line-of-sight matching feeling is improved is obtained." Hamamoto at pg. 3. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Hamamoto alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[a]. obtaining a digital image from a camera;	Hamamoto expressly and/or inherently discloses and/or renders obvious obtaining a digital image from a camera. *See*, *e.g.*, disclosures below. "The present invention has been made in view of such circumstances, and an arbitrary viewpoint image synthesis device that generates an image in which a shooting direction and a line-of-sight direction are matched by combining images of a plurality of cameras having different shooting directions. The purpose is to provide. The present invention provides a camera that captures an image of a subject that is installed at at least three locations around the display unit of the display device, the right side surface, and the left side surface, and the line of sight of the subject based on each image captured by the camera. An image composition processing unit for compositing images taken from a virtual camera in a direction, and the image composition processing unit changes from a camera coordinate system to a virtual camera coordinate system using camera parameters obtained by camera calibration of the camera. A coordinate conversion unit for conversion; a distance estimation unit for estimating a distance model of a subject with respect to an image converted by the coordinate conversion unit; and an image composition unit for combining a virtual camera viewpoint image from the distance model of the subject. Is an arbitrary viewpoint image composition device.

Asserted Claim of the '109 Patent	Exemplary Citations to Hamamoto
	Here, the distance estimation unit performs evaluation by block matching for each pair of images converted by the coordinate conversion unit, changes the virtual plane distance within a range in which distance estimation is performed, and evaluates at all distances. The distance model with the smallest evaluation value is obtained as the distance value of the target pixel, and the distance model of the subject is estimated. The distance estimation unit may perform the evaluation by the block matching using an irregular block. The image composition unit may extract and paste a color of a pixel corresponding to the distance model of the subject from the image converted by the coordinate conversion unit. In addition, the image composition unit obtains pixels of surrounding cameras corresponding to the pixels of the virtual camera from the distance value in a one-to-one relationship. According to the present invention, with the above-described configuration, it is possible to obtain an effect that the front image can be improved in image quality and the line-of-sight matching feeling is improved. In particular, by improving the image quality of the peripheral region of the eyes, it is possible to further improve the line-of-sight matching feeling, and it is possible to realize an arbitrary viewpoint image composition device applicable to a television conversation system. Further, according to the present invention, the distance estimation unit performs block matching on the image acquired from the camera with an irregular block, so that the influence of occlusion can be reduced and the synthesis result of the front image can be improved in image quality. Can do. That is, the effect that the line-of-sight matching feeling is improved is obtained." Hamamoto at pg. 3.

Asserted Claim of the '109 Patent	Exemplary Citations to Hamamoto
	This limitation would have been obvious to a person of ordinary skill in the art based on (1) Hamamoto alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[b]. flipping the image about a vertical axis so as to reverse right and left sides of the image;	Hamamoto expressly and/or inherently discloses and/or renders obvious flipping the image about a vertical axis so as to reverse right and left sides of the image. *See*, *e.g.*, disclosures below. "The present invention has been made in view of such circumstances, and an arbitrary viewpoint image synthesis device that generates an image in which a shooting direction and a line-of-sight direction are matched by combining images of a plurality of cameras having different shooting directions. The purpose is to provide. The present invention provides a camera that captures an image of a subject that is installed at at least three locations around the display unit of the display device, the right side surface, and the left side surface, and the line of sight of the subject based on each image captured by the camera. An image composition processing unit for compositing images taken from a virtual camera in a direction, and the image composition processing unit changes from a camera coordinate system to a virtual camera coordinate system using camera parameters obtained by camera calibration of the camera. A coordinate conversion unit for conversion; a distance estimation unit for estimating a distance model of a subject with respect to an image converted by the coordinate conversion unit; and an image composition unit for combining a virtual camera viewpoint image from the distance model of the subject. Is an arbitrary viewpoint image composition device. Here, the distance estimation unit performs evaluation by block matching for each pair of images converted by the coordinate conversion unit, changes the virtual plane distance within a range in which distance estimation is performed, and evaluates at all distances.

Asserted Claim of the '109 Patent	Exemplary Citations to Hamamoto
	The distance model with the smallest evaluation value is obtained as the distance value of the target pixel, and the distance model of the subject is estimated. The distance estimation unit may perform the evaluation by the block matching using an irregular block. The image composition unit may extract and paste a color of a pixel corresponding to the distance model of the subject from the image converted by the coordinate conversion unit. In addition, the image composition unit obtains pixels of surrounding cameras corresponding to the pixels of the virtual camera from the distance value in a one-to-one relationship. According to the present invention, with the above-described configuration, it is possible to obtain an effect that the front image can be improved in image quality and the line-of-sight matching feeling is improved. In particular, by improving the image quality of the peripheral region of the eyes, it is possible to further improve the line-of-sight matching feeling, and it is possible to realize an arbitrary viewpoint image composition device applicable to a television conversation system. Further, according to the present invention, the distance estimation unit performs block matching on the image acquired from the camera with an irregular block, so that the influence of occlusion can be reduced and the synthesis result of the front image can be improved in image quality. Can do. That is, the effect that the line-of-sight matching feeling is improved is obtained." Hamamoto at pg. 3. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Hamamoto alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of

Asserted Claim of the '109 Patent	Exemplary Citations to Hamamoto
	Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[c]. applying a transformation mapping to the image to modify the image such that it appears to mimic a reflection of a mirror;	Hamamoto expressly and/or inherently discloses and/or renders obvious applying a transformation mapping to the image to modify the image such that it appears to mimic a reflection of a mirror. *See*, *e.g.*, disclosures below. "The present invention has been made in view of such circumstances, and an arbitrary viewpoint image synthesis device that generates an image in which a shooting direction and a line-of-sight direction are matched by combining images of a plurality of cameras having different shooting directions. The purpose is to provide. The present invention provides a camera that captures an image of a subject that is installed at at least three locations around the display unit of the display device, the right side surface, and the left side surface, and the line of sight of the subject based on each image captured by the camera. An image composition processing unit for compositing images taken from a virtual camera in a direction, and the image composition processing unit changes from a camera coordinate system to a virtual camera coordinate system using camera parameters obtained by camera calibration of the camera. A coordinate conversion unit for conversion; a distance estimation unit for estimating a distance model of a subject with respect to an image converted by the coordinate conversion unit; and an image composition unit for combining a virtual camera viewpoint image from the distance model of the subject. Is an arbitrary viewpoint image composition device. Here, the distance estimation unit performs evaluation by block matching for each pair of images converted by the coordinate conversion unit, changes the virtual plane distance within a range in which distance estimation is performed, and evaluates at all distances. The distance model with the smallest evaluation value is obtained as the distance value of the target pixel, and the distance model of the subject is estimated.

Asserted Claim of the '109 Patent	Exemplary Citations to Hamamoto
	The distance estimation unit may perform the evaluation by the block matching using an irregular block. The image composition unit may extract and paste a color of a pixel corresponding to the distance model of the subject from the image converted by the coordinate conversion unit. In addition, the image composition unit obtains pixels of surrounding cameras corresponding to the pixels of the virtual camera from the distance value in a one-to-one relationship. According to the present invention, with the above-described configuration, it is possible to obtain an effect that the front image can be improved in image quality and the line-of-sight matching feeling is improved. In particular, by improving the image quality of the peripheral region of the eyes, it is possible to further improve the line-of-sight matching feeling, and it is possible to realize an arbitrary viewpoint image composition device applicable to a television conversation system. Further, according to the present invention, the distance estimation unit performs block matching on the image acquired from the camera with an irregular block, so that the influence of occlusion can be reduced and the synthesis result of the front image can be improved in image quality. Can do. That is, the effect that the line-of-sight matching feeling is improved is obtained." Hamamoto at pg. 3. "Embodiments of the present invention will be described below in detail with reference to the drawings. FIG. 1 is a functional block diagram showing the overall configuration of an arbitrary viewpoint image synthesis system 1 according to the first embodiment of the present invention. An arbitrary viewpoint image composition system 1 shown in FIG. 1 includes a display device 5 that displays an image, and an arbitrary viewpoint image composition device that synthesizes an image in which the line-of-sight direction of the subject 6

Asserted Claim of the '109 Patent	Exemplary Citations to Hamamoto
	matches the shooting direction based on the captured image of the subject 6. 10. The arbitrary viewpoint image composition device 10 includes cameras 2A, 2B, and 2C that photograph a subject 6, an image composition processing unit 3 that composes a virtual camera viewpoint image from the photographed images, and an image output unit 4 that outputs a composite image. And basically consists of As shown in FIG. 1, the camera 2 </ b> A is mounted on the upper center of the display device 5, the camera 2 </ b> B is mounted on the lower left side of the display device 5, and the camera 2 </ b> C is mounted on the lower right side of the display device 5. Thus, the subject 6 is simultaneously photographed by the cameras 2A, 2B, and 2C arranged at the three positions around the display portion of the display device 5. FIG. 2 shows a flowchart of the processing procedure of the arbitrary viewpoint image synthesis system 1. First, the subject 6 is photographed by the cameras 2A, 2B, and 2C to acquire an image (step S21: Steps are omitted hereinafter). Next, the image composition processing unit 3 synthesizes the viewpoint image of the virtual camera in which the photographing direction and the line-of-sight direction coincide with each other from the three photographed images (S22). The synthesized image is output from the image output unit 4 to the display device 5 (S23), and the virtual camera viewpoint image is displayed on the display device 5 (S24). Next, a detailed configuration of the image composition processing unit 3 is shown in FIG. The image composition processing unit 3 includes coordinate conversion units 21, 22, and 23 that convert images captured by the cameras 2 </ b> A, 2 </ b> B, and 2 </ b> C from a camera coordinate system to a virtual camera coordinate system, and an image converted to the virtual camera coordinate system. A distance estimation unit 24 that estimates a distance image (distance model) of the subject, an image synthesis unit 25 that synthesizes a virtual camera viewpoint image from the estimated distance model, and a camera parameter storage unit that stores camera parameters used for coordinate conversion 26 basically." Hamamoto at pg. 5.

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	This limitation would have been obvious to a person of ordinary skill in the art based on (1) Hamamoto alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[d]. resizing the image to reduce variations caused by changes in object's distance to the camera;	Hamamoto expressly and/or inherently discloses and/or renders obvious resizing the image to reduce variations caused by changes in object's distance to the camera. *See*, *e.g.*, disclosures below. "Embodiments of the present invention will be described below in detail with reference to the drawings. FIG. 1 is a functional block diagram showing the overall configuration of an arbitrary viewpoint image synthesis system 1 according to the first embodiment of the present invention. An arbitrary viewpoint image composition system 1 shown in FIG. 1 includes a display device 5 that displays an image, and an arbitrary viewpoint image composition device that synthesizes an image in which the line-of-sight direction of the subject 6 matches the shooting direction based on the captured image of the subject 6. 10. The arbitrary viewpoint image composition device 10 includes cameras 2A, 2B, and 2C that photograph a subject 6, an image composition processing unit 3 that composes a virtual camera viewpoint image from the photographed images, and an image output unit 4 that outputs a composite image. And basically consists of As shown in FIG. 1, the camera 2 </ b> A is mounted on the upper center of the display device 5, the camera 2 </ b> B is mounted on the lower left side of the display device 5, and the camera 2 </ b> C is mounted on the lower right side of the display device 5. Thus, the subject 6 is simultaneously photographed by the cameras 2A, 2B, and 2C arranged at the three positions around the display portion of the display device 5. FIG. 2 shows a flowchart of the processing procedure of the arbitrary viewpoint image synthesis system 1. First, the subject 6 is photographed by the cameras 2A, 2B, and 2C

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	to acquire an image (step S21: Steps are omitted hereinafter). Next, the image composition processing unit 3 synthesizes the viewpoint image of the virtual camera in which the photographing direction and the line-of-sight direction coincide with each other from the three photographed images (S22). The synthesized image is output from the image output unit 4 to the display device 5 (S23), and the virtual camera viewpoint image is displayed on the display device 5 (S24). Next, a detailed configuration of the image composition processing unit 3 is shown in FIG. The image composition processing unit 3 includes coordinate conversion units 21, 22, and 23 that convert images captured by the cameras 2 </ b> A, 2 </ b> B, and 2 </ b> C from a camera coordinate system to a virtual camera coordinate system, and an image converted to the virtual camera coordinate system. A distance estimation unit 24 that estimates a distance image (distance model) of the subject, an image synthesis unit 25 that synthesizes a virtual camera viewpoint image from the estimated distance model, and a camera parameter storage unit that stores camera parameters used for coordinate conversion 26 basically." Hamamoto at pg. 5. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Hamamoto alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[e]. displaying the image on the monitor after performing the flipping, transformation mapping, and resizing;	Hamamoto expressly and/or inherently discloses and/or renders obvious displaying the image on the monitor after performing the flipping, transformation mapping, and resizing. *See*, *e.g.*, disclosures below. "[Explanation of Multi-lens Camera Calibration] When obtaining the positional relationship of two or more cameras, the global coordinate system must be made common to all cameras, and therefore, external parameter estimation must be performed simultaneously. Here, consider a trinocular camera system as shown in FIG. 17 in which two cameras 2-2 and 2-3 are added to the configuration of FIG. In this system, a plurality

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	of scenes with different angles of the checker pattern 51 are simultaneously photographed from three eyes (cameras 2-1, 2-2, 2-3), and camera calibration is performed using the image group. Examples of images taken from the left camera 2-3 are shown in FIGS. 18A, 18C, and 18E, and examples of images taken from the right camera 2-2 are FIGS. 18B, 18D, and 18F. Shown in (X, y, z) indicates how many times the checker pattern 51 has been rotated around each axis, and images of the same rotation angle are simultaneously acquired from the left and right cameras 2-2 and 2-3. When shooting is performed in this way, as shown in FIG. 18, it can be seen that the images of the checker pattern 51 are displayed at positions shifted from the image centers of the respective cameras in both the left and right cameras 2-2 and 2-3. . FIG. 19 shows camera parameters estimated by performing the above-described camera calibration on the captured image group in this way. From FIG. 19, it can be confirmed that the center of the image is shifted in both the left and right cameras as compared with the monocular calibration result of FIG." Hamamoto at pg. 12. "Still another embodiment of the present invention will be described in detail with reference to the drawings. FIG. 41 is a functional block diagram showing a configuration example of this embodiment. The configuration of the arbitrary viewpoint image composition device 210 of the system 201 of this embodiment is different from the arbitrary viewpoint image composition device 10 of FIG. 1, and includes an image transmission unit 4500 and an image reception unit 4502 instead of the image output unit 4. . In the arbitrary viewpoint image composition device 210, the image photographed by the imaging device is composed by the image composition processing unit 3, and the synthesized image is connected to the external network 4501 via the image transmission unit 4500, and another arbitrary viewpoint image composition device. 210 and the like, and an image transmitted from another arbitrary viewpoint image composition device 210 or the like via the image receiving unit 4502 is displayed on the display device 5. In this way, this system 201 is suitable for conducting a video conference because users in remote places can communicate with each other by matching the line of sight via the network 4501." Hamamoto at pg. 21.

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	This limitation would have been obvious to a person of ordinary skill in the art based on (1) Hamamoto alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[f]. wherein the non-ordered steps are performed on a series of images of a live video feed from the camera;	Hamamoto expressly and/or inherently discloses and/or renders obvious wherein the non-ordered steps are performed on a series of images of a live video feed from the camera. *See*, *e.g.*, disclosures below. "Still another embodiment of the present invention will be described in detail with reference to the drawings. FIG. 41 is a functional block diagram showing a configuration example of this embodiment. The configuration of the arbitrary viewpoint image composition device 210 of the system 201 of this embodiment is different from the arbitrary viewpoint image composition device 10 of FIG. 1, and includes an image transmission unit 4500 and an image reception unit 4502 instead of the image output unit 4. . In the arbitrary viewpoint image composition device 210, the image photographed by the imaging device is composed by the image composition processing unit 3, and the synthesized image is connected to the external network 4501 via the image transmission unit 4500, and another arbitrary viewpoint image composition device. 210 and the like, and an image transmitted from another arbitrary viewpoint image composition device 210 or the like via the image receiving unit 4502 is displayed on the display device 5. In this way, this system 201 is suitable for conducting a video conference because users in remote places can communicate with each other by matching the line of sight via the network 4501." Hamamoto at pg. 21. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Hamamoto alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

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1[g]. determining distance to a user appearing in the live video feed; and	Hamamoto expressly and/or inherently discloses and/or renders obvious determining distance to a user appearing in the live video feed. *See*, *e.g.*, disclosures below. "Embodiments of the present invention will be described below in detail with reference to the drawings. FIG. 1 is a functional block diagram showing the overall configuration of an arbitrary viewpoint image synthesis system 1 according to the first embodiment of the present invention. An arbitrary viewpoint image composition system 1 shown in FIG. 1 includes a display device 5 that displays an image, and an arbitrary viewpoint image composition device that synthesizes an image in which the line-of-sight direction of the subject 6 matches the shooting direction based on the captured image of the subject 6. 10. The arbitrary viewpoint image composition device 10 includes cameras 2A, 2B, and 2C that photograph a subject 6, an image composition processing unit 3 that composes a virtual camera viewpoint image from the photographed images, and an image output unit 4 that outputs a composite image. And basically consists of As shown in FIG. 1, the camera 2 </ b> A is mounted on the upper center of the display device 5, the camera 2 </ b> B is mounted on the lower left side of the display device 5, and the camera 2 </ b> C is mounted on the lower right side of the display device 5. Thus, the subject 6 is simultaneously photographed by the cameras 2A, 2B, and 2C arranged at the three positions around the display portion of the display device 5. FIG. 2 shows a flowchart of the processing procedure of the arbitrary viewpoint image synthesis system 1. First, the subject 6 is photographed by the cameras 2A, 2B, and 2C to acquire an image (step S21: Steps are omitted hereinafter). Next, the image composition processing unit 3 synthesizes the viewpoint image of the virtual camera in which the photographing direction and the line-of-sight direction coincide with each other from the three photographed images (S22). The synthesized image is output from the image output unit 4 to the display device 5 (S23), and the virtual camera viewpoint image is displayed on the display device 5 (S24).

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	Next, a detailed configuration of the image composition processing unit 3 is shown in FIG. The image composition processing unit 3 includes coordinate conversion units 21, 22, and 23 that convert images captured by the cameras 2 </ b> A, 2 </ b> B, and 2 </ b> C from a camera coordinate system to a virtual camera coordinate system, and an image converted to the virtual camera coordinate system. A distance estimation unit 24 that estimates a distance image (distance model) of the subject, an image synthesis unit 25 that synthesizes a virtual camera viewpoint image from the estimated distance model, and a camera parameter storage unit that stores camera parameters used for coordinate conversion 26 basically." Hamamoto at pg. 5. "Furthermore, the detailed processing relationship of each part of the image composition processing unit 3 is shown in FIG. Based on the parameters stored in the camera parameter storage unit 26, the coordinate conversion units 21, 22, and 23 convert the images I 1 conv, I 2 conv, I 3 conv from the images I 1, I 2, I 3 from the cameras 2 A, i2 B, 2 C. To the distance estimation unit 24 and the image composition unit 25. The distance estimation unit 24 performs evaluation by block matching for each of the three images I1conv, I2conv, and I3conv. Here, the virtual plane distance z is changed within the range in which distance estimation is performed, and evaluation is performed at all distances. At this time, the distance having the smallest evaluation value is set as the distance value d (i, j) at the target pixel (i, j). By performing this operation on all the pixels, the distance image of the subject can be estimated (a detailed description of this process will be described later). Next, the image composition unit 25 extracts and pastes corresponding pixel colors from the coordinate conversion images I1conv, I2conv, and I3conv to the created distance image of the subject. When distance information of the subject 6 is obtained, pixels of surrounding cameras corresponding to the pixels of the virtual camera can be obtained in a one-to-one relationship by geometric calculation. By performing this operation on all the pixels of the virtual camera, a virtual camera viewpoint image can be synthesized (a detailed description of this process will be described later).

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	FIG. 5 shows a flowchart of the image composition processing unit 3. In FIG. 5, the coordinate conversion units 21, 22, and 23 acquire images I1, I2, and I3 from the cameras 2A, 2B, and 2C (S51), and the camera coordinate system acquired from the cameras 2A, 2B, and 2C. The images I1, I2, and I3 are converted into images I1conv, I2conv, and I3conv in the virtual camera coordinate system, and sent to the distance estimation unit 24 and the image composition unit 25 (S52). Next, the distance estimation unit 24 changes the virtual plane distance z within the range in which distance estimation is performed on the images I1conv, I2conv, and I3conv converted to the virtual camera coordinate system, and performs block matching for each pair of two images at all distances. Then, the distance image d is estimated using the distance having the smallest evaluation value as the distance value of the target pixel (S53). Finally, the image composition unit 25 extracts the colors of the pixels corresponding to the created distance image d of the subject from the images I1, I2, and I3 and pastes them on the distance image d to synthesize the virtual camera viewpoint image (S54).).” Hamamoto at pg. 6. “Still another embodiment of the present invention will be described in detail with reference to the drawings. FIG. 41 is a functional block diagram showing a configuration example of this embodiment. The configuration of the arbitrary viewpoint image composition device 210 of the system 201 of this embodiment is different from the arbitrary viewpoint image composition device 10 of FIG. 1, and includes an image transmission unit 4500 and an image reception unit 4502 instead of the image output unit 4. . In the arbitrary viewpoint image composition device 210, the image photographed by the imaging device is composed by the image composition processing unit 3, and the synthesized image is connected to the external network 4501 via the image transmission unit 4500, and another arbitrary viewpoint image composition device. 210 and the like, and an image transmitted from another arbitrary viewpoint image composition device 210 or the like via the image receiving unit 4502 is displayed on the display device 5. In this way, this system 201 is suitable for conducting a video conference because users in

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	remote places can communicate with each other by matching the line of sight via the network 4501." Hamamoto at pg. 21. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Hamamoto alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[h]. varying rate at which the non-ordered steps are performed on the series of images according to the distance.	Hamamoto expressly and/or inherently discloses and/or renders obvious varying rate at which the non-ordered steps are performed on the series of images according to the distance. *See*, *e.g.*, disclosures below. "Embodiments of the present invention will be described below in detail with reference to the drawings. FIG. 1 is a functional block diagram showing the overall configuration of an arbitrary viewpoint image synthesis system 1 according to the first embodiment of the present invention. An arbitrary viewpoint image composition system 1 shown in FIG. 1 includes a display device 5 that displays an image, and an arbitrary viewpoint image composition device that synthesizes an image in which the line-of-sight direction of the subject 6 matches the shooting direction based on the captured image of the subject 6. 10. The arbitrary viewpoint image composition device 10 includes cameras 2A, 2B, and 2C that photograph a subject 6, an image composition processing unit 3 that composes a virtual camera viewpoint image from the photographed images, and an image output unit 4 that outputs a composite image. And basically consists of As shown in FIG. 1, the camera 2 </ b> A is mounted on the upper center of the display device 5, the camera 2 </ b> B is mounted on the lower left side of the display device 5, and the camera 2 </ b> C is mounted on the lower right side of the display device 5.

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	Thus, the subject 6 is simultaneously photographed by the cameras 2A, 2B, and 2C arranged at the three positions around the display portion of the display device 5. FIG. 2 shows a flowchart of the processing procedure of the arbitrary viewpoint image synthesis system 1. First, the subject 6 is photographed by the cameras 2A, 2B, and 2C to acquire an image (step S21: Steps are omitted hereinafter). Next, the image composition processing unit 3 synthesizes the viewpoint image of the virtual camera in which the photographing direction and the line-of-sight direction coincide with each other from the three photographed images (S22). The synthesized image is output from the image output unit 4 to the display device 5 (S23), and the virtual camera viewpoint image is displayed on the display device 5 (S24). Next, a detailed configuration of the image composition processing unit 3 is shown in FIG. The image composition processing unit 3 includes coordinate conversion units 21, 22, and 23 that convert images captured by the cameras 2 </ b> A, 2 </ b> B, and 2 </ b> C from a camera coordinate system to a virtual camera coordinate system, and an image converted to the virtual camera coordinate system. A distance estimation unit 24 that estimates a distance image (distance model) of the subject, an image synthesis unit 25 that synthesizes a virtual camera viewpoint image from the estimated distance model, and a camera parameter storage unit that stores camera parameters used for coordinate conversion 26 basically." Hamamoto at pg. 5. "Furthermore, the detailed processing relationship of each part of the image composition processing unit 3 is shown in FIG. Based on the parameters stored in the camera parameter storage unit 26, the coordinate conversion units 21, 22, and 23 convert the images I 1 conv, I 2 conv, I 3 conv from the images I 1, I 2, I 3 from the cameras 2 A, i2 B, 2 C. To the distance estimation unit 24 and the image composition unit 25. The distance estimation unit 24 performs evaluation by block matching for each of the three images I1conv, I2conv, and I3conv. Here, the virtual plane distance z is changed within the range in which distance estimation is performed, and evaluation is performed at all distances. At this time, the distance having the smallest evaluation value is set as the distance value d (i, j) at the target pixel (i, j). By performing this operation on all the

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	pixels, the distance image of the subject can be estimated (a detailed description of this process will be described later). Next, the image composition unit 25 extracts and pastes corresponding pixel colors from the coordinate conversion images I1conv, I2conv, and I3conv to the created distance image of the subject. When distance information of the subject 6 is obtained, pixels of surrounding cameras corresponding to the pixels of the virtual camera can be obtained in a one-to-one relationship by geometric calculation. By performing this operation on all the pixels of the virtual camera, a virtual camera viewpoint image can be synthesized (a detailed description of this process will be described later). FIG. 5 shows a flowchart of the image composition processing unit 3. In FIG. 5, the coordinate conversion units 21, 22, and 23 acquire images I1, I2, and I3 from the cameras 2A, 2B, and 2C (S51), and the camera coordinate system acquired from the cameras 2A, 2B, and 2C. The images I1, I2, and I3 are converted into images I1conv, I2conv, and I3conv in the virtual camera coordinate system, and sent to the distance estimation unit 24 and the image composition unit 25 (S52). Next, the distance estimation unit 24 changes the virtual plane distance z within the range in which distance estimation is performed on the images I1conv, I2conv, and I3conv converted to the virtual camera coordinate system, and performs block matching for each pair of two images at all distances. Then, the distance image d is estimated using the distance having the smallest evaluation value as the distance value of the target pixel (S53). Finally, the image composition unit 25 extracts the colors of the pixels corresponding to the created distance image d of the subject from the images I1, I2, and I3 and pastes them on the distance image d to synthesize the virtual camera viewpoint image (S54).).” Hamamoto at pg. 6. “Still another embodiment of the present invention will be described in detail with reference to the drawings. FIG. 41 is a functional block diagram showing a configuration

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	example of this embodiment. The configuration of the arbitrary viewpoint image composition device 210 of the system 201 of this embodiment is different from the arbitrary viewpoint image composition device 10 of FIG. 1, and includes an image transmission unit 4500 and an image reception unit 4502 instead of the image output unit 4. . In the arbitrary viewpoint image composition device 210, the image photographed by the imaging device is composed by the image composition processing unit 3, and the synthesized image is connected to the external network 4501 via the image transmission unit 4500, and another arbitrary viewpoint image composition device. 210 and the like, and an image transmitted from another arbitrary viewpoint image composition device 210 or the like via the image receiving unit 4502 is displayed on the display device 5. In this way, this system 201 is suitable for conducting a video conference because users in remote places can communicate with each other by matching the line of sight via the network 4501." Hamamoto at pg. 21. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Hamamoto alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

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Claim 2	
2. The method of claim 1, wherein the transformation mapping renders an image appearing to have been taken from a camera positioned at eye-level height and pointing horizontally.	Hamamoto expressly and/or inherently discloses and/or renders obvious wherein the transformation mapping renders an image appearing to have been taken from a camera positioned at eye-level height and pointing horizontally. *See*, *e.g.*, disclosures below. "FIG. 1 is a functional block diagram showing the overall configuration of an arbitrary viewpoint image synthesis system 1 according to the first embodiment of the present invention. An arbitrary viewpoint image composition system 1 shown in FIG. 1 includes

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	a display device 5 that displays an image, and an arbitrary viewpoint image composition device that synthesizes an image in which the line-of-sight direction of the subject 6 matches the shooting direction based on the captured image of the subject 6. 10. The arbitrary viewpoint image composition device 10 includes cameras 2A, 2B, and 2C that photograph a subject 6, an image composition processing unit 3 that composes a virtual camera viewpoint image from the photographed images, and an image output unit 4 that outputs a composite image. And basically consists of As shown in FIG. 1, the camera 2 </ b> A is mounted on the upper center of the display device 5, the camera 2 </ b> B is mounted on the lower left side of the display device 5, and the camera 2 </ b> C is mounted on the lower right side of the display device 5. Thus, the subject 6 is simultaneously photographed by the cameras 2A, 2B, and 2C arranged at the three positions around the display portion of the display device 5. FIG. 2 shows a flowchart of the processing procedure of the arbitrary viewpoint image synthesis system 1. First, the subject 6 is photographed by the cameras 2A, 2B, and 2C to acquire an image (step S21: Steps are omitted hereinafter). Next, the image composition processing unit 3 synthesizes the viewpoint image of the virtual camera in which the photographing direction and the line-of-sight direction coincide with each other from the three photographed images (S22). The synthesized image is output from the image output unit 4 to the display device 5 (S23), and the virtual camera viewpoint image is displayed on the display device 5 (S24). Next, a detailed configuration of the image composition processing unit 3 is shown in FIG. The image composition processing unit 3 includes coordinate conversion units 21, 22, and 23 that convert images captured by the cameras 2 </ b> A, 2 </ b> B, and 2 </ b> C from a camera coordinate system to a virtual camera coordinate system, and an image converted to the virtual camera coordinate system. A distance estimation unit 24 that estimates a distance image (distance model) of the subject, an image synthesis unit 25 that synthesizes a virtual camera viewpoint image from the estimated distance model,

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	and a camera parameter storage unit that stores camera parameters used for coordinate conversion 26 basically." Hamamoto at pg. 5. "Furthermore, the detailed processing relationship of each part of the image composition processing unit 3 is shown in FIG. Based on the parameters stored in the camera parameter storage unit 26, the coordinate conversion units 21, 22, and 23 convert the images I 1 conv, I 2 conv, I 3 conv from the images I 1, I 2, I 3 from the cameras 2 A, i2 B, 2 C. To the distance estimation unit 24 and the image composition unit 25. The distance estimation unit 24 performs evaluation by block matching for each of the three images I1conv, I2conv, and I3conv. Here, the virtual plane distance z is changed within the range in which distance estimation is performed, and evaluation is performed at all distances. At this time, the distance having the smallest evaluation value is set as the distance value d (i, j) at the target pixel (i, j). By performing this operation on all the pixels, the distance image of the subject can be estimated (a detailed description of this process will be described later). Next, the image composition unit 25 extracts and pastes corresponding pixel colors from the coordinate conversion images I1conv, I2conv, and I3conv to the created distance image of the subject. When distance information of the subject 6 is obtained, pixels of surrounding cameras corresponding to the pixels of the virtual camera can be obtained in a one-to-one relationship by geometric calculation. By performing this operation on all the pixels of the virtual camera, a virtual camera viewpoint image can be synthesized (a detailed description of this process will be described later). FIG. 5 shows a flowchart of the image composition processing unit 3. In FIG. 5, the coordinate conversion units 21, 22, and 23 acquire images I1, I2, and I3 from the cameras 2A, 2B, and 2C (S51), and the camera coordinate system acquired from the cameras 2A, 2B, and 2C. The images I1, I2, and I3 are converted into images I1conv, I2conv, and I3conv in the virtual camera coordinate system, and sent to the distance estimation unit 24 and the image composition unit 25 (S52).

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	Next, the distance estimation unit 24 changes the virtual plane distance z within the range in which distance estimation is performed on the images I1conv, I2conv, and I3conv converted to the virtual camera coordinate system, and performs block matching for each pair of two images at all distances. Then, the distance image d is estimated using the distance having the smallest evaluation value as the distance value of the target pixel (S53). Finally, the image composition unit 25 extracts the colors of the pixels corresponding to the created distance image d of the subject from the images I1, I2, and I3 and pastes them on the distance image d to synthesize the virtual camera viewpoint image (S54).).” Hamamoto at pg. 6. “Still another embodiment of the present invention will be described in detail with reference to the drawings. FIG. 41 is a functional block diagram showing a configuration example of this embodiment. The configuration of the arbitrary viewpoint image composition device 210 of the system 201 of this embodiment is different from the arbitrary viewpoint image composition device 10 of FIG. 1, and includes an image transmission unit 4500 and an image reception unit 4502 instead of the image output unit 4. . In the arbitrary viewpoint image composition device 210, the image photographed by the imaging device is composed by the image composition processing unit 3, and the synthesized image is connected to the external network 4501 via the image transmission unit 4500, and another arbitrary viewpoint image composition device. 210 and the like, and an image transmitted from another arbitrary viewpoint image composition device 210 or the like via the image receiving unit 4502 is displayed on the display device 5. In this way, this system 201 is suitable for conducting a video conference because users in remote places can communicate with each other by matching the line of sight via the network 4501.” Hamamoto at pg. 21. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Hamamoto alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of

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	Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

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Claim 7	
7[pre]. The method of claim 1, further comprising the steps:	To the extent the preamble is limiting, Hamamoto expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. *See* Claim Limitations 1[pre]-[1[h]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Hamamoto alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
7[a]. obtaining a reference image;	Hamamoto expressly and/or inherently discloses and/or renders obvious obtaining a reference image. *See*, *e.g.*, disclosures below. "The present invention has been made in view of such circumstances, and an arbitrary viewpoint image synthesis device that generates an image in which a shooting direction and a line-of-sight direction are matched by combining images of a plurality of cameras having different shooting directions. The purpose is to provide. The present invention provides a camera that captures an image of a subject that is installed at at least three locations around the display unit of the display device, the right side surface, and the left side surface, and the line of sight of the subject based on each image captured by the camera. An image composition processing unit for compositing images taken from a virtual camera in a direction, and the image composition processing

Asserted Claim of the '109 Patent	Exemplary Citations to Hamamoto
	unit changes from a camera coordinate system to a virtual camera coordinate system using camera parameters obtained by camera calibration of the camera. A coordinate conversion unit for conversion; a distance estimation unit for estimating a distance model of a subject with respect to an image converted by the coordinate conversion unit; and an image composition unit for combining a virtual camera viewpoint image from the distance model of the subject. Is an arbitrary viewpoint image composition device. Here, the distance estimation unit performs evaluation by block matching for each pair of images converted by the coordinate conversion unit, changes the virtual plane distance within a range in which distance estimation is performed, and evaluates at all distances. The distance model with the smallest evaluation value is obtained as the distance value of the target pixel, and the distance model of the subject is estimated. The distance estimation unit may perform the evaluation by the block matching using an irregular block. The image composition unit may extract and paste a color of a pixel corresponding to the distance model of the subject from the image converted by the coordinate conversion unit. In addition, the image composition unit obtains pixels of surrounding cameras corresponding to the pixels of the virtual camera from the distance value in a one-to-one relationship. According to the present invention, with the above-described configuration, it is possible to obtain an effect that the front image can be improved in image quality and the line-of-sight matching feeling is improved. In particular, by improving the image quality of the peripheral region of the eyes, it is possible to further improve the line-of-sight matching feeling, and it is possible to realize an arbitrary viewpoint image composition device applicable to a television conversation system.

Asserted Claim of the '109 Patent	Exemplary Citations to Hamamoto
	Further, according to the present invention, the distance estimation unit performs block matching on the image acquired from the camera with an irregular block, so that the influence of occlusion can be reduced and the synthesis result of the front image can be improved in image quality. Can do. That is, the effect that the line-of-sight matching feeling is improved is obtained." Hamamoto at pg. 3. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Hamamoto alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
7[b]. performing registration of the digital image with the reference image;	Hamamoto expressly and/or inherently discloses and/or renders obvious performing registration of the digital image with the reference image. *See*, *e.g.*, disclosures below. "The present invention has been made in view of such circumstances, and an arbitrary viewpoint image synthesis device that generates an image in which a shooting direction and a line-of-sight direction are matched by combining images of a plurality of cameras having different shooting directions. The purpose is to provide. The present invention provides a camera that captures an image of a subject that is installed at at least three locations around the display unit of the display device, the right side surface, and the left side surface, and the line of sight of the subject based on each image captured by the camera. An image composition processing unit for compositing images taken from a virtual camera in a direction, and the image composition processing unit changes from a camera coordinate system to a virtual camera coordinate system using camera parameters obtained by camera calibration of the camera. A coordinate conversion unit for conversion; a distance estimation unit for estimating a distance model of a subject with respect to an image converted by the coordinate conversion unit; and an image composition unit for combining a virtual camera viewpoint image from the distance model of the subject. Is an arbitrary viewpoint image composition device.

Asserted Claim of the '109 Patent	Exemplary Citations to Hamamoto
	Here, the distance estimation unit performs evaluation by block matching for each pair of images converted by the coordinate conversion unit, changes the virtual plane distance within a range in which distance estimation is performed, and evaluates at all distances. The distance model with the smallest evaluation value is obtained as the distance value of the target pixel, and the distance model of the subject is estimated. The distance estimation unit may perform the evaluation by the block matching using an irregular block. The image composition unit may extract and paste a color of a pixel corresponding to the distance model of the subject from the image converted by the coordinate conversion unit. In addition, the image composition unit obtains pixels of surrounding cameras corresponding to the pixels of the virtual camera from the distance value in a one-to-one relationship. According to the present invention, with the above-described configuration, it is possible to obtain an effect that the front image can be improved in image quality and the line-of-sight matching feeling is improved. In particular, by improving the image quality of the peripheral region of the eyes, it is possible to further improve the line-of-sight matching feeling, and it is possible to realize an arbitrary viewpoint image composition device applicable to a television conversation system. Further, according to the present invention, the distance estimation unit performs block matching on the image acquired from the camera with an irregular block, so that the influence of occlusion can be reduced and the synthesis result of the front image can be improved in image quality. Can do. That is, the effect that the line-of-sight matching feeling is improved is obtained." Hamamoto at pg. 3. "Equation (59) shows the correspondence between the point mim on the image coordinates of the virtual camera and the point m1 on the image coordinates of the

Asserted Claim of the '109 Patent	Exemplary Citations to Hamamoto
	camera 2-1. Therefore, by using the equation (59), an image captured by the camera 2-1 can be converted into an image captured from the virtual camera viewpoint. However, at this time, only the portion where the subject is present at the distance z of the assumed plane assumed above is correctly converted, and the other portions are erroneously converted. For example, when a sphere is a subject as shown in FIG. 30 and z is changed so as to pass through the sphere on the virtual plane, only the thick line portion shown in FIG. 30 is correctly converted. 30A shows a case where the virtual plane is at the position z, FIG. 30B shows a case where the virtual plane is at z + α, FIG. 30C shows a case where the virtual plane is at z + 2α, Thick lines indicate which part of the sphere that is the subject is correctly converted. The coordinate conversion units 21, 22, and 23 convert the expressions (59), (60), and (61) to the images I1, I2, and I3 acquired from the camera 2-1, the camera 2-2, and the camera 2-3, respectively. By applying, images I1conv, I2conv, and I3conv obtained by converting the respective images to the viewpoint of the camera 2-0 that is a virtual camera are obtained." Hamamoto at pg. 15. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Hamamoto alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
7[c]. using data obtained from the registration to generate the transformation mapping.	Hamamoto expressly and/or inherently discloses and/or renders obvious using data obtained from the registration to generate the transformation mapping. *See*, *e.g.*, disclosures below. "The present invention has been made in view of such circumstances, and an arbitrary viewpoint image synthesis device that generates an image in which a shooting direction and a line-of-sight direction are matched by combining images of a plurality of cameras having different shooting directions. The purpose is to provide.

Asserted Claim of the ’109 Patent	Exemplary Citations to Hamamoto
	The present invention provides a camera that captures an image of a subject that is installed at at least three locations around the display unit of the display device, the right side surface, and the left side surface, and the line of sight of the subject based on each image captured by the camera. An image composition processing unit for compositing images taken from a virtual camera in a direction, and the image composition processing unit changes from a camera coordinate system to a virtual camera coordinate system using camera parameters obtained by camera calibration of the camera. A coordinate conversion unit for conversion; a distance estimation unit for estimating a distance model of a subject with respect to an image converted by the coordinate conversion unit; and an image composition unit for combining a virtual camera viewpoint image from the distance model of the subject. Is an arbitrary viewpoint image composition device. Here, the distance estimation unit performs evaluation by block matching for each pair of images converted by the coordinate conversion unit, changes the virtual plane distance within a range in which distance estimation is performed, and evaluates at all distances. The distance model with the smallest evaluation value is obtained as the distance value of the target pixel, and the distance model of the subject is estimated. The distance estimation unit may perform the evaluation by the block matching using an irregular block. The image composition unit may extract and paste a color of a pixel corresponding to the distance model of the subject from the image converted by the coordinate conversion unit. In addition, the image composition unit obtains pixels of surrounding cameras corresponding to the pixels of the virtual camera from the distance value in a one-to-one relationship. According to the present invention, with the above-described configuration, it is possible to obtain an effect that the front image can be improved in image quality and the line-of-sight matching feeling is improved. In particular, by improving the image quality of the

Asserted Claim of the ’109 Patent	Exemplary Citations to Hamamoto
	peripheral region of the eyes, it is possible to further improve the line-of-sight matching feeling, and it is possible to realize an arbitrary viewpoint image composition device applicable to a television conversation system. Further, according to the present invention, the distance estimation unit performs block matching on the image acquired from the camera with an irregular block, so that the influence of occlusion can be reduced and the synthesis result of the front image can be improved in image quality. Can do. That is, the effect that the line-of-sight matching feeling is improved is obtained.” Hamamoto at pg. 3. “Embodiments of the present invention will be described below in detail with reference to the drawings. FIG. 1 is a functional block diagram showing the overall configuration of an arbitrary viewpoint image synthesis system 1 according to the first embodiment of the present invention. An arbitrary viewpoint image composition system 1 shown in FIG. 1 includes a display device 5 that displays an image, and an arbitrary viewpoint image composition device that synthesizes an image in which the line-of-sight direction of the subject 6 matches the shooting direction based on the captured image of the subject 6. 10. The arbitrary viewpoint image composition device 10 includes cameras 2A, 2B, and 2C that photograph a subject 6, an image composition processing unit 3 that composes a virtual camera viewpoint image from the photographed images, and an image output unit 4 that outputs a composite image. And basically consists of As shown in FIG. 1, the camera 2 </ b> A is mounted on the upper center of the display device 5, the camera 2 </ b> B is mounted on the lower left side of the display device 5, and the camera 2 </ b> C is mounted on the lower right side of the display device 5. Thus, the subject 6 is simultaneously photographed by the cameras 2A, 2B, and 2C arranged at the three positions around the display portion of the display device 5. FIG. 2 shows a flowchart of the processing procedure of the arbitrary viewpoint image synthesis system 1. First, the subject 6 is photographed by the cameras 2A, 2B, and 2C

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	to acquire an image (step S21: Steps are omitted hereinafter). Next, the image composition processing unit 3 synthesizes the viewpoint image of the virtual camera in which the photographing direction and the line-of-sight direction coincide with each other from the three photographed images (S22). The synthesized image is output from the image output unit 4 to the display device 5 (S23), and the virtual camera viewpoint image is displayed on the display device 5 (S24). Next, a detailed configuration of the image composition processing unit 3 is shown in FIG. The image composition processing unit 3 includes coordinate conversion units 21, 22, and 23 that convert images captured by the cameras 2 </ b> A, 2 </ b> B, and 2 </ b> C from a camera coordinate system to a virtual camera coordinate system, and an image converted to the virtual camera coordinate system. A distance estimation unit 24 that estimates a distance image (distance model) of the subject, an image synthesis unit 25 that synthesizes a virtual camera viewpoint image from the estimated distance model, and a camera parameter storage unit that stores camera parameters used for coordinate conversion 26 basically." Hamamoto at pg. 5. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Hamamoto alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '109 Patent	Exemplary Citations to Hamamoto
Claim 8	
8. The method of claim 1, further comprising applying a translation	Hamamoto expressly and/or inherently discloses and/or renders obvious applying a translation transformation to move the image within display area of the monitor. *See*, *e.g.*, disclosures below.

Asserted Claim of the '109 Patent	Exemplary Citations to Hamamoto
transformation to move the image within display area of the monitor.	"The present invention has been made in view of such circumstances, and an arbitrary viewpoint image synthesis device that generates an image in which a shooting direction and a line-of-sight direction are matched by combining images of a plurality of cameras having different shooting directions. The purpose is to provide. The present invention provides a camera that captures an image of a subject that is installed at at least three locations around the display unit of the display device, the right side surface, and the left side surface, and the line of sight of the subject based on each image captured by the camera. An image composition processing unit for compositing images taken from a virtual camera in a direction, and the image composition processing unit changes from a camera coordinate system to a virtual camera coordinate system using camera parameters obtained by camera calibration of the camera. A coordinate conversion unit for conversion; a distance estimation unit for estimating a distance model of a subject with respect to an image converted by the coordinate conversion unit; and an image composition unit for combining a virtual camera viewpoint image from the distance model of the subject. Is an arbitrary viewpoint image composition device. Here, the distance estimation unit performs evaluation by block matching for each pair of images converted by the coordinate conversion unit, changes the virtual plane distance within a range in which distance estimation is performed, and evaluates at all distances. The distance model with the smallest evaluation value is obtained as the distance value of the target pixel, and the distance model of the subject is estimated. The distance estimation unit may perform the evaluation by the block matching using an irregular block. The image composition unit may extract and paste a color of a pixel corresponding to the distance model of the subject from the image converted by the coordinate conversion unit.

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	In addition, the image composition unit obtains pixels of surrounding cameras corresponding to the pixels of the virtual camera from the distance value in a one-to-one relationship. According to the present invention, with the above-described configuration, it is possible to obtain an effect that the front image can be improved in image quality and the line-of-sight matching feeling is improved. In particular, by improving the image quality of the peripheral region of the eyes, it is possible to further improve the line-of-sight matching feeling, and it is possible to realize an arbitrary viewpoint image composition device applicable to a television conversation system. Further, according to the present invention, the distance estimation unit performs block matching on the image acquired from the camera with an irregular block, so that the influence of occlusion can be reduced and the synthesis result of the front image can be improved in image quality. Can do. That is, the effect that the line-of-sight matching feeling is improved is obtained." Hamamoto at pg. 3. "Embodiments of the present invention will be described below in detail with reference to the drawings. FIG. 1 is a functional block diagram showing the overall configuration of an arbitrary viewpoint image synthesis system 1 according to the first embodiment of the present invention. An arbitrary viewpoint image composition system 1 shown in FIG. 1 includes a display device 5 that displays an image, and an arbitrary viewpoint image composition device that synthesizes an image in which the line-of-sight direction of the subject 6 matches the shooting direction based on the captured image of the subject 6. 10. The arbitrary viewpoint image composition device 10 includes cameras 2A, 2B, and 2C that photograph a subject 6, an image composition processing unit 3 that composes a virtual camera viewpoint image from the photographed images, and an image output unit 4 that outputs a composite image. And basically consists of

Asserted Claim of the '109 Patent	Exemplary Citations to Hamamoto
	As shown in FIG. 1, the camera 2 </ b> A is mounted on the upper center of the display device 5, the camera 2 </ b> B is mounted on the lower left side of the display device 5, and the camera 2 </ b> C is mounted on the lower right side of the display device 5. Thus, the subject 6 is simultaneously photographed by the cameras 2A, 2B, and 2C arranged at the three positions around the display portion of the display device 5. FIG. 2 shows a flowchart of the processing procedure of the arbitrary viewpoint image synthesis system 1. First, the subject 6 is photographed by the cameras 2A, 2B, and 2C to acquire an image (step S21: Steps are omitted hereinafter). Next, the image composition processing unit 3 synthesizes the viewpoint image of the virtual camera in which the photographing direction and the line-of-sight direction coincide with each other from the three photographed images (S22). The synthesized image is output from the image output unit 4 to the display device 5 (S23), and the virtual camera viewpoint image is displayed on the display device 5 (S24). Next, a detailed configuration of the image composition processing unit 3 is shown in FIG. The image composition processing unit 3 includes coordinate conversion units 21, 22, and 23 that convert images captured by the cameras 2 </ b> A, 2 </ b> B, and 2 </ b> C from a camera coordinate system to a virtual camera coordinate system, and an image converted to the virtual camera coordinate system. A distance estimation unit 24 that estimates a distance image (distance model) of the subject, an image synthesis unit 25 that synthesizes a virtual camera viewpoint image from the estimated distance model, and a camera parameter storage unit that stores camera parameters used for coordinate conversion 26 basically." Hamamoto at pg. 5. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Hamamoto alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '109 Patent	Exemplary Citations to Hamamoto
Claim 9	
9. The method of claim 1, further comprising changing illumination intensity of individual or groups of pixels of the monitor, so as to enhance shading or illumination in the image.	Hamamoto expressly and/or inherently discloses and/or renders obvious changing illumination intensity of individual or groups of pixels of the monitor, so as to enhance shading or illumination in the image. *See*, *e.g.*, disclosures below. "PROBLEM TO BE SOLVED: To provide an arbitrary viewpoint image synthesizing device which generates an image in which an image capturing direction and an eye direction match by subjecting images captured by a plurality of cameras in different image capturing directions to synthesis processing. <P>SOLUTION: An image from each camera 2A, 2B and 2C is coordinate-transformed by coordinate transformation parts 21, 22 and 23 based on a parameter stored in a camera parameter storage part 26. The transformed image is transferred to a distance estimation part 24 and an image synthesis part 25. The distance estimation part 24 evaluates those three images by block matching for each two image as one set. The image synthesis part 25 composites the images of virtual camera viewpoints by extracting and attaching a corresponding pixel color from the coordinate transformed image to the created distance image of an object." Hamamoto at Abstract. "The present invention has been made in view of such circumstances, and an arbitrary viewpoint image synthesis device that generates an image in which a shooting direction and a line-of-sight direction are matched by combining images of a plurality of cameras having different shooting directions. The purpose is to provide. The present invention provides a camera that captures an image of a subject that is installed at at least three locations around the display unit of the display device, the right side surface, and the left side surface, and the line of sight of the subject based on each image captured by the camera. An image composition processing unit for compositing images taken from a virtual camera in a direction, and the image composition processing unit changes from a camera coordinate system to a virtual camera coordinate system using camera parameters obtained by camera calibration of the camera. A coordinate conversion unit for conversion; a distance estimation unit for estimating a distance model

Asserted Claim of the '109 Patent	Exemplary Citations to Hamamoto
	of a subject with respect to an image converted by the coordinate conversion unit; and an image composition unit for combining a virtual camera viewpoint image from the distance model of the subject. Is an arbitrary viewpoint image composition device. Here, the distance estimation unit performs evaluation by block matching for each pair of images converted by the coordinate conversion unit, changes the virtual plane distance within a range in which distance estimation is performed, and evaluates at all distances. The distance model with the smallest evaluation value is obtained as the distance value of the target pixel, and the distance model of the subject is estimated. The distance estimation unit may perform the evaluation by the block matching using an irregular block. The image composition unit may extract and paste a color of a pixel corresponding to the distance model of the subject from the image converted by the coordinate conversion unit. In addition, the image composition unit obtains pixels of surrounding cameras corresponding to the pixels of the virtual camera from the distance value in a one-to-one relationship. According to the present invention, with the above-described configuration, it is possible to obtain an effect that the front image can be improved in image quality and the line-of-sight matching feeling is improved. In particular, by improving the image quality of the peripheral region of the eyes, it is possible to further improve the line-of-sight matching feeling, and it is possible to realize an arbitrary viewpoint image composition device applicable to a television conversation system. Further, according to the present invention, the distance estimation unit performs block matching on the image acquired from the camera with an irregular block, so that the influence of occlusion can be reduced and the synthesis result of the front image can be

Asserted Claim of the '109 Patent	Exemplary Citations to Hamamoto
	improved in image quality. Can do. That is, the effect that the line-of-sight matching feeling is improved is obtained." Hamamoto at pg. 3. "Furthermore, the detailed processing relationship of each part of the image composition processing unit 3 is shown in FIG. Based on the parameters stored in the camera parameter storage unit 26, the coordinate conversion units 21, 22, and 23 convert the images I 1 conv, I 2 conv, I 3 conv from the images I 1, I 2, I 3 from the cameras 2 A, i2 B, 2 C. To the distance estimation unit 24 and the image composition unit 25. The distance estimation unit 24 performs evaluation by block matching for each of the three images I1conv, I2conv, and I3conv. Here, the virtual plane distance z is changed within the range in which distance estimation is performed, and evaluation is performed at all distances. At this time, the distance having the smallest evaluation value is set as the distance value d (i, j) at the target pixel (i, j). By performing this operation on all the pixels, the distance image of the subject can be estimated (a detailed description of this process will be described later). Next, the image composition unit 25 extracts and pastes corresponding pixel colors from the coordinate conversion images I1conv, I2conv, and I3conv to the created distance image of the subject. When distance information of the subject 6 is obtained, pixels of surrounding cameras corresponding to the pixels of the virtual camera can be obtained in a one-to-one relationship by geometric calculation. By performing this operation on all the pixels of the virtual camera, a virtual camera viewpoint image can be synthesized (a detailed description of this process will be described later). FIG. 5 shows a flowchart of the image composition processing unit 3. In FIG. 5, the coordinate conversion units 21, 22, and 23 acquire images I1, I2, and I3 from the cameras 2A, 2B, and 2C (S51), and the camera coordinate system acquired from the cameras 2A, 2B, and 2C. The images I1, I2, and I3 are converted into images I1conv, I2conv, and I3conv in the virtual camera coordinate system, and sent to the distance estimation unit 24 and the image composition unit 25 (S52).

Asserted Claim of the '109 Patent	Exemplary Citations to Hamamoto
	Next, the distance estimation unit 24 changes the virtual plane distance z within the range in which distance estimation is performed on the images I1conv, I2conv, and I3conv converted to the virtual camera coordinate system, and performs block matching for each pair of two images at all distances. Then, the distance image d is estimated using the distance having the smallest evaluation value as the distance value of the target pixel (S53). Finally, the image composition unit 25 extracts the colors of the pixels corresponding to the created distance image d of the subject from the images I1, I2, and I3 and pastes them on the distance image d to synthesize the virtual camera viewpoint image (S54).).” Hamamoto at pg. 6. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Hamamoto alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

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Claim 11	
11[pre]. The method of claim 1, further comprising:	To the extent the preamble is limiting, Hamamoto expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. *See* Claim Limitations 1[pre]-[1[h]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Hamamoto alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of

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	Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
11[a]. determining distance to a user appearing in the image; and,	Hamamoto expressly and/or inherently discloses and/or renders obvious determining distance to a user appearing in the image. *See*, *e.g.*, disclosures below. *See* Claim Limitation 1[g]. *See also*: "FIG. 1 is a functional block diagram showing the overall configuration of an arbitrary viewpoint image synthesis system 1 according to the first embodiment of the present invention. An arbitrary viewpoint image composition system 1 shown in FIG. 1 includes a display device 5 that displays an image, and an arbitrary viewpoint image composition device that synthesizes an image in which the line-of-sight direction of the subject 6 matches the shooting direction based on the captured image of the subject 6. 10. The arbitrary viewpoint image composition device 10 includes cameras 2A, 2B, and 2C that photograph a subject 6, an image composition processing unit 3 that composes a virtual camera viewpoint image from the photographed images, and an image output unit 4 that outputs a composite image. And basically consists of As shown in FIG. 1, the camera 2 </ b> A is mounted on the upper center of the display device 5, the camera 2 </ b> B is mounted on the lower left side of the display device 5, and the camera 2 </ b> C is mounted on the lower right side of the display device 5. Thus, the subject 6 is simultaneously photographed by the cameras 2A, 2B, and 2C arranged at the three positions around the display portion of the display device 5. FIG. 2 shows a flowchart of the processing procedure of the arbitrary viewpoint image synthesis system 1. First, the subject 6 is photographed by the cameras 2A, 2B, and 2C to acquire an image (step S21: Steps are omitted hereinafter). Next, the image composition processing unit 3 synthesizes the viewpoint image of the virtual camera in which the photographing direction and the line-of-sight direction coincide with each other from the three photographed images (S22). The synthesized image is output from

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	the image output unit 4 to the display device 5 (S23), and the virtual camera viewpoint image is displayed on the display device 5 (S24). Next, a detailed configuration of the image composition processing unit 3 is shown in FIG. The image composition processing unit 3 includes coordinate conversion units 21, 22, and 23 that convert images captured by the cameras 2 </ b> A, 2 </ b> B, and 2 </ b> C from a camera coordinate system to a virtual camera coordinate system, and an image converted to the virtual camera coordinate system. A distance estimation unit 24 that estimates a distance image (distance model) of the subject, an image synthesis unit 25 that synthesizes a virtual camera viewpoint image from the estimated distance model, and a camera parameter storage unit that stores camera parameters used for coordinate conversion 26 basically." Hamamoto at pg. 5. "Furthermore, the detailed processing relationship of each part of the image composition processing unit 3 is shown in FIG. Based on the parameters stored in the camera parameter storage unit 26, the coordinate conversion units 21, 22, and 23 convert the images I 1 conv, I 2 conv, I 3 conv from the images I 1, I 2, I 3 from the cameras 2 A, i2 B, 2 C. To the distance estimation unit 24 and the image composition unit 25. The distance estimation unit 24 performs evaluation by block matching for each of the three images I1conv, I2conv, and I3conv. Here, the virtual plane distance z is changed within the range in which distance estimation is performed, and evaluation is performed at all distances. At this time, the distance having the smallest evaluation value is set as the distance value d (i, j) at the target pixel (i, j). By performing this operation on all the pixels, the distance image of the subject can be estimated (a detailed description of this process will be described later). Next, the image composition unit 25 extracts and pastes corresponding pixel colors from the coordinate conversion images I1conv, I2conv, and I3conv to the created distance image of the subject. When distance information of the subject 6 is obtained, pixels of surrounding cameras corresponding to the pixels of the virtual camera can be obtained in a one-to-one relationship by geometric calculation. By performing this operation on

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	all the pixels of the virtual camera, a virtual camera viewpoint image can be synthesized (a detailed description of this process will be described later). FIG. 5 shows a flowchart of the image composition processing unit 3. In FIG. 5, the coordinate conversion units 21, 22, and 23 acquire images I1, I2, and I3 from the cameras 2A, 2B, and 2C (S51), and the camera coordinate system acquired from the cameras 2A, 2B, and 2C. The images I1, I2, and I3 are converted into images I1conv, I2conv, and I3conv in the virtual camera coordinate system, and sent to the distance estimation unit 24 and the image composition unit 25 (S52). Next, the distance estimation unit 24 changes the virtual plane distance z within the range in which distance estimation is performed on the images I1conv, I2conv, and I3conv converted to the virtual camera coordinate system, and performs block matching for each pair of two images at all distances. Then, the distance image d is estimated using the distance having the smallest evaluation value as the distance value of the target pixel (S53). Finally, the image composition unit 25 extracts the colors of the pixels corresponding to the created distance image d of the subject from the images I1, I2, and I3 and pastes them on the distance image d to synthesize the virtual camera viewpoint image (S54).).” Hamamoto at pg. 6. “Still another embodiment of the present invention will be described in detail with reference to the drawings. FIG. 41 is a functional block diagram showing a configuration example of this embodiment. The configuration of the arbitrary viewpoint image composition device 210 of the system 201 of this embodiment is different from the arbitrary viewpoint image composition device 10 of FIG. 1, and includes an image transmission unit 4500 and an image reception unit 4502 instead of the image output unit 4. . In the arbitrary viewpoint image composition device 210, the image photographed by the imaging device is composed by the image composition processing unit 3, and the synthesized image is connected to the external network 4501 via the image transmission unit 4500, and another arbitrary viewpoint image composition device. 210 and the like,

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	and an image transmitted from another arbitrary viewpoint image composition device 210 or the like via the image receiving unit 4502 is displayed on the display device 5. In this way, this system 201 is suitable for conducting a video conference because users in remote places can communicate with each other by matching the line of sight via the network 4501." Hamamoto at pg. 21. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Hamamoto alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
11[b]. varying resolution of the image according to the distance.	Hamamoto expressly and/or inherently discloses and/or renders obvious varying resolution of the image according to the distance. *See*, *e.g.*, disclosures below. "FIG. 1 is a functional block diagram showing the overall configuration of an arbitrary viewpoint image synthesis system 1 according to the first embodiment of the present invention. An arbitrary viewpoint image composition system 1 shown in FIG. 1 includes a display device 5 that displays an image, and an arbitrary viewpoint image composition device that synthesizes an image in which the line-of-sight direction of the subject 6 matches the shooting direction based on the captured image of the subject 6. 10. The arbitrary viewpoint image composition device 10 includes cameras 2A, 2B, and 2C that photograph a subject 6, an image composition processing unit 3 that composes a virtual camera viewpoint image from the photographed images, and an image output unit 4 that outputs a composite image. And basically consists of As shown in FIG. 1, the camera 2 </ b> A is mounted on the upper center of the display device 5, the camera 2 </ b> B is mounted on the lower left side of the display device 5, and the camera 2 </ b> C is mounted on the lower right side of the display device 5. Thus, the subject 6 is simultaneously photographed by the cameras 2A, 2B, and 2C arranged at the three positions around the display portion of the display device 5.

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	FIG. 2 shows a flowchart of the processing procedure of the arbitrary viewpoint image synthesis system 1. First, the subject 6 is photographed by the cameras 2A, 2B, and 2C to acquire an image (step S21: Steps are omitted hereinafter). Next, the image composition processing unit 3 synthesizes the viewpoint image of the virtual camera in which the photographing direction and the line-of-sight direction coincide with each other from the three photographed images (S22). The synthesized image is output from the image output unit 4 to the display device 5 (S23), and the virtual camera viewpoint image is displayed on the display device 5 (S24). Next, a detailed configuration of the image composition processing unit 3 is shown in FIG. The image composition processing unit 3 includes coordinate conversion units 21, 22, and 23 that convert images captured by the cameras 2 </ b> A, 2 </ b> B, and 2 </ b> C from a camera coordinate system to a virtual camera coordinate system, and an image converted to the virtual camera coordinate system. A distance estimation unit 24 that estimates a distance image (distance model) of the subject, an image synthesis unit 25 that synthesizes a virtual camera viewpoint image from the estimated distance model, and a camera parameter storage unit that stores camera parameters used for coordinate conversion 26 basically." Hamamoto at pg. 5. "Furthermore, the detailed processing relationship of each part of the image composition processing unit 3 is shown in FIG. Based on the parameters stored in the camera parameter storage unit 26, the coordinate conversion units 21, 22, and 23 convert the images I 1 conv, I 2 conv, I 3 conv from the images I 1, I 2, I 3 from the cameras 2 A, i2 B, 2 C. To the distance estimation unit 24 and the image composition unit 25. The distance estimation unit 24 performs evaluation by block matching for each of the three images I1conv, I2conv, and I3conv. Here, the virtual plane distance z is changed within the range in which distance estimation is performed, and evaluation is performed at all distances. At this time, the distance having the smallest evaluation value is set as the distance value d (i, j) at the target pixel (i, j). By performing this operation on all the pixels, the distance image of the subject can be estimated (a detailed description of this process will be described later).

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	Next, the image composition unit 25 extracts and pastes corresponding pixel colors from the coordinate conversion images I1conv, I2conv, and I3conv to the created distance image of the subject. When distance information of the subject 6 is obtained, pixels of surrounding cameras corresponding to the pixels of the virtual camera can be obtained in a one-to-one relationship by geometric calculation. By performing this operation on all the pixels of the virtual camera, a virtual camera viewpoint image can be synthesized (a detailed description of this process will be described later). FIG. 5 shows a flowchart of the image composition processing unit 3. In FIG. 5, the coordinate conversion units 21, 22, and 23 acquire images I1, I2, and I3 from the cameras 2A, 2B, and 2C (S51), and the camera coordinate system acquired from the cameras 2A, 2B, and 2C. The images I1, I2, and I3 are converted into images I1conv, I2conv, and I3conv in the virtual camera coordinate system, and sent to the distance estimation unit 24 and the image composition unit 25 (S52). Next, the distance estimation unit 24 changes the virtual plane distance z within the range in which distance estimation is performed on the images I1conv, I2conv, and I3conv converted to the virtual camera coordinate system, and performs block matching for each pair of two images at all distances. Then, the distance image d is estimated using the distance having the smallest evaluation value as the distance value of the target pixel (S53). Finally, the image composition unit 25 extracts the colors of the pixels corresponding to the created distance image d of the subject from the images I1, I2, and I3 and pastes them on the distance image d to synthesize the virtual camera viewpoint image (S54).)." Hamamoto at pg. 6. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Hamamoto alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of

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	Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

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Exhibit A-29: Invalidity of U.S. Patent No. 8,982,109 in view of U.S. Patent Pub. No. 2010/0102538 ("Tan")

This chart is subject to all reservations, objections, and disclaimers in Defendants' Invalidity Contentions and any amendment, supplement, or modification thereof, which are incorporated herein by reference in their entirety.

Tan was originally filed October 29, 2009 and was published on May 5, 2011, and thus is available as prior art to U.S. Patent No. 8,982,109 (the "'109 Patent") under at least 35 U.S.C. §§ 102(a), (b) and (e).

Tan anticipates the Asserted Claims of the '109 Patent. To the extent it is found Tan does not expressly disclose certain limitations in the Asserted Claims, such limitations are at least implicitly or inherently disclosed. Moreover, to the extent it is found that Tan does not anticipate the Asserted Claims, Tan renders obvious the Asserted Claims, either alone or in combination with other prior art identified in the cover pleading or herein, and/or in combination with the general knowledge of a person having ordinary skill in the art.

In these contentions, Defendants have relied in part on Plaintiff's Infringement Contentions. In those contentions, Plaintiff appears to pursue overly broad claim constructions in an effort to assert infringement where none exists, and to accuse products that do not infringe the claims. Defendants' assertion that a particular limitation is disclosed by a prior art reference and/or is disclosed in a particular manner may be based in part on Plaintiff's apparent claim interpretations. In relying on Plaintiff's apparent claim interpretations, Defendants do not admit that Plaintiff's apparent claim interpretations are supportable or proper or that the claim limitations in question are definite or otherwise amenable to construction.

Defendants have endeavored to provide as much detail as possible in these contentions and, in doing so, have exceeded the level of detail required. The inclusion of specific details in some areas is not a concession that such details are required or that the omission of similar details in other areas is a defect. These citations to portions of any reference in this chart are exemplary only. Defendants will rely on the entirety of the references cited in this chart to show that the Asserted Claims are invalid.

Asserted Claim of the '109 Patent	Exemplary Citations to Tan
Claim 1	
1[pre]. A method for operating a system having a monitor, a camera, and a processor, so as to display a mirror-mimicking image on the monitor, by performing non-ordered steps comprising:	To the extent the preamble is limiting, Tan expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. "Various embodiments of the present invention are directed to video-conferencing systems configured and operated to create eye contact between video conference participants. In particular, embodiments of the present invention include a sec-through display screen allowing one or more cameras to be placed behind the display screen and out of site of a local participant. Eye contact can be created between the local participant viewing the display screen and a remote participant projected onto the display screen by (1) shifting the image of the remote participant into eye contact with the local participant; (2) shifting the line-of-sight of the camera into alignment with the remote participant's head so that the local participant is looking into the lens of the camera enabling the establishment of eye contact with the remote participant; or (3) having an array of cameras located behind the display, where the camera nearest a line-of-sight of the local participant that also passes through the remote participant is activated, or views from two or more cameras of the array of cameras are used to synthesize a virtual camera lying on the line-of-sight passing through the local participant and the image of the remote participant." *See* Tan at para. [0015]. "In general, system and methods for establishing eye contact between participants in a video conference are described above with reference to a computing device. The computing device can be a desktop computer, a laptop, or any other suitable device configured to carry out video and image processing. For convenience sake, the computing device is described above, and is shown in FIGS. 1-8, as a separate component of the video conferencing system. However, embodiments of the present invention are not so limited. In other embodiments, the video processing performed by the computing devices described above may also be performed by the projector, or the video processing can be performed by the camera."

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	See Tan at para. [0038]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Tan alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[a]. obtaining a digital image from a camera;	Tan expressly and/or inherently discloses and/or renders obvious obtaining a digital image from a camera. *See*, *e.g.*, disclosures below. "Camera 104 captures video images of the first participant 108. The video images are sent to the computing device 118 for image processing, and the projector 106 projects video images received from the computing device 118 of the second participant onto the display screen 102. The computing device 118 can use well-known facial recognition/detection algorithms to determine an approximate coordinate location of the center of the first participant's 108 face or head and determine an approximate coordinate location of the center of the second participant's 110 face or head. Based on the coordinate locations of the participant's heads, the computing device 118 can be used to determine a point 122 where the LOS 120 of the camera 104 passes through the display screen 102 and uses the mechanized platform 116 to reposition of the projector 106 to project the second participant 110 such that approximate center of the second participant's face or head matches the point 122, as indicated by directional arrow 124." *See* Tan at para. [0018]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Tan alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of

Asserted Claim of the '109 Patent	Exemplary Citations to Tan
	Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[b]. flipping the image about a vertical axis so as to reverse right and left sides of the image;	Tan expressly and/or inherently discloses and/or renders obvious flipping the image about a vertical axis so as to reverse right and left sides of the image. *See*, *e.g.*, disclosures below. "FIG. 2 shows the video conferencing system 100 with the projector 106 repositioned in accordance with embodiments of the present invention. As shown in the example of FIG. 2, the projector 106 is repositioned such that the center of the second participant's 110 head substantially intersects the point 122. Dashed line FIG. 202 represents the previous position of the second participant shown in FIG. 1. Note that as a result of repositioning the image of the second participant 110, the LOS 112 of the first participant 108 is reoriented into approximate alignment with the LOS 120. In other words, the first participant 108 looks at the face of the second participant 110 and looks into the lens of the camera 104, creating for the second participant 110 the appearance of the first participant 108 looking at the face of the second participant 110 through the second participant's display. When the second participant 110 looks into a camera creating the second participant's image on the display screen 102 at the second participant's location, the second participant 110 appears to be looking at the face of the first participant 108 through the display screen 102. As a result, the first and second participants can experience a face-to-face video conference with eye contact." *See* Tan at para. [0019]. "Note that by activating the appropriate one or more cameras of the array of cameras 604, the first participant 108 looks at the face of the second participant 110 and looks into the lens of one camera or the lens of a virtual camera, creating for the second participant 110 the appearance of the first participant 108 looking at the face of the second participant 110. When the second participant 110 looks into the camera creating the second participant's image on the display screen 602 at the second participant's

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	location, the first participant 108 has the impression of the second participant 110 looking at the face of the first participant 108 through the display screen 102. As a result, the first and second participants can experience a face-to-face video conference with eye contact." *See* Tan at para. [0053]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Tan alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[c]. applying a transformation mapping to the image to modify the image such that it appears to mimic a reflection of a mirror;	Tan expressly and/or inherently discloses and/or renders obvious applying a transformation mapping to the image to modify the image such that it appears to mimic a reflection of a mirror. *See*, *e.g.*, disclosures below. "In still other embodiments, rather than using mechanical means to shift the image captured by the camera and/or the image projected by the projector, the collected images from the camera and the images projected by the projector can be electronically processed by the computing device so that the LOS of the camera and the LOS of the first participant appear substantially aligned and pass through the face of the second participant. For example, the image of the second participant projected onto the display screen can be electronically processed by the computing device such that second participant is repositioned within the display screen with the second participant's head located such that the LOS of the camera and the LOS of the first participant are substantially aligned and pass through the face of the second participant." *See* Tan at para. [0027].

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	"When the video conference begins, one camera, such as centrally located camera 608, can be used to initially capture video images of the first participant 108, which are sent to the computing device 606 for image processing, and the projector projects images received from the computing device 606 of the second participant 110 onto the display screen 102. The computing device 606 can use well-known facial recognition/detection algorithms to determine an approximate coordinate location 610 of the center of the first participant's 108 face or head and determine an approximate coordinate location 612 of the center of the second participant's face or head projected onto the display screen 602. Based on the coordinate locations 610 and 612, the computing device 606 can be used to determine the line of sight 112." *See* Tan at para. [0029]. "In other embodiments, once the LOS 112 has been determined, the computing device 606 can activate two or more cameras and perform view synthesis to create an artificial LOS with a direction substantially aligned with the LOS 112. FIG. 8 shows two cameras 802 and 804 of the array of cameras 604 activated in accordance with embodiments of the present invention. The cameras 802 and 804 each capture a different video image of the first participant 108 that are sent to the computing device 606. The computing device 606 performs view synthesis to create a single image of the first participant 108 that is sent to the second participant 110. The synthesized image corresponds to a virtual camera located somewhere between the cameras 802 and 804 and has a LOS 806 that passes through the point 612 of the second participant's head. The synthesized image can also be used to track movements of the first participant 108 such that when the first participant 108 changes position during the course of the video conference the direction of the LOS 112 also changes. The computing device 606 responds to changes in the LOS 112 by activating to a particular camera, or by activating two or more cameras to generate a synthesized image, in order to provide video images of the first participant 108 with a LOS substantially aligned with the new direction of the LOS 112."

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	See Tan at para. [0031]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Tan alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[d]. resizing the image to reduce variations caused by changes in object's distance to the camera;	Tan expressly and/or inherently discloses and/or renders obvious resizing the image to reduce variations caused by changes in object's distance to the camera. *See*, *e.g.*, disclosures below. "In still other embodiments, rather than using mechanical means to shift the image captured by the camera and/or the image projected by the projector, the collected images from the camera and the images projected by the projector can be electronically processed by the computing device so that the LOS of the camera and the LOS of the first participant appear substantially aligned and pass through the face of the second participant. For example, the image of the second participant projected onto the display screen can be electronically processed by the computing device such that second participant is repositioned within the display screen with the second participant's head located such that the LOS of the camera and the LOS of the first participant are substantially aligned and pass through the face of the second participant." *See* Tan at para. [0027]. "When the video conference begins, one camera, such as centrally located camera 608, can be used to initially capture video images of the first participant 108, which are sent to the computing device 606 for image processing, and the projector projects images received from the computing device 606 of the second participant 110 onto the display screen 102. The computing device 606 can use well-known facial recognition/detection algorithms to determine an approximate coordinate location 610 of the center of the first participant's 108 face or head and determine an approximate coordinate location 612 of

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	the center of the second participant's face or head projected onto the display screen 602. Based on the coordinate locations 610 and 612, the computing device 606 can be used to determine the line of sight 112." *See* Tan at para. [0029]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Tan alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[e]. displaying the image on the monitor after performing the flipping, transformation mapping, and resizing;	Tan expressly and/or inherently discloses and/or renders obvious displaying the image on the monitor after performing the flipping, transformation mapping, and resizing. *See*, *e.g.*, disclosures below. "FIG. 9 shows a control-flow diagram of a method for establishing eye contact between participants in a video conference in accordance with embodiments of the present invention. In step 901, a video image of a first video conference participant is captured through a display screen using a video camera. As described above with reference to FIGS. 1-8, the display screen is positioned between the video camera and the first participant. In step 902, a video image of a second video conference participant is projected onto the display screen using a projector, as described above with reference to FIGS. 1-3. The second participant is projected so that the first participant can view the second participant on the display. In step 903, a LOS directed from an approximate center position of the first participant's face or head to an approximate center point of the projected image of the second participant's face or head is determined. In this step, facial recognition/detection algorithms can be used to identify the shape and surface areas of the first and second participants' faces. A first point corresponding to the center of the first participant's face and a second point corresponding to the center of the second participant's face can be used to construct a vector corresponding to the LOS from the

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	first participant to the second participant. In step 904, the LOS from the first participant to the second participant can be aligned with the LOS from the camera to the first participant by (1) shifting the image of the second participant into eye contact with the first participant, as described above with reference to FIGS. 1-3; (2) shifting the line-of-sight of the camera into alignment with the second participant's face or head so that the first participant is looking into the lens of the camera establishing eye contact with the remote participant, as described above with reference to FIGS. 4-5; and (3) having an array of cameras located behind the display, where one or more cameras are used to established eye contact between the first participant and the second participant, as described above with reference to FIGS. 6-8.” *See* Tan at para. [0037]. “In general, system and methods for establishing eye contact between participants in a video conference are described above with reference to a computing device. The computing device can be a desktop computer, a laptop, or any other suitable device configured to carry out video and image processing. For convenience sake, the computing device is described above, and is shown in FIGS. 1-8, as a separate component of the video conferencing system. However, embodiments of the present invention are not so limited. In other embodiments, the video processing performed by the computing devices described above may also be performed by the projector, or the video processing can be performed by the camera.” *See* Tan at para. [0038]. “A video conference application 1018 provides various software components for established eye contact between video conference participants, as described above. In certain embodiments, some or all of the processes performed by the application 1018 can be integrated into the operating system 1014. In certain embodiments, the processes can be at least partially implemented in digital electronic circuitry, or in computer hardware, firmware, software, or in any combination thereof.”

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	See Tan at para. [0042]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Tan alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[f]. wherein the non-ordered steps are performed on a series of images of a live video feed from the camera;	Tan expressly and/or inherently discloses and/or renders obvious wherein the non-ordered steps are performed on a series of images of a live video feed from the camera. *See*, *e.g.*, disclosures below. "In certain embodiments, once the LOS 112 has been determined, the computing device 606 activates a camera with a LOS closely aligned with the LOS 112, passes the approximate center of the second participant face, and enables the first participants to look into the lens of the activated camera. FIG. 7 shows a camera 702 of the array of cameras 604 activated in accordance with embodiments of the present invention. The camera 702 has a LOS 704 closely aligned with the direction 112 and substantially passes through the point 612 of the second participant's head. The video images provided by the camera 702 can then be used to track movements of the first participant 108 such that when the first participant 108 changes position during the course of the video conference the direction of the LOS 112 also changes. The computing device 606 responds to changes in the LOS 112 by activating a different camera in the array of cameras 604 in order to provide video images of the first participant 108 from a camera with a LOS closely aligned with the new direction of the LOS 112." *See* Tan at para. [0030]. "In other embodiments, once the LOS 112 has been determined, the computing device 606 can activate two or more cameras and perform view synthesis to create an artificial LOS with a direction substantially aligned with the LOS 112. FIG. 8 shows two cameras 802 and 804 of the array of cameras 604 activated in accordance with embodiments of

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	the present invention. The cameras 802 and 804 each capture a different video image of the first participant 108 that are sent to the computing device 606. The computing device 606 performs view synthesis to create a single image of the first participant 108 that is sent to the second participant 110. The synthesized image corresponds to a virtual camera located somewhere between the cameras 802 and 804 and has a LOS 806 that passes through the point 612 of the second participant's head. The synthesized image can also be used to track movements of the first participant 108 such that when the first participant 108 changes position during the course of the video conference the direction of the LOS 112 also changes. The computing device 606 responds to changes in the LOS 112 by activating to a particular camera, or by activating two or more cameras to generate a synthesized image, in order to provide video images of the first participant 108 with a LOS substantially aligned with the new direction of the LOS 112." *See* Tan at para. [0031]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Tan alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[g]. determining distance to a user appearing in the live video feed; and	Tan expressly and/or inherently discloses and/or renders obvious determining distance to a user appearing in the live video feed. *See*, *e.g.*, disclosures below. "In certain embodiments, once the LOS 112 has been determined, the computing device 606 activates a camera with a LOS closely aligned with the LOS 112, passes the approximate center of the second participant face, and enables the first participants to look into the lens of the activated camera. FIG. 7 shows a camera 702 of the array of cameras 604 activated in accordance with embodiments of the present invention. The camera 702 has a LOS 704 closely aligned with the direction 112 and substantially passes through the point 612 of the second participant's head. The video images provided by the camera 702 can then be used to track movements of the first participant 108 such

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	that when the first participant 108 changes position during the course of the video conference the direction of the LOS 112 also changes. The computing device 606 responds to changes in the LOS 112 by activating a different camera in the array of cameras 604 in order to provide video images of the first participant 108 from a camera with a LOS closely aligned with the new direction of the LOS 112." *See* Tan at para. [0030]. "In other embodiments, once the LOS 112 has been determined, the computing device 606 can activate two or more cameras and perform view synthesis to create an artificial LOS with a direction substantially aligned with the LOS 112. FIG. 8 shows two cameras 802 and 804 of the array of cameras 604 activated in accordance with embodiments of the present invention. The cameras 802 and 804 each capture a different video image of the first participant 108 that are sent to the computing device 606. The computing device 606 performs view synthesis to create a single image of the first participant 108 that is sent to the second participant 110. The synthesized image corresponds to a virtual camera located somewhere between the cameras 802 and 804 and has a LOS 806 that passes through the point 612 of the second participant's head. The synthesized image can also be used to track movements of the first participant 108 such that when the first participant 108 changes position during the course of the video conference the direction of the LOS 112 also changes. The computing device 606 responds to changes in the LOS 112 by activating to a particular camera, or by activating two or more cameras to generate a synthesized image, in order to provide video images of the first participant 108 with a LOS substantially aligned with the new direction of the LOS 112." *See* Tan at para. [0031]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Tan alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of

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	Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[h]. varying rate at which the non-ordered steps are performed on the series of images according to the distance.	Tan expressly and/or inherently discloses and/or renders obvious varying rate at which the non-ordered steps are performed on the series of images according to the distance. *See*, *e.g.*, disclosures below. "In certain embodiments, once the LOS 112 has been determined, the computing device 606 activates a camera with a LOS closely aligned with the LOS 112, passes the approximate center of the second participant face, and enables the first participants to look into the lens of the activated camera. FIG. 7 shows a camera 702 of the array of cameras 604 activated in accordance with embodiments of the present invention. The camera 702 has a LOS 704 closely aligned with the direction 112 and substantially passes through the point 612 of the second participant's head. The video images provided by the camera 702 can then be used to track movements of the first participant 108 such that when the first participant 108 changes position during the course of the video conference the direction of the LOS 112 also changes. The computing device 606 responds to changes in the LOS 112 by activating a different camera in the array of cameras 604 in order to provide video images of the first participant 108 from a camera with a LOS closely aligned with the new direction of the LOS 112." *See* Tan at para. [0030]. "In other embodiments, once the LOS 112 has been determined, the computing device 606 can activate two or more cameras and perform view synthesis to create an artificial LOS with a direction substantially aligned with the LOS 112. FIG. 8 shows two cameras 802 and 804 of the array of cameras 604 activated in accordance with embodiments of the present invention. The cameras 802 and 804 each capture a different video image of the first participant 108 that are sent to the computing device 606. The computing device 606 performs view synthesis to create a single image of the first participant 108 that is sent to the second participant 110. The synthesized image corresponds to a virtual camera located somewhere between the cameras 802 and 804 and has a LOS 806 that

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	passes through the point 612 of the second participant's head. The synthesized image can also be used to track movements of the first participant 108 such that when the first participant 108 changes position during the course of the video conference the direction of the LOS 112 also changes. The computing device 606 responds to changes in the LOS 112 by activating to a particular camera, or by activating two or more cameras to generate a synthesized image, in order to provide video images of the first participant 108 with a LOS substantially aligned with the new direction of the LOS 112." *See* Tan at para. [0031]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Tan alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

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Claim 2	
2. The method of claim 1, wherein the transformation mapping renders an image appearing to have been taken from a camera positioned at eye-level height and pointing horizontally.	Tan expressly and/or inherently discloses and/or renders obvious wherein the transformation mapping renders an image appearing to have been taken from a camera positioned at eye-level height and pointing horizontally. *See*, *e.g.*, disclosures below. "In still other embodiments, rather than using mechanical means to shift the image captured by the camera and/or the image projected by the projector, the collected images from the camera and the images projected by the projector can be electronically processed by the computing device so that the LOS of the camera and the LOS of the first participant appear substantially aligned and pass through the face of the second

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	participant. For example, the image of the second participant projected onto the display screen can be electronically processed by the computing device such that second participant is repositioned within the display screen with the second participant's head located such that the LOS of the camera and the LOS of the first participant are substantially aligned and pass through the face of the second participant.” *See* Tan at para. [0027]. “When the video conference begins, one camera, such as centrally located camera 608, can be used to initially capture video images of the first participant 108, which are sent to the computing device 606 for image processing, and the projector projects images received from the computing device 606 of the second participant 110 onto the display screen 102. The computing device 606 can use well-known facial recognition/detection algorithms to determine an approximate coordinate location 610 of the center of the first participant's 108 face or head and determine an approximate coordinate location 612 of the center of the second participant's face or head projected onto the display screen 602. Based on the coordinate locations 610 and 612, the computing device 606 can be used to determine the line of sight 112.” *See* Tan at para. [0029]. “In other embodiments, once the LOS 112 has been determined, the computing device 606 can activate two or more cameras and perform view synthesis to create an artificial LOS with a direction substantially aligned with the LOS 112. FIG. 8 shows two cameras 802 and 804 of the array of cameras 604 activated in accordance with embodiments of the present invention. The cameras 802 and 804 each capture a different video image of the first participant 108 that are sent to the computing device 606. The computing device 606 performs view synthesis to create a single image of the first participant 108 that is sent to the second participant 110. The synthesized image corresponds to a virtual camera located somewhere between the cameras 802 and 804 and has a LOS 806 that passes through the point 612 of the second participant's head. The synthesized image can

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	also be used to track movements of the first participant 108 such that when the first participant 108 changes position during the course of the video conference the direction of the LOS 112 also changes. The computing device 606 responds to changes in the LOS 112 by activating to a particular camera, or by activating two or more cameras to generate a synthesized image, in order to provide video images of the first participant 108 with a LOS substantially aligned with the new direction of the LOS 112." *See* Tan at para. [0031]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Tan alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '109 Patent	Exemplary Citations to Tan
Claim 7	
7[pre]. The method of claim 1, further comprising the steps:	To the extent the preamble is limiting, Tan expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. *See* Claim Limitations 1[pre]-[1[h]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Tan alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of

Asserted Claim of the '109 Patent	Exemplary Citations to Tan
	Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
7[a]. obtaining a reference image;	Tan expressly and/or inherently discloses and/or renders obvious obtaining a reference image. *See*, *e.g.*, disclosures below. "Camera 104 captures video images of the first participant 108. The video images are sent to the computing device 118 for image processing, and the projector 106 projects video images received from the computing device 118 of the second participant onto the display screen 102. The computing device 118 can use well-known facial recognition/detection algorithms to determine an approximate coordinate location of the center of the first participant's 108 face or head and determine an approximate coordinate location of the center of the second participant's 110 face or head. Based on the coordinate locations of the participant's heads, the computing device 118 can be used to determine a point 122 where the LOS 120 of the camera 104 passes through the display screen 102 and uses the mechanized platform 116 to reposition of the projector 106 to project the second participant 110 such that approximate center of the second participant's face or head matches the point 122, as indicated by directional arrow 124." *See* Tan at para. [0018]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Tan alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
7[b]. performing registration of the digital image with the reference image;	Tan expressly and/or inherently discloses and/or renders obvious performing registration of the digital image with the reference image. *See*, *e.g.*, disclosures below. "Camera 104 captures video images of the first participant 108. The video images are sent to the computing device 118 for image processing, and the projector 106 projects

Asserted Claim of the '109 Patent	Exemplary Citations to Tan
	video images received from the computing device 118 of the second participant onto the display screen 102. The computing device 118 can use well-known facial recognition/detection algorithms to determine an approximate coordinate location of the center of the first participant's 108 face or head and determine an approximate coordinate location of the center of the second participant's 110 face or head. Based on the coordinate locations of the participant's heads, the computing device 118 can be used to determine a point 122 where the LOS 120 of the camera 104 passes through the display screen 102 and uses the mechanized platform 116 to reposition of the projector 106 to project the second participant 110 such that approximate center of the second participant's face or head matches the point 122, as indicated by directional arrow 124." *See* Tan at para. [0018]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Tan alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
7[c]. using data obtained from the registration to generate the transformation mapping.	Tan expressly and/or inherently discloses and/or renders obvious using data obtained from the registration to generate the transformation mapping. *See*, *e.g.*, disclosures below. "In still other embodiments, rather than using mechanical means to shift the image captured by the camera and/or the image projected by the projector, the collected images from the camera and the images projected by the projector can be electronically processed by the computing device so that the LOS of the camera and the LOS of the first participant appear substantially aligned and pass through the face of the second participant. For example, the image of the second participant projected onto the display screen can be electronically processed by the computing device such that second

Asserted Claim of the '109 Patent	Exemplary Citations to Tan
	participant is repositioned within the display screen with the second participant's head located such that the LOS of the camera and the LOS of the first participant are substantially aligned and pass through the face of the second participant." *See* Tan at para. [0027]. "When the video conference begins, one camera, such as centrally located camera 608, can be used to initially capture video images of the first participant 108, which are sent to the computing device 606 for image processing, and the projector projects images received from the computing device 606 of the second participant 110 onto the display screen 102. The computing device 606 can use well-known facial recognition/detection algorithms to determine an approximate coordinate location 610 of the center of the first participant's 108 face or head and determine an approximate coordinate location 612 of the center of the second participant's face or head projected onto the display screen 602. Based on the coordinate locations 610 and 612, the computing device 606 can be used to determine the line of sight 112." *See* Tan at para. [0029]. "In other embodiments, once the LOS 112 has been determined, the computing device 606 can activate two or more cameras and perform view synthesis to create an artificial LOS with a direction substantially aligned with the LOS 112. FIG. 8 shows two cameras 802 and 804 of the array of cameras 604 activated in accordance with embodiments of the present invention. The cameras 802 and 804 each capture a different video image of the first participant 108 that are sent to the computing device 606. The computing device 606 performs view synthesis to create a single image of the first participant 108 that is sent to the second participant 110. The synthesized image corresponds to a virtual camera located somewhere between the cameras 802 and 804 and has a LOS 806 that passes through the point 612 of the second participant's head. The synthesized image can also be used to track movements of the first participant 108 such that when the first participant 108 changes position during the course of the video conference the direction

Asserted Claim of the '109 Patent	Exemplary Citations to Tan
	of the LOS 112 also changes. The computing device 606 responds to changes in the LOS 112 by activating to a particular camera, or by activating two or more cameras to generate a synthesized image, in order to provide video images of the first participant 108 with a LOS substantially aligned with the new direction of the LOS 112." *See* Tan at para. [0031]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Tan alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '109 Patent	Exemplary Citations to Tan
Claim 8	
8. The method of claim 1, further comprising applying a translation transformation to move the image within display area of the monitor.	Tan expressly and/or inherently discloses and/or renders obvious applying a translation transformation to move the image within display area of the monitor. *See*, *e.g.*, disclosures below. "In still other embodiments, rather than using mechanical means to shift the image captured by the camera and/or the image projected by the projector, the collected images from the camera and the images projected by the projector can be electronically processed by the computing device so that the LOS of the camera and the LOS of the first participant appear substantially aligned and pass through the face of the second participant. For example, the image of the second participant projected onto the display

Asserted Claim of the '109 Patent	Exemplary Citations to Tan
	screen can be electronically processed by the computing device such that second participant is repositioned within the display screen with the second participant's head located such that the LOS of the camera and the LOS of the first participant are substantially aligned and pass through the face of the second participant." *See* Tan at para. [0027]. "When the video conference begins, one camera, such as centrally located camera 608, can be used to initially capture video images of the first participant 108, which are sent to the computing device 606 for image processing, and the projector projects images received from the computing device 606 of the second participant 110 onto the display screen 102. The computing device 606 can use well-known facial recognition/detection algorithms to determine an approximate coordinate location 610 of the center of the first participant's 108 face or head and determine an approximate coordinate location 612 of the center of the second participant's face or head projected onto the display screen 602. Based on the coordinate locations 610 and 612, the computing device 606 can be used to determine the line of sight 112." *See* Tan at para. [0029]. "In other embodiments, once the LOS 112 has been determined, the computing device 606 can activate two or more cameras and perform view synthesis to create an artificial LOS with a direction substantially aligned with the LOS 112. FIG. 8 shows two cameras 802 and 804 of the array of cameras 604 activated in accordance with embodiments of the present invention. The cameras 802 and 804 each capture a different video image of the first participant 108 that are sent to the computing device 606. The computing device 606 performs view synthesis to create a single image of the first participant 108 that is sent to the second participant 110. The synthesized image corresponds to a virtual camera located somewhere between the cameras 802 and 804 and has a LOS 806 that passes through the point 612 of the second participant's head. The synthesized image can also be used to track movements of the first participant 108 such that when the first

Asserted Claim of the '109 Patent	Exemplary Citations to Tan
	participant 108 changes position during the course of the video conference the direction of the LOS 112 also changes. The computing device 606 responds to changes in the LOS 112 by activating to a particular camera, or by activating two or more cameras to generate a synthesized image, in order to provide video images of the first participant 108 with a LOS substantially aligned with the new direction of the LOS 112." *See* Tan at para. [0031]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Tan alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '109 Patent	Exemplary Citations to Tan
Claim 9	
9. The method of claim 1, further comprising changing illumination intensity of individual or groups of pixels of the monitor, so as to enhance shading or illumination in the image.	Tan expressly and/or inherently discloses and/or renders obvious changing illumination intensity of individual or groups of pixels of the monitor, so as to enhance shading or illumination in the image. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Tan alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '109 Patent	Exemplary Citations to Tan
Claim 11	
11[pre]. The method of claim 1, further comprising:	To the extent the preamble is limiting, Tan expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. *See* Claim Limitations 1[pre]-[1[h]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Tan alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
11[a]. determining distance to a user appearing in the image; and,	Tan expressly and/or inherently discloses and/or renders obvious determining distance to a user appearing in the image. *See*, *e.g.*, disclosures below. *See* Claim Limitation 1[g]. *See also*: "In certain embodiments, once the LOS 112 has been determined, the computing device 606 activates a camera with a LOS closely aligned with the LOS 112, passes the approximate center of the second participant face, and enables the first participants to look into the lens of the activated camera. FIG. 7 shows a camera 702 of the array of cameras 604 activated in accordance with embodiments of the present invention. The camera 702 has a LOS 704 closely aligned with the direction 112 and substantially passes through the point 612 of the second participant's head. The video images provided by the camera 702 can then be used to track movements of the first participant 108 such that when the first participant 108 changes position during the course of the video conference the direction of the LOS 112 also changes. The computing device 606 responds to changes in the LOS 112 by activating a different camera in the array of

Asserted Claim of the '109 Patent	Exemplary Citations to Tan
	cameras 604 in order to provide video images of the first participant 108 from a camera with a LOS closely aligned with the new direction of the LOS 112." *See* Tan at para. [0030]. "In other embodiments, once the LOS 112 has been determined, the computing device 606 can activate two or more cameras and perform view synthesis to create an artificial LOS with a direction substantially aligned with the LOS 112. FIG. 8 shows two cameras 802 and 804 of the array of cameras 604 activated in accordance with embodiments of the present invention. The cameras 802 and 804 each capture a different video image of the first participant 108 that are sent to the computing device 606. The computing device 606 performs view synthesis to create a single image of the first participant 108 that is sent to the second participant 110. The synthesized image corresponds to a virtual camera located somewhere between the cameras 802 and 804 and has a LOS 806 that passes through the point 612 of the second participant's head. The synthesized image can also be used to track movements of the first participant 108 such that when the first participant 108 changes position during the course of the video conference the direction of the LOS 112 also changes. The computing device 606 responds to changes in the LOS 112 by activating to a particular camera, or by activating two or more cameras to generate a synthesized image, in order to provide video images of the first participant 108 with a LOS substantially aligned with the new direction of the LOS 112." *See* Tan at para. [0031]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Tan alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '109 Patent	Exemplary Citations to Tan
11[b]. varying resolution of the image according to the distance.	Tan expressly and/or inherently discloses and/or renders obvious varying resolution of the image according to the distance. *See*, *e.g.*, disclosures below. "In certain embodiments, once the LOS 112 has been determined, the computing device 606 activates a camera with a LOS closely aligned with the LOS 112, passes the approximate center of the second participant face, and enables the first participants to look into the lens of the activated camera. FIG. 7 shows a camera 702 of the array of cameras 604 activated in accordance with embodiments of the present invention. The camera 702 has a LOS 704 closely aligned with the direction 112 and substantially passes through the point 612 of the second participant's head. The video images provided by the camera 702 can then be used to track movements of the first participant 108 such that when the first participant 108 changes position during the course of the video conference the direction of the LOS 112 also changes. The computing device 606 responds to changes in the LOS 112 by activating a different camera in the array of cameras 604 in order to provide video images of the first participant 108 from a camera with a LOS closely aligned with the new direction of the LOS 112." *See* Tan at para. [0030]. "In other embodiments, once the LOS 112 has been determined, the computing device 606 can activate two or more cameras and perform view synthesis to create an artificial LOS with a direction substantially aligned with the LOS 112. FIG. 8 shows two cameras 802 and 804 of the array of cameras 604 activated in accordance with embodiments of the present invention. The cameras 802 and 804 each capture a different video image of the first participant 108 that are sent to the computing device 606. The computing device 606 performs view synthesis to create a single image of the first participant 108 that is sent to the second participant 110. The synthesized image corresponds to a virtual camera located somewhere between the cameras 802 and 804 and has a LOS 806 that passes through the point 612 of the second participant's head. The synthesized image can also be used to track movements of the first participant 108 such that when the first participant 108 changes position during the course of the video conference the direction of the LOS 112 also changes. The computing device 606 responds to changes in the LOS

Asserted Claim of the '109 Patent	Exemplary Citations to Tan
	112 by activating to a particular camera, or by activating two or more cameras to generate a synthesized image, in order to provide video images of the first participant 108 with a LOS substantially aligned with the new direction of the LOS 112." *See* Tan at para. [0031]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Tan alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Exhibit A-30: Invalidity of U.S. Patent No. 8,982,109 in view of U.S. Patent Pub. No. 2011/0134146 ("Lin")

This chart is subject to all reservations, objections, and disclaimers in Defendants' Invalidity Contentions and any amendment, supplement, or modification thereof, which are incorporated herein by reference in their entirety.

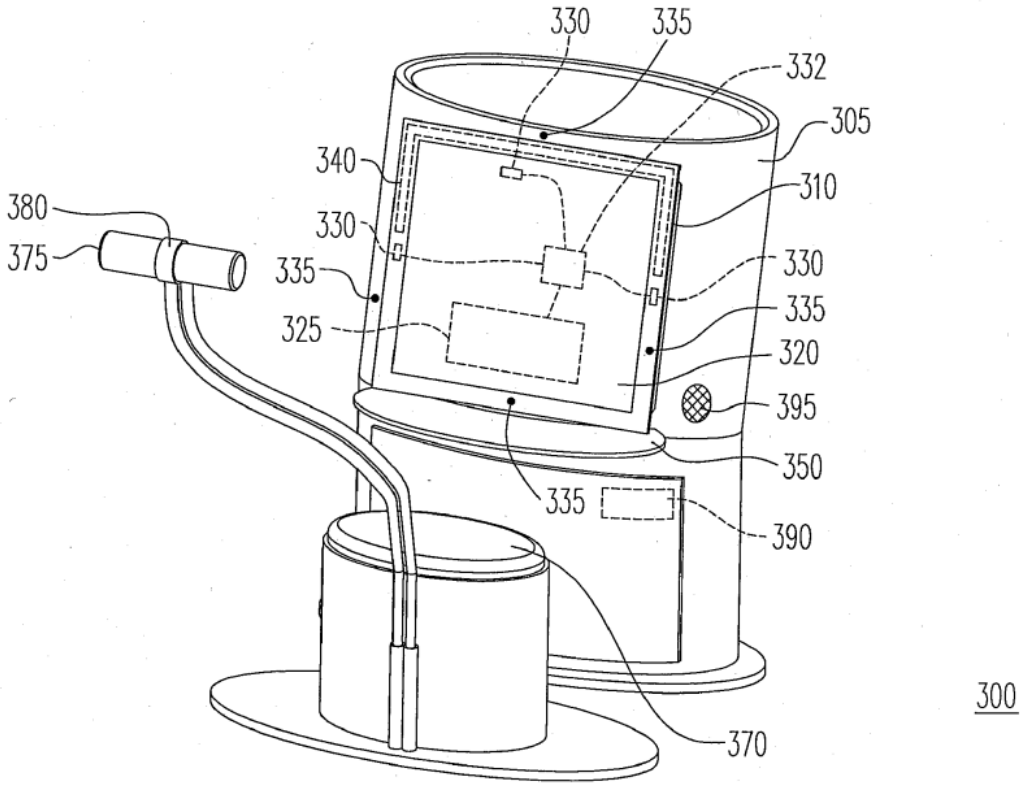
Lin was originally filed February 15, 2011 and was published on June 9, 2011, and thus is available as prior art to U.S. Patent No. 8,982,109 (the "'109 Patent") under at least 35 U.S.C. § 102(e).

Lin anticipates the Asserted Claims of the '109 Patent. To the extent it is found Lin does not expressly disclose certain limitations in the Asserted Claims, such limitations are at least implicitly or inherently disclosed. Moreover, to the extent it is found that Lin does not anticipate the Asserted Claims, Lin renders obvious the Asserted Claims, either alone or in combination with other prior art identified in the cover pleading or herein, and/or in combination with the general knowledge of a person having ordinary skill in the art.

In these contentions, Defendants have relied in part on Plaintiff's Infringement Contentions. In those contentions, Plaintiff appears to pursue overly broad claim constructions in an effort to assert infringement where none exists, and to accuse products that do not infringe the claims. Defendants' assertion that a particular limitation is disclosed by a prior art reference and/or is disclosed in a particular manner may be based in part on Plaintiff's apparent claim interpretations. In relying on Plaintiff's apparent claim interpretations, Defendants do not admit that Plaintiff's apparent claim interpretations are supportable or proper or that the claim limitations in question are definite or otherwise amenable to construction.

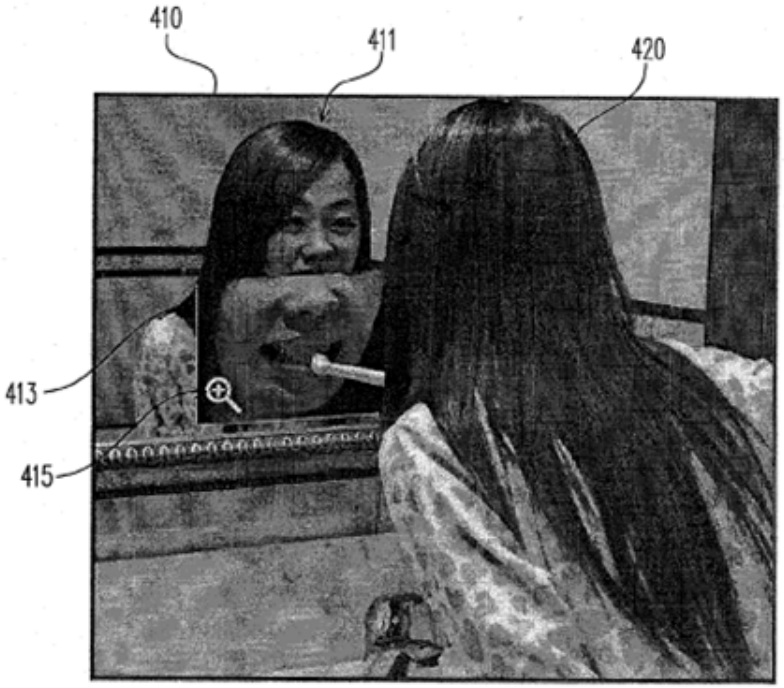
Defendants have endeavored to provide as much detail as possible in these contentions and, in doing so, have exceeded the level of detail required. The inclusion of specific details in some areas is not a concession that such details are required or that the omission of similar details in other areas is a defect. These citations to portions of any reference in this chart are exemplary only. Defendants will rely on the entirety of the references cited in this chart to show that the Asserted Claims are invalid.

Asserted Claim of the '109 Patent	Exemplary Citations to Lin
Claim 1	
1[pre]. A method for operating a system having a monitor, a camera, and a processor, so as to display a mirror-mimicking image on the monitor, by performing non-ordered steps comprising:	To the extent the preamble is limiting, Lin expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. "An interactive display system and an interactive display method are introduced herein. The interactive display system includes a mirror and a display unit. The display unit is built in the mirror, for providing auxiliary showing an image of a user in front of the display system. The image of the user can be automatically enlarged or shrunk and displayed on the display unit when the user moves forward to or away from the interactive display system. In the method, a distance is sensed between the user and the display system. When the user moves relative to the display system, the captured image of the user displayed on the display system is enlarged or shrunk using a zoom ratio based on a rate of change of the distance between the user and the display system." Lin at Abstract. "The present invention provides an interactive display system. A display unit is embedded in a mirror for providing auxiliary showing of an enlarged or a shrunk image of an object in front of the interactive display system. The display unit can be a liquid crystal display (LCD), a light emitting diode (LED) display, a vacuum fluorescent display (VFD), a plasma display (PDP), an organic light emitting display (OLED) or a field emission display (FED) and the like. In one embodiment, the interactive display system further includes a control device such as a touch panel for the user to give commands or select modes of the display." Lin at ¶ [0021]. "Please refer to FIGS.3A-3C, which show respective views of a preferred embodiment of an interactive display system of the present invention. As shown in FIG. 3A, the interactive display system300 is disposed in a main body 305. The main body includes a desktop 350 and a chair 370 with a back support 375, which is disposed in front of the main body 305. The interactive display system 300 includes an mirror 320 disposed in a frame 310, a plurality of cameras 330 disposed on the frame 310 or on the mirror 320, and a light source 340. A display unit 325 is built within the mirror 320. The interactive display system 300

Asserted Claim of the ’109 Patent	Exemplary Citations to Lin
	further includes a behind camera 380 for capturing rear-view image of the user. The interactive display system 300 further includes a plurality of distance sensors 335 surrounding the mirror 320 for sensing several distance variations in different angles between the user and the interactive display system 300.” Lin at ¶ [0028].  FIG. 3A

Asserted Claim of the '109 Patent	Exemplary Citations to Lin
	Lin at Fig. 3A. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Lin alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[a]. obtaining a digital image from a camera;	Lin expressly and/or inherently discloses and/or renders obvious obtaining a digital image from a camera. *See, e.g.*, disclosures below. "The interactive display system of the present invention includes one or a plurality of image capture devices such as cameras for capturing images of the user in front of the interactive display system. Ordinarily, the captured image is displayed by the display unit directly, that means the display unit behaves as a part of the minor and user may not notice the presence of the display unit. Otherwise, through an image data processing operation conducted in an image processing unit, the captured images can be enlarged or shrunk and displayed on the display unit. The operation of enlarging or shrinking images can be done in response to the movement of the user in front of the interactive display system. In an alternative embodiment, the operation of enlarging or shrinking images can be done in response to user's commands. Besides, the portion of the user's body to be enlarged and shown on the display unit, such as his right face or his nose, and the enlarging/shrinking ratio of images shown on the display unit also can be determined according to the commands given by the user." Lin at ¶ [0023]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Lin alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity

Asserted Claim of the '109 Patent	Exemplary Citations to Lin
	Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[b]. flipping the image about a vertical axis so as to reverse right and left sides of the image;	Lin expressly and/or inherently discloses and/or renders obvious flipping the image about a vertical axis so as to reverse right and left sides of the image. *See, e.g.*, disclosures below. Lin discloses a reflected image of a user which implies that the image is flipped about a vertical axis. "When a user stands or sits in front of the interactive display system, the image of the user can be automatically enlarged or shrunk and displayed on a display unit embedded in the mirror when the user moves forward to or away from the interactive display system. For example, when the user moves forward close to the mirror for putting on make-up or wearing contact lenses, the image shown on the display unit will be automatically enlarged for user's convenience. The reflected image of the user and the enlarged partial image of the user can be displayed at the same time and facial features can be clearly seen through the enlarged image displayed on the display unit. When the user moves away from the interactive display system for a full view of the whole body, the image shown on the display unit will be automatically shrunk. The reflected image of the user and the shrunk image of the user can be displayed at the same time and a full view of the whole body can be clearly seen on the display unit." Lin at ¶ [0022]. "The interactive display system of the present invention includes one or a plurality of image capture devices such as cameras for capturing images of the user in front of the interactive display system. Ordinarily, the captured image is displayed by the display unit directly, that means the display unit behaves as a part of the minor and user may not notice the presence of the display unit. Otherwise, through an image data processing operation conducted in an image processing unit, the captured images can be enlarged or shrunk and displayed on the display unit. The operation of enlarging or shrinking images can be done in response to the movement of the user in front of the interactive display system. In an alternative embodiment, the operation of enlarging or shrinking images can be done in response to

Asserted Claim of the ’109 Patent	Exemplary Citations to Lin
	user's commands. Besides, the portion of the user's body to be enlarged and shown on the display unit, such as his right face or his nose, and the enlarging/shrinking ratio of images shown on the display unit also can be determined according to the commands given by the user.” Lin at ¶ [0023].  FIG. 4 Lin at Fig. 4.

Asserted Claim of the '109 Patent	Exemplary Citations to Lin
	This limitation would have been obvious to a person of ordinary skill in the art based on (1) Lin alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[c]. applying a transformation mapping to the image to modify the image such that it appears to mimic a reflection of a mirror;	Lin expressly and/or inherently discloses and/or renders obvious applying a transformation mapping to the image to modify the image such that it appears to mimic a reflection of a mirror. *See, e.g.*, disclosures below. Lin discloses enlarging and shrinking the image based on a user's movement. "An interactive display system and an interactive display method are introduced herein. The interactive display system includes a mirror and a display unit. The display unit is built in the mirror, for providing auxiliary showing an image of a user in front of the display system. The image of the user can be automatically enlarged or shrunk and displayed on the display unit when the user moves forward to or away from the interactive display system. In the method, a distance is sensed between the user and the display system. When the user moves relative to the display system, the captured image of the user displayed on the display system is enlarged or shrunk using a zoom ratio based on a rate of change of the distance between the user and the display system." Lin at Abstract. "When a user stands or sits in front of the interactive display system, the image of the user can be automatically enlarged or shrunk and displayed on a display unit embedded in the mirror when the user moves forward to or away from the interactive display system. For example, when the user moves forward close to the mirror for putting on make-up or wearing contact lenses, the image shown on the display unit will be automatically enlarged for user's convenience. The reflected image of the user and the enlarged partial image of the user can be displayed at the same time and facial features can be clearly seen through the enlarged image displayed on the display unit. When the user moves away from the interactive display system for a full view of the whole body, the image shown on the display unit will be automatically shrunk. The reflected image of the user and the shrunk image of

Asserted Claim of the '109 Patent	Exemplary Citations to Lin
	the user can be displayed at the same time and a full view of the whole body can be clearly seen on the display unit." Lin at ¶ [0022]. "In the interactive display system, when the user moves forward close to the display system, the distance sensors 335 detect the user being moving forward, the captured image of the user is enlarged and displayed on the display unit 325. If the user moves closer, the captured image of the user is enlarged again with a larger enlarging ratio and displayed on the display unit. On the contrary, if the user is moving away from the display system 300, the captured image of the user is shrunk and displayed on the display unit 325. If the user moves further away, the captured image of the user is shrunk again with a larger shrinking ratio and displayed on the display unit." Lin at ¶ [0030]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Lin alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[d]. resizing the image to reduce variations caused by changes in object's distance to the camera;	Lin expressly and/or inherently discloses and/or renders obvious resizing the image to reduce variations caused by changes in object's distance to the camera. *See, e.g.*, disclosures below. "An interactive display system and an interactive display method are introduced herein. The interactive display system includes a mirror and a display unit. The display unit is built in the mirror, for providing auxiliary showing an image of a user in front of the display system. The image of the user can be automatically enlarged or shrunk and displayed on the display unit when the user moves forward to or away from the interactive display system. In the method, a distance is sensed between the user and the display system. When the user moves relative to the display system, the captured image of the user displayed on the display system is enlarged or shrunk using a zoom ratio based on a rate of change of the distance between the user and the display system." Lin at Abstract.

Asserted Claim of the '109 Patent	Exemplary Citations to Lin
	"In the interactive display system, when the user moves forward close to the display system, the distance sensors 335 detect the user being moving forward, the captured image of the user is enlarged and displayed on the display unit 325. If the user moves closer, the captured image of the user is enlarged again with a larger enlarging ratio and displayed on the display unit. On the contrary, if the user is moving away from the display system 300, the captured image of the user is shrunk and displayed on the display unit 325. If the user moves further away, the captured image of the user is shrunk again with a larger shrinking ratio and displayed on the display unit." Lin at ¶ [0030]. "In the case that the user is brushing her teeth, she desires to get an enlarged portion of her face. While the interactive display system is operating in an automatic manner, if the user is moving forward to the mirror 410, the enlarging ratio is increased and, on the contrary, if the user is moving away from the mirror 410, the enlarging ratio is decreased. If the interactive display system is operating in a user mode selection manner, because the user is desiring to get an enlarged portion of her face, the user can select the enlarging ratio as desired by, for example, through a touch screen." Lin at ¶ [0034]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Lin alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[e]. displaying the image on the monitor after performing the flipping, transformation mapping, and resizing;	Lin expressly and/or inherently discloses and/or renders obvious displaying the image on the monitor after performing the flipping, transformation mapping, and resizing. *See, e.g.*, disclosures below. "An interactive display system and an interactive display method are introduced herein. The interactive display system includes a mirror and a display unit. The display unit is built in the mirror, for providing auxiliary showing an image of a user in front of the display system. The image of the user can be automatically enlarged or shrunk and displayed on the display

Asserted Claim of the ’109 Patent	Exemplary Citations to Lin
	unit when the user moves forward to or away from the interactive display system. In the method, a distance is sensed between the user and the display system. When the user moves relative to the display system, the captured image of the user displayed on the display system is enlarged or shrunk using a zoom ratio based on a rate of change of the distance between the user and the display system.” Lin at Abstract. “When a user stands or sits in front of the interactive display system, the image of the user can be automatically enlarged or shrunk and displayed on a display unit embedded in the mirror when the user moves forward to or away from the interactive display system. For example, when the user moves forward close to the mirror for putting on make-up or wearing contact lenses, the image shown on the display unit will be automatically enlarged for user's convenience. The reflected image of the user and the enlarged partial image of the user can be displayed at the same time and facial features can be clearly seen through the enlarged image displayed on the display unit. When the user moves away from the interactive display system for a full view of the whole body, the image shown on the display unit will be automatically shrunk. The reflected image of the user and the shrunk image of the user can be displayed at the same time and a full view of the whole body can be clearly seen on the display unit.” Lin at ¶ [0022]. “These cameras 330 in a front side of the interactive display system 300 capture images of the user in front of the mirror 320. The captured images will be displayed on the display unit 325, and by an image data processing operation in an image processing unit 332 connected to the cameras 330 and the display unit 325, the captured images can be easily enlarged or shrunk in response to the movement of the user or based on the user's commands.” Lin at ¶ [0029]. “In the interactive display system, when the user moves forward close to the display system, the distance sensors 335 detect the user being moving forward, the captured image of the user is enlarged and displayed on the display unit 325. If the user moves closer, the captured image of the user is enlarged again with a larger enlarging ratio and displayed on the display unit. On the contrary, if the user is moving away from the display system 300, the captured

Asserted Claim of the '109 Patent	Exemplary Citations to Lin
	image of the user is shrunk and displayed on the display unit 325. If the user moves further away, the captured image of the user is shrunk again with a larger shrinking ratio and displayed on the display unit." Lin at ¶ [0030]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Lin alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[f]. wherein the non-ordered steps are performed on a series of images of a live video feed from the camera;	Lin expressly and/or inherently discloses and/or renders obvious wherein the non-ordered steps are performed on a series of images of a live video feed from the camera. *See, e.g.*, disclosures below. "When a user stands or sits in front of the interactive display system, the image of the user can be automatically enlarged or shrunk and displayed on a display unit embedded in the mirror when the user moves forward to or away from the interactive display system. For example, when the user moves forward close to the mirror for putting on make-up or wearing contact lenses, the image shown on the display unit will be automatically enlarged for user's convenience. The reflected image of the user and the enlarged partial image of the user can be displayed at the same time and facial features can be clearly seen through the enlarged image displayed on the display unit. When the user moves away from the interactive display system for a full view of the whole body, the image shown on the display unit will be automatically shrunk. The reflected image of the user and the shrunk image of the user can be displayed at the same time and a full view of the whole body can be clearly seen on the display unit." Lin at ¶ [0022]. "In the interactive display system, when the user moves forward close to the display system, the distance sensors 335 detect the user being moving forward, the captured image of the user is enlarged and displayed on the display unit 325. If the user moves closer, the captured image of the user is enlarged again with a larger enlarging ratio and displayed on the display unit. On the contrary, if the user is moving away from the display system 300, the captured

Asserted Claim of the '109 Patent	Exemplary Citations to Lin
	image of the user is shrunk and displayed on the display unit 325. If the user moves further away, the captured image of the user is shrunk again with a larger shrinking ratio and displayed on the display unit." Lin at ¶ [0030]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Lin alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[g]. determining distance to a user appearing in the live video feed; and	Lin expressly and/or inherently discloses and/or renders obvious determining distance to a user appearing in the live video feed. *See, e.g.*, disclosures below. "An interactive display system and an interactive display method are introduced herein. The interactive display system includes a mirror and a display unit. The display unit is built in the mirror, for providing auxiliary showing an image of a user in front of the display system. The image of the user can be automatically enlarged or shrunk and displayed on the display unit when the user moves forward to or away from the interactive display system. In the method, a distance is sensed between the user and the display system. When the user moves relative to the display system, the captured image of the user displayed on the display system is enlarged or shrunk using a zoom ratio based on a rate of change of the distance between the user and the display system." Lin at Abstract. "When a user stands or sits in front of the interactive display system, the image of the user can be automatically enlarged or shrunk and displayed on a display unit embedded in the mirror when the user moves forward to or away from the interactive display system. For example, when the user moves forward close to the mirror for putting on make-up or wearing contact lenses, the image shown on the display unit will be automatically enlarged for user's convenience. The reflected image of the user and the enlarged partial image of the user can be displayed at the same time and facial features can be clearly seen through the

Asserted Claim of the '109 Patent	Exemplary Citations to Lin
	enlarged image displayed on the display unit. When the user moves away from the interactive display system for a full view of the whole body, the image shown on the display unit will be automatically shrunk. The reflected image of the user and the shrunk image of the user can be displayed at the same time and a full view of the whole body can be clearly seen on the display unit." Lin at ¶ [0022]. "In the interactive display system, when the user moves forward close to the display system, the distance sensors 335 detect the user being moving forward, the captured image of the user is enlarged and displayed on the display unit 325. If the user moves closer, the captured image of the user is enlarged again with a larger enlarging ratio and displayed on the display unit. On the contrary, if the user is moving away from the display system 300, the captured image of the user is shrunk and displayed on the display unit 325. If the user moves further away, the captured image of the user is shrunk again with a larger shrinking ratio and displayed on the display unit." Lin at ¶ [0030]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Lin alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[h]. varying rate at which the non-ordered steps are performed on the series of images according to the distance.	Lin expressly and/or inherently discloses and/or renders obvious varying rate at which the non-ordered steps are performed on the series of images according to the distance. *See, e.g.*, disclosures below. "When a user stands or sits in front of the interactive display system, the image of the user can be automatically enlarged or shrunk and displayed on a display unit embedded in the mirror when the user moves forward to or away from the interactive display system. For example, when the user moves forward close to the mirror for putting on make-up or wearing contact lenses, the image shown on the display unit will be automatically enlarged

Asserted Claim of the ’109 Patent	Exemplary Citations to Lin
	for user's convenience. The reflected image of the user and the enlarged partial image of the user can be displayed at the same time and facial features can be clearly seen through the enlarged image displayed on the display unit. When the user moves away from the interactive display system for a full view of the whole body, the image shown on the display unit will be automatically shrunk. The reflected image of the user and the shrunk image of the user can be displayed at the same time and a full view of the whole body can be clearly seen on the display unit.” Lin at ¶ [0022]. “In the interactive display system, when the user moves forward close to the display system, the distance sensors 335 detect the user being moving forward, the captured image of the user is enlarged and displayed on the display unit 325. If the user moves closer, the captured image of the user is enlarged again with a larger enlarging ratio and displayed on the display unit. On the contrary, if the user is moving away from the display system 300, the captured image of the user is shrunk and displayed on the display unit 325. If the user moves further away, the captured image of the user is shrunk again with a larger shrinking ratio and displayed on the display unit.” Lin at ¶ [0030]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Lin alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the ’109 Patent	Exemplary Citations to Lin
Claim 2	

Asserted Claim of the '109 Patent	Exemplary Citations to Lin
2. The method of claim 1, wherein the transformation mapping renders an image appearing to have been taken from a camera positioned at eye-level height and pointing horizontally.	Lin expressly and/or inherently discloses and/or renders obvious wherein the transformation mapping renders an image appearing to have been taken from a camera positioned at eye-level height and pointing horizontally. *See*, *e.g.*, disclosures below. Lin discloses enlarging and shrinking the image based on a user's movement. "An interactive display system and an interactive display method are introduced herein. The interactive display system includes a mirror and a display unit. The display unit is built in the mirror, for providing auxiliary showing an image of a user in front of the display system. The image of the user can be automatically enlarged or shrunk and displayed on the display unit when the user moves forward to or away from the interactive display system. In the method, a distance is sensed between the user and the display system. When the user moves relative to the display system, the captured image of the user displayed on the display system is enlarged or shrunk using a zoom ratio based on a rate of change of the distance between the user and the display system." Lin at Abstract. "When a user stands or sits in front of the interactive display system, the image of the user can be automatically enlarged or shrunk and displayed on a display unit embedded in the mirror when the user moves forward to or away from the interactive display system. For example, when the user moves forward close to the mirror for putting on make-up or wearing contact lenses, the image shown on the display unit will be automatically enlarged for user's convenience. The reflected image of the user and the enlarged partial image of the user can be displayed at the same time and facial features can be clearly seen through the enlarged image displayed on the display unit. When the user moves away from the interactive display system for a full view of the whole body, the image shown on the display unit will be automatically shrunk. The reflected image of the user and the shrunk image of the user can be displayed at the same time and a full view of the whole body can be clearly seen on the display unit." Lin at ¶ [0022]. "In the interactive display system, when the user moves forward close to the display system, the distance sensors 335 detect the user being moving forward, the captured

Asserted Claim of the '109 Patent	Exemplary Citations to Lin
	image of the user is enlarged and displayed on the display unit 325. If the user moves closer, the captured image of the user is enlarged again with a larger enlarging ratio and displayed on the display unit. On the contrary, if the user is moving away from the display system 300, the captured image of the user is shrunk and displayed on the display unit 325. If the user moves further away, the captured image of the user is shrunk again with a larger shrinking ratio and displayed on the display unit." Lin at ¶ [0030]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Lin alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '109 Patent	Exemplary Citations to Lin
Claim 7	
7[pre]. The method of claim 1, further comprising the steps:	To the extent the preamble is limiting, Lin expressly and/or inherently discloses and/or renders obvious this limitation. *See, e.g.*, disclosures below. *See* Claim Limitations 1[pre]-[1[h]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Lin alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the ’109 Patent	Exemplary Citations to Lin
7[a]. obtaining a reference image;	Lin expressly and/or inherently discloses and/or renders obvious obtaining a reference image. *See, e.g.*, disclosures below. “The interactive display system of the present invention includes one or a plurality of image capture devices such as cameras for capturing images of the user in front of the interactive display system. Ordinarily, the captured image is displayed by the display unit directly, that means the display unit behaves as a part of the minor and user may not notice the presence of the display unit. Otherwise, through an image data processing operation conducted in an image processing unit, the captured images can be enlarged or shrunk and displayed on the display unit. The operation of enlarging or shrinking images can be done in response to the movement of the user in front of the interactive display system. In an alternative embodiment, the operation of enlarging or shrinking images can be done in response to user's commands. Besides, the portion of the user's body to be enlarged and shown on the display unit, such as his right face or his nose, and the enlarging/shrinking ratio of images shown on the display unit also can be determined according to the commands given by the user.” Lin at ¶ [0023]. “These cameras 330 in a front side of the interactive display system 300 capture images of the user in front of the mirror 320. The captured images will be displayed on the display unit 325, and by an image data processing operation in an image processing unit 332 connected to the cameras 330 and the display unit 325, the captured images can be easily enlarged or shrunk in response to the movement of the user or based on the user's commands.” Lin at ¶ [0029]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Lin alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '109 Patent	Exemplary Citations to Lin
7[b]. performing registration of the digital image with the reference image;	Lin expressly and/or inherently discloses and/or renders obvious performing registration of the digital image with the reference image. *See, e.g.*, disclosures below. "These cameras 330 in a front side of the interactive display system 300 capture images of the user in front of the mirror 320. The captured images will be displayed on the display unit 325, and by an image data processing operation in an image processing unit 332 connected to the cameras 330 and the display unit 325, the captured images can be easily enlarged or shrunk in response to the movement of the user or based on the user's commands." Lin at ¶ [0029]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Lin alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
7[c]. using data obtained from the registration to generate the transformation mapping.	Lin expressly and/or inherently discloses and/or renders obvious using data obtained from the registration to generate the transformation mapping. *See, e.g.*, disclosures below. Lin discloses enlarging and shrinking the image based on a user's movement. "An interactive display system and an interactive display method are introduced herein. The interactive display system includes a mirror and a display unit. The display unit is built in the mirror, for providing auxiliary showing an image of a user in front of the display system. The image of the user can be automatically enlarged or shrunk and displayed on the display unit when the user moves forward to or away from the interactive display system. In the method, a distance is sensed between the user and the display system. When the user moves relative to the display system, the captured image of the user displayed on the display system is enlarged or shrunk using a zoom ratio

Asserted Claim of the ’109 Patent	Exemplary Citations to Lin
	based on a rate of change of the distance between the user and the display system.” Lin at Abstract. “When a user stands or sits in front of the interactive display system, the image of the user can be automatically enlarged or shrunk and displayed on a display unit embedded in the mirror when the user moves forward to or away from the interactive display system. For example, when the user moves forward close to the mirror for putting on make-up or wearing contact lenses, the image shown on the display unit will be automatically enlarged for user's convenience. The reflected image of the user and the enlarged partial image of the user can be displayed at the same time and facial features can be clearly seen through the enlarged image displayed on the display unit. When the user moves away from the interactive display system for a full view of the whole body, the image shown on the display unit will be automatically shrunk. The reflected image of the user and the shrunk image of the user can be displayed at the same time and a full view of the whole body can be clearly seen on the display unit.” Lin at ¶ [0022]. “In the interactive display system, when the user moves forward close to the display system, the distance sensors 335 detect the user being moving forward, the captured image of the user is enlarged and displayed on the display unit 325. If the user moves closer, the captured image of the user is enlarged again with a larger enlarging ratio and displayed on the display unit. On the contrary, if the user is moving away from the display system 300, the captured image of the user is shrunk and displayed on the display unit 325. If the user moves further away, the captured image of the user is shrunk again with a larger shrinking ratio and displayed on the display unit.” Lin at ¶ [0030]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Lin alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of

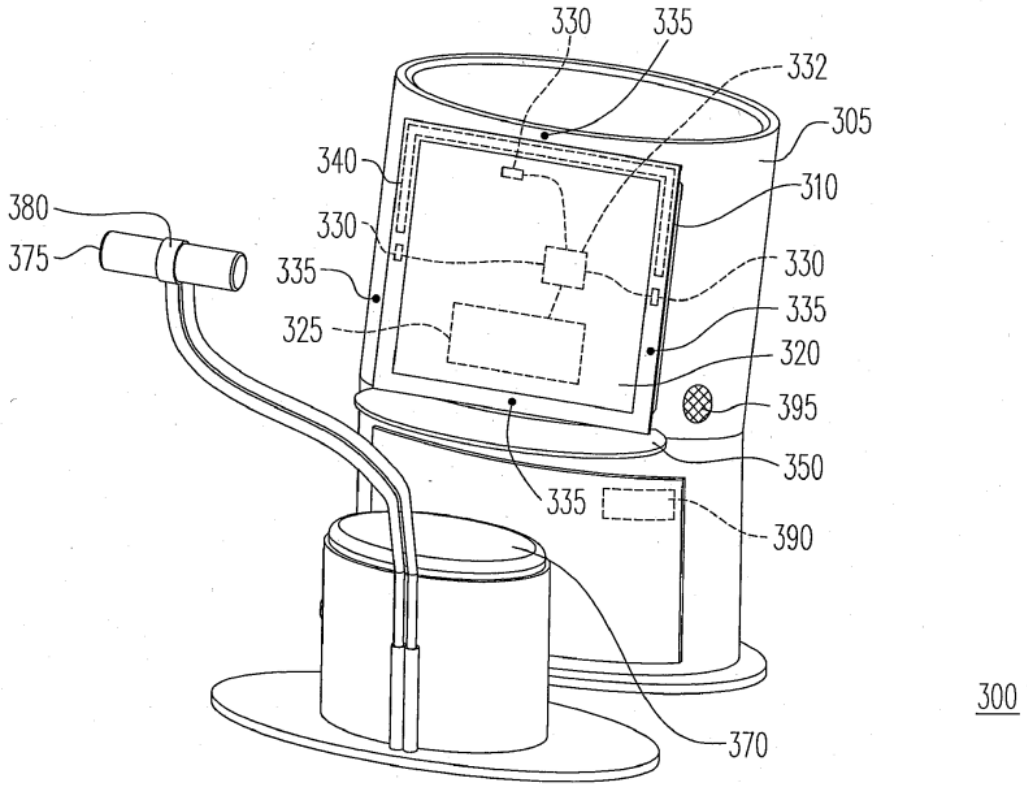
Asserted Claim of the ’109 Patent	Exemplary Citations to Lin
	Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the ’109 Patent	Exemplary Citations to Lin
Claim 8	
8. The method of claim 1, further comprising applying a translation transformation to move the image within display area of the monitor.	Lin expressly and/or inherently discloses and/or renders obvious applying a translation transformation to move the image within display area of the monitor. *See, e.g.*, disclosures below. “An interactive display system and an interactive display method are introduced herein. The interactive display system includes a mirror and a display unit. The display unit is built in the mirror, for providing auxiliary showing an image of a user in front of the display system. The image of the user can be automatically enlarged or shrunk and displayed on the display unit when the user moves forward to or away from the interactive display system. In the method, a distance is sensed between the user and the display system. When the user moves relative to the display system, the captured image of the user displayed on the display system is enlarged or shrunk using a zoom ratio based on a rate of change of the distance between the user and the display system.” Lin at Abstract. “When a user stands or sits in front of the interactive display system, the image of the user can be automatically enlarged or shrunk and displayed on a display unit embedded in the mirror when the user moves forward to or away from the interactive display system. For example, when the user moves forward close to the mirror for putting on make-up or wearing contact lenses, the image shown on the display unit will be automatically enlarged for user's convenience. The reflected image of the user and the enlarged partial image of the user can be displayed at the same time and facial features can be clearly seen through the enlarged image displayed on the display unit. When the

Asserted Claim of the '109 Patent	Exemplary Citations to Lin
	user moves away from the interactive display system for a full view of the whole body, the image shown on the display unit will be automatically shrunk. The reflected image of the user and the shrunk image of the user can be displayed at the same time and a full view of the whole body can be clearly seen on the display unit." Lin at ¶ [0022]. "In the interactive display system, when the user moves forward close to the display system, the distance sensors 335 detect the user being moving forward, the captured image of the user is enlarged and displayed on the display unit 325. If the user moves closer, the captured image of the user is enlarged again with a larger enlarging ratio and displayed on the display unit. On the contrary, if the user is moving away from the display system 300, the captured image of the user is shrunk and displayed on the display unit 325. If the user moves further away, the captured image of the user is shrunk again with a larger shrinking ratio and displayed on the display unit." Lin at ¶ [0030]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Lin alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '109 Patent	Exemplary Citations to Lin
Claim 9	
9. The method of claim 1, further comprising changing illumination intensity of individual or groups of	Lin expressly and/or inherently discloses and/or renders obvious changing illumination intensity of individual or groups of pixels of the monitor, so as to enhance shading or illumination in the image. *See, e.g.*, disclosures below.

Asserted Claim of the '109 Patent	Exemplary Citations to Lin
pixels of the monitor, so as to enhance shading or illumination in the image.	"The present invention provides an interactive display system. A display unit is embedded in a mirror for providing auxiliary showing of an enlarged or a shrunk image of an object in front of the interactive display system. The display unit can be a liquid crystal display (LCD), a light emitting diode (LED) display, a vacuum fluorescent display (VFD), a plasma display (PDP), an organic light emitting display (OLED) or a field emission display (FED) and the like. In one embodiment, the interactive display system further includes a control device such as a touch panel for the user to give commands or select modes of the display." Lin at ¶ [0021]. "Please refer to FIGS.3A-3C, which show respective views of a preferred embodiment of an interactive display system of the present invention. As shown in FIG. 3A, the interactive display system300 is disposed in a main body 305. The main body includes a desktop 350 and a chair 370 with a back support 375, which is disposed in front of the main body 305. The interactive display system 300 includes an mirror 320 disposed in a frame 310, a plurality of cameras 330 disposed on the frame 310 or on the mirror 320, and a light source 340. A display unit 325 is built within the mirror 320. The interactive display system 300 further includes a behind camera 380 for capturing rear-view image of the user. The interactive display system 300 further includes a plurality of distance sensors 335 surrounding the mirror 320 for sensing several distance variations in different angles between the user and the interactive display system 300." Lin at ¶ [0028].

Asserted Claim of the ’109 Patent	Exemplary Citations to Lin
	 FIG. 3A Lin at Fig. 3A.

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	This limitation would have been obvious to a person of ordinary skill in the art based on (1) Lin alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '109 Patent	Exemplary Citations to Lin
Claim 11	
11[pre]. The method of claim 1, further comprising:	To the extent the preamble is limiting, Lin expressly and/or inherently discloses and/or renders obvious this limitation. *See, e.g.*, disclosures below. *See* Claim Limitations 1[pre]-[1[h]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Lin alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
11[a]. determining distance to a user appearing in the image; and,	Lin expressly and/or inherently discloses and/or renders obvious determining distance to a user appearing in the image. *See, e.g.*, disclosures below. *See* Claim Limitation 1[g]. *See also*: "An interactive display system and an interactive display method are introduced herein. The interactive display system includes a mirror and a display unit. The display unit is built in the mirror, for providing auxiliary showing an image of a user in front of the display system. The image of the user can be automatically enlarged or shrunk and displayed on the display unit when the user moves forward to or away from the

Asserted Claim of the ’109 Patent	Exemplary Citations to Lin
	interactive display system. In the method, a distance is sensed between the user and the display system. When the user moves relative to the display system, the captured image of the user displayed on the display system is enlarged or shrunk using a zoom ratio based on a rate of change of the distance between the user and the display system.” Lin at Abstract. “When a user stands or sits in front of the interactive display system, the image of the user can be automatically enlarged or shrunk and displayed on a display unit embedded in the mirror when the user moves forward to or away from the interactive display system. For example, when the user moves forward close to the mirror for putting on make-up or wearing contact lenses, the image shown on the display unit will be automatically enlarged for user's convenience. The reflected image of the user and the enlarged partial image of the user can be displayed at the same time and facial features can be clearly seen through the enlarged image displayed on the display unit. When the user moves away from the interactive display system for a full view of the whole body, the image shown on the display unit will be automatically shrunk. The reflected image of the user and the shrunk image of the user can be displayed at the same time and a full view of the whole body can be clearly seen on the display unit.” Lin at ¶ [0022]. “In the interactive display system, when the user moves forward close to the display system, the distance sensors 335 detect the user being moving forward, the captured image of the user is enlarged and displayed on the display unit 325. If the user moves closer, the captured image of the user is enlarged again with a larger enlarging ratio and displayed on the display unit. On the contrary, if the user is moving away from the display system 300, the captured image of the user is shrunk and displayed on the display unit 325. If the user moves further away, the captured image of the user is shrunk again with a larger shrinking ratio and displayed on the display unit.” Lin at ¶ [0030].

Asserted Claim of the '109 Patent	Exemplary Citations to Lin
	This limitation would have been obvious to a person of ordinary skill in the art based on (1) Lin alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
11[b]. varying resolution of the image according to the distance.	Lin expressly and/or inherently discloses and/or renders obvious varying resolution of the image according to the distance. *See, e.g.*, disclosures below. "An interactive display system and an interactive display method are introduced herein. The interactive display system includes a mirror and a display unit. The display unit is built in the mirror, for providing auxiliary showing an image of a user in front of the display system. The image of the user can be automatically enlarged or shrunk and displayed on the display unit when the user moves forward to or away from the interactive display system. In the method, a distance is sensed between the user and the display system. When the user moves relative to the display system, the captured image of the user displayed on the display system is enlarged or shrunk using a zoom ratio based on a rate of change of the distance between the user and the display system." Lin at Abstract. "When a user stands or sits in front of the interactive display system, the image of the user can be automatically enlarged or shrunk and displayed on a display unit embedded in the mirror when the user moves forward to or away from the interactive display system. For example, when the user moves forward close to the mirror for putting on make-up or wearing contact lenses, the image shown on the display unit will be automatically enlarged for user's convenience. The reflected image of the user and the enlarged partial image of the user can be displayed at the same time and facial features can be clearly seen through the enlarged image displayed on the display unit. When the user moves away from the interactive display system for a full view of the whole body, the image shown on the display unit will be automatically shrunk. The reflected image

Asserted Claim of the ’109 Patent	Exemplary Citations to Lin
	of the user and the shrunk image of the user can be displayed at the same time and a full view of the whole body can be clearly seen on the display unit.” Lin at ¶ [0022]. “In the interactive display system, when the user moves forward close to the display system, the distance sensors 335 detect the user being moving forward, the captured image of the user is enlarged and displayed on the display unit 325. If the user moves closer, the captured image of the user is enlarged again with a larger enlarging ratio and displayed on the display unit. On the contrary, if the user is moving away from the display system 300, the captured image of the user is shrunk and displayed on the display unit 325. If the user moves further away, the captured image of the user is shrunk again with a larger shrinking ratio and displayed on the display unit.” Lin at ¶ [0030]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Lin alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Exhibit B-00: Invalidity of U.S. Patent No. 8,982,110 in view of Prior Art References ("'110 Patent References")

This chart is subject to all reservations, objections, and disclaimers in Defendants' Invalidity Contentions and any amendment, supplement, or modification thereof, which are incorporated herein by reference in their entirety.

This chart identifies disclosures from the following references which disclose, alone or in combination, each of the limitations of U.S. Patent No. 8,982,110 (the "'110 Patent"), at least under Plaintiff's apparent interpretation as showing in Plaintiff's infringement contentions.

- **U.S. Patent Pub. No. 2009/0015658 ("Enstad")** was originally filed July 11, 2008 and published on January 15, 2009, and thus is available as prior art to the '110 Patent under at least 35 U.S.C. §§ 102(a), (b) and (e).
- ***A Handheld Mirror Simulation*, Francois et al., ("Francois I")** became public on July 6-9, 2003, at the 2003 International Conference on Multimedia and Expo, and thus is available as prior art to the '110 Patent under at least 35 U.S.C. §§ 102(a) and (b).
- ***A Handheld Virtual Mirror*, Francois et al.; *A Handheld Mirror Simulation*, Francois et al.; *Mirror symmetry -> 2-view stereo geometry*, Francois et al.; *Software Architecture for Computer Vision: Beyond Pipes and Filters*, Francois; *Software Architecture for Immersipresence*, Francois; *An Architectural Framework for the Design, Analysis and Implementation of Interactive Systems*, Francois (collectively "Francois II")** comprise the technical publications listed below, each of which are available as prior art to the '110 Patent under at least 35 U.S.C. §§ 102(a) and (b):
  - *A Handheld Mirror Simulation*, Francois et al., ("Francois I") (2003);
  - Integrated Media Systems Center, Alexandre R.J. Francois et al., *A Handheld Virtual Mirror* (2002);
  - Image and Vision Computing 21, 137–143, Alexandre R.J. Francois et al., *Mirror symmetry -> 2-view stereo geometry* (2003);
  - Institute for Robotics and Intelligent Systems, Alexandre R.J. Francois, *Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003);
  - Integrated Media Systems Center, Alexandre R.J. Francois, *Software Architecture for Immersipresence* (2003);
  - The Computer Journal, Vol. 54 No. 7, Alexandre R.J. Francois, *An Architectural Framework for the Design, Analysis and Implementation of Interactive Systems* (2010).
- **U.S. Patent Pub. No. 2011/0298910 ("Haan")** was originally filed February 15, 2010 and was published December 8, 2011, and thus is available as prior art to the '110 Patent under at least 35 U.S.C. §§ 102(a), (b) and (e).
- **Japanese Patent Pub. No. JP 2010-177777 A ("Hatanaka")** was originally filed January 27, 2009 and published on August 12, 2010, and thus is available as prior art to the '110 Patent under at least 35 U.S.C. §§ 102(a) and (b).

- ***Smart Makeup Mirror: Computer-Augmented Mirror to Aid Makeup Application*, Iwabuchi et al. ("Iwabuchi")** was published on July 24, 2009 and thus is available as prior art to the '110 Patent under at least 35 U.S.C. §§ 102(a) and (b).
- **U.S. Patent Pub. No. 2008/0297589 ("Kurtz")** was originally filed May 31, 2007 and published on December 4, 2008, and thus is available as prior art to the '110 Patent under at least 35 U.S.C. §§ 102(a), (b), and (e).
- **WO Patent Pub. No. 2006/108279 ("Lizee")** was originally filed April 11, 2006 and published October 19, 2006, and thus is available as prior art to the '110 Patent under at least 35 U.S.C. §§ 102(a) and (b).
- **Japanese Patent Pub. No. JP 2006-236013 A ("Miyaoku")** was originally filed on February 25, 2005 and published on September 7, 2006, and thus is available as prior art to the '110 Patent under at least 35 U.S.C. §§ 102(a) and (b).
- **U.S. Patent No. 7,999,843 ("Ohba")** was originally filed January 28, 2005 and issued on August 16, 2011, and thus is available as prior art to the '110 Patent under at least 35 U.S.C. §§ 102(a), (b), and (e).
- **High-speed Gaze Controller for Millisecond-order Pan/tilt Camera, Okumura et al. ("Okumura I")** was originally published May 9-13, 2011, and thus is available as prior art to the '110 Patent under at least 35 U.S.C. §§ 102(a) and (b).
- **U.S. Patent Pub. No. 2011/0254691 ("Ooi")** was originally filed August 25, 2010 and published on October 20, 2011, and thus is available as prior art to the '110 Patent under at least 35 U.S.C. §§ 102(a), (b) and (e).
- **U.S. Patent Pub. No. 2007/004[0033] ("Rosenberg")** was originally filed September 26, 2006 and was published on February 22, 2007, and thus is available as prior art to the '110 Patent under at least 35 U.S.C. §§ 102(a), (b) and (e).
- ***Virtual Mirror by Fusing Multiple RGB-D* Cameras, Shen. et al. ("Shen")** was originally published at least as of December 3, 2012 in the IEEE *Proceedings of The 2012 Asia Pacific Signal and Information Processing Association Annual Summit and Conference*, and thus is available as prior art to the '110 Patent under at least 35 U.S.C. §§ 102(a) and (b).
- ***A Free-Viewpoint Virtual Mirror with Marker-Less User Interaction*, Straka et al. ("Straka I")** was originally published in May 2011, and thus is available as prior art to the '110 Patent under at least 35 U.S.C. §§ 102(a) and (b).
- **U.S. Patent Pub. No. 2014/0313230 ("Suggs")** was originally filed December 20, 2011 and published on October 23, 2014, and thus is available as prior art to the '110 Patent under at least 35 U.S.C. § 102(e).
- **U.S. Patent No. 9,355,585 ("Tripathi")** was originally filed April 3, 2012 and issued on May 31, 2016, and thus is available as prior art to the '110 Patent under at least 35 U.S.C. §§ 102 (e).
- **The Saccade Mirror System ("Okumura II")** expressly and/or inherently discloses and/or renders obvious the asserted claims of the '110 Patent. On information and belief, Okumura II is described at least in the following documents:
    - 2011 IEEE International Conference on Robotics and Automation, Kohei Okumura et al., *High-speed Gaze Controller for Millisecond-order Pan/tilt Camera System* (2011).
    - 1ms Auto Pan-Tilt for Perfect Recentering, uploaded by Ishikawa Group Laboratory, 6 July 2012, https://www.youtube.com/watch?v=9Q_lcFZOgVo.
- **The Virtual Mirror System ("Straka II.")** expressly and/or inherently discloses and/or renders obvious the asserted claims of the '110 Patent. On information and belief, Straka II is described at least in the following documents:

  - Proceedings of the 17th Scandinavian Conference on Image Analysis, Matthias Straka et al., *A Free-Viewpoint Virtual Mirror with Marker-Less User Interaction* (2011).
  - *A Free-Viewpoint Virtual Mirror with Marker-Less User Interaction*, uploaded by rvlab, 28 February 2011, https://www.youtube.com/watch?v=b1Ryo3bcTDk.
- **U.S. Patent Pub. No. 2011/0246329 ("Geisner")** was originally filed April 1, 2010 and issued on October 6, 2011, and thus is available as prior art to '110 Patent under at least 35 U.S.C. §§ 102(a), (b) and (e).
- **JP Patent Pub. No. 2[0031]53263 ("Ikui")** was originally filed November 19, 2001 and published on May 23, 2003, and thus is available as prior art to the '110 Patent under at least 35 U.S.C. §§ 102(a) and (b).
- **U.S. Patent No. 9,122,320 ("Rowles")** was originally filed February 16, 2011 and issued on September 1, 2015, and thus is available as prior art to the '110 Patent under at least 35 U.S.C. § 102(e).
- **U.S. Patent Pub. No. 2010/0226531 ("Goto")** was originally filed January 15, 2007 and published on September 9, 2010, and thus is available as prior art to the '110 Patent under at least 35 U.S.C. §§ 102(a), (b), and (e).
- **Shiseido Augmented Reality Cosmetic Mirror System Art ("Shiseido")** expressly and/or inherently discloses and/or renders obvious the Asserted Claims of the '110 Patent. On information and belief, Shiseido is described at least in the following documents:
  - Goto, published on September 9, 2010.
  - *Shiseido Makeup Mirror Lets You Try on Cosmetics With Augmented Reality*, Trend Hunter, 6 February 2010, https://www.trendhunter.com/trends/shiseido-makeup-mirror ("Trend Hunter").
  - *Try Out Dozens of Looks In Minutes And Wipe Them Off At The Push Of A Button With The Magic Make-Up Mirror*, Daily Mail, 28 March 2011, https://www.dailymail.co.uk/femail/article-1370892/Shiseidos-magic-make-mirror-try-dozens-looks.html ("Daily Mail").
  - *Shiseido: Augmented Reality Cosmetic Mirror*, uploaded by PSVParis, 6 December 2010, https://www.youtube.com/watch?v=n8Jp1LuQByg ("YouTube").
- **Human-Computer Interface System ("Francois III")** expressly and/or inherently discloses and/or renders obvious the Asserted Claims of the '110 Patent. On information and belief, Francois III is described at least in the following documents:
  - A Handheld Mirror Simulation, Francois et al. (2003);
  - Integrated Media Systems Center, Alexandre R.J. Francois et al., A Handheld Virtual Mirror (2002)
- **U.S. Patent Pub. No. 2010/0177159 ("Tojo")** s originally filed January 7, 2010 and was published on January 15, 2010, and thus is available as prior art to the '110 under at least 35 U.S.C. §§ 102(a), (b) and (e).
- **U.S. Patent Pub. No. 2007/004[0033] ("Wolf")** as originally filed May 26, 2010 and was published on March 21, 2013, and thus is available as prior art to '110 Patent under at least 35 U.S.C. §§ 102(a), (b) and (e).
- **U.S. Patent No. 6,677,980 ("Jeon")** was originally filed November 10, 2000 and was published on January 13, 2004, and thus is available as prior art to the '110 Patent under at least 35 U.S.C. §§ 102 (e).

The ’110 Patent References anticipate the Asserted Claims of the ’110 Patent. To the extent it is found the ’110 Patent References do not expressly disclose certain limitations in the Asserted Claims, such limitations are at least implicitly or inherently disclosed. Moreover, to the extent it is found that ’110 Patent References do not anticipate the Asserted Claims, the ’110 Patent References render obvious the Asserted Claims, either alone or in combination with other prior art identified in the cover pleading or herein, and/or in combination with the general knowledge of a person having ordinary skill in the art.

In these contentions, Defendants have relied in part on Plaintiff’s Infringement Contentions. In those contentions, Plaintiff appears to pursue overly broad claim constructions in an effort to assert infringement where none exists, and to accuse products that do not infringe the claims. Defendants’ assertion that a particular limitation is disclosed by a prior art reference and/or is disclosed in a particular manner may be based in part on Plaintiff’s apparent claim interpretations. In relying on Plaintiff’s apparent claim interpretations, Defendants do not admit that Plaintiff’s apparent claim interpretations are supportable or proper or that the claim limitations in question are definite or otherwise amenable to construction.

Defendants have endeavored to provide as much detail as possible in these contentions and, in doing so, have exceeded the level of detail required. The inclusion of specific details in some areas is not a concession that such details are required or that the omission of similar details in other areas is a defect. These citations to portions of any reference in this chart are exemplary only. Defendants will rely on the entirety of the references cited in this chart to show that the Asserted Claims are invalid.

Asserted Claim of the '110 Patent	Exemplary Citations to the '110 Patent References
Claim 1	
1[pre]. A computerized method for operating a display system, the display system having a camera, a monitor, and a processor, the method comprising:	Each reference below discloses or suggests this feature, alone or in combination with the other references shown for this limitation. **Enstad.** *See* paras. [0002]; [0008]-[0009]; [0026]; [0029]-[0032]; Figs. 1-2 **Francois I.** *See* Abstract, p. 745; 1.INTRODUCTION, p. 745; Fig. 1 **Francois II.** *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at the introductory paragraph; *id*. at Section 1.Problem formulation and geometric analysis; *id*. at Section 2.2.System integration; *id*. at Section 3.Perspectives; Figs. 1-2. *See also Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 1 (Abstract); *id*. 4.3 Handheld mirror simulation, pgs 13-15; *id*. at 4.5 Live video in animated 3-D graphics, pp. 16-17; Figs. 12-13; 14-16 **Hatanaka.** *See* paras. [0001], [0008]-[0013], [0015]-[0020], [0021]-[0024], [0027] **Iwabuchi**. *See* 2. Smart Makeup Mirror, p.496, Fig. 1 **Kurtz.** *See* paras. [0042], Fig. 1 **Lizee.** *See* paras. [0029], Fig. 1 **Miyaoku.** *See* Abstract, paras. [0002]-[0008], [0011], [0015], [0022]-[0025], [0028]-[0031], [0073]-[0080], [0081]-[0084], Fig. 1, 7, 8 **Ohba.** *See* 5:14-29, 5:52-53, 5:60-66, Fig. 1, 2 **Okumura I.** *See* pp. 6186, 6187, 6189, 6190, pp. 6190-6191, Fig. 1(b), 2, 9, 11, 13 **Ooi.**. *See* paras. [0001], [0005]-[0007], [0008], [0039]-[0044], [0047]-[0055], [0066]-[0067], Fig. 1, 2

Asserted Claim of the '110 Patent	Exemplary Citations to the '110 Patent References
	Rosenberg. *See* paras. [0006]-[0008], [0025]-[0029], [0109], Fig. 13 **Shen.** *See* p. 4 **Straka I.** *See* p. 3 **Suggs.** *See* paras. [0017]-[0018], [0022]-[0023], [0042] **Tripathi.** *See* 1:6-31, 1:35-2:12, 3:35-4:35, 4:36-51, 5:28-41, 6:6-28, 7:45-50, 10:17-24, 11:54-12:24, Fig. 1-3, 5, 19 **Magic Mirror.** *See* Forbes at 2-3, Forbes at 3, CNN Money at 1, Digital Commerce 360 at 2, CBC at 1-2 **Okumura II.** *See* p. 6186, 6187, 6189, 6190, 6190-6191, 6191, Fig. 1(a), 1(b), 2, 9, 11, 13 **Straka II.** *See* p. 3 **Geisner.** *See* paras. [0003]-[0004], [0024]-[0025], [0026]-[0031], [0034]-[0040], [0042]-[0048], [0054]-[0056], [0072]-[0073], [0102]-[0105], [0109]-[0111], [0114], [0121]-[0125], [0129]-[0132], Fig. 10 **Rowles.** *See* Abstract, 1:24-25, 3:37-46, 3:61-4:30, 4:15-5:29, 7:4-14, 7:65-8:43, 8:53-9:3, 9:43-10:12, 10:53-11:6, 11:44-57, 12:56-13:10, 14:61-15:8, Figs. 1C, 2A, 3A, 3C, 6A **Goto.** *See* paras. [0007], [0085], [0088], [0104], [0129] **Shiseido.** *See* Goto at paras. [0007], [0085], [0088], [0104], [0129]; Daily Mail at 3; Trend Hunter at 2; YouTube at 0:015

Asserted Claim of the '110 Patent	Exemplary Citations to the '110 Patent References
	Francois III. *See Handheld Mirror Simulation*, p. 745; *A Handheld Virtual Mirror* at Figs. 1-2 **Tojo.** *See* paras. [0013], [0037], Figs. 3A-B **Wolf.** *See* para. [0024] **Jeon.** *See* 1:25-49 Further, this limitation would have been obvious to a person of ordinary skill in the art based on (1) the above citations; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts.
1[a]. operating the camera to generate a stream of images of the user;	Each reference below discloses or suggests this feature, alone or in combination with the other references shown for this limitation. **Enstad.** *See* paras. [0002]; [0008]-[0009]; [0026]; [0029]-[0032]; Figs. 1-2. **Francois I.** *See* Abstract, p. 745; 1.INTRODUCTION, p. 745; Fig. 1. **Francois II.** *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at the introductory paragraph; *id*. at Section 1.Problem formulation and geometric analysis; *id*. at Section 2.2.System integration; *id*. at Section 3.Perspectives; Figs. 1-2. *See also Mirror symmetry -> 2-view stereo geometry* (2003) at 137 (Abstract); *id*. at pp. 138-139; *id*. at 4.3 Handheld mirror simulation, pgs 13-15; *id*. at 4.5 Live video in animated 3-D graphics, pp. 16-17; Figs. 12-13; 14-16. **Haan.** *See* Claim 1, paras. [0024]-[0027], [0058]. **Hatanaka.** *See* paras. [0001]-[0003], [0015]-[0020], [0021]-[0024], [0037]-[0038], [0041]-[0045], [0049]-[0051], [0055]-[0057], [0071]-[0075], [0086].

Asserted Claim of the '110 Patent	Exemplary Citations to the '110 Patent References
	Iwabuchi. *See* Abstract, p.495, 2. Smart Makeup Mirror, p.496, 2. Makeup Support Function", pp. 496-497. **Kurtz.** *See* Abstract, paras. [0042]-[0043], Fig. 1. **Lizee.** *See* paras. [0029]-[0030]. **Miyaoku.** *See* Abstract, paras. [0007]-[0008], [0014]-[0015], [0024], [0027], [0028]-[0031], [0033], [0074]-[0075], [0083], Fig. 1, 2, 6, 8. **Ohba.** *See* 5:14-29. **Okumura I.** *See* p. 6186, 6187, 6189, 6190, pp. 6190-6191, Fig. 1(b), 2, 9, 11, 13. **Ooi.**. *See* paras. [0008], [0039]-[0041], [0051]-[0055], Fig. 1, 2 **Rosenberg.** *See* paras. [0025]-[0029], [0038]-[0039] **Shen.** *See* p. 3, 4 **Straka I.** *See* Sect. 3, Straka I at p. 2-4 **Suggs.** *See* Abstract, paras. [0019], [0023]-[0024], [0043] **Tripathi.** *See* 6:10-20, 7:45-50, 10:17-24, 11:44-12:24, Fig. 1, 2, 5, 19 **Magic Mirror.** *See* Forbes at 2-3, CNN Money at 1, Digital Commerce 360 at 2 **Okumura II.** *See* p. 6186, 6187, 6189, 6190, 6190-6191, 6191, Fig. 1(a), 1(b), 2, 9, 11, 13 **Straka II.** *See* p. 2-4, Sect. 3

Asserted Claim of the '110 Patent	Exemplary Citations to the '110 Patent References
	Geisner. *See* paras. [0004], [0028]-[0031], [0034]-[0040], [0042]-[0047], [0053]-[0057], [0072], [0103], [0114]-[0116], [0124]-[0127], [0129]-[0132], [0139], Figs. 1-2, 7, 9-10 **Rowles.** *See* Abstract, 1:24-25, 3:54-60, 4:37-46, 4:60-5:18, 5:33-40, 5:61-6:6, 6:33-44, 6:50-63, 7:4-8:13, 8:66-9:3, 9:30-38, 9:51-10:3, 10:60-11:6, 11:44-14:5, 14:61-15:8, 15:43-58, Figs. 1A, 1C, 2A, 3A, 3C, 6A **Goto.** *See* paras. [0007], [0085], [0088], [0104], [0129] **Shiseido.** *See* Goto at paras. [0007], [0085], [0088], [0104], [0129]; Daily Mail at 3; Trend Hunter at 2; YouTube at 0:015 **Francois III.** *See Handheld Mirror Simulation*, p. 745; *A Handheld Virtual Mirror* at Figs. 1-2 **Tojo.** *See* paras. [0041], [0048] **Wolf.** *See* para. [0067] **Jeon.** *See* Abstract, 3:6-11 Further, this limitation would have been obvious to a person of ordinary skill in the art based on (1) the above citations; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts.
1[b]. operating the processor to detect the presence of the user in the stream of image;	Each reference below discloses or suggests this feature, alone or in combination with the other references shown for this limitation. **Enstad.** *See* paras. [0006]-[0007]; [0009]; [0027]; [0030]; [0035]-[0039]; Figs. 2; 5.

Asserted Claim of the '110 Patent	Exemplary Citations to the '110 Patent References
	Francois I. *See* 1.INTRODUCTION, p. 745; 3.SYSTEM INTEGRATION, p. 747; Figs. 1; 6. **Francois II.** *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at the introductory paragraph; *id*. at Section 1.Problem formulation and geometric analysis; *id*. at Section 2.2.System integration; *id*. at Section 3.Perspectives; Figs. 1-2. *See also Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 4.1 Real-time video segmentation and tracking, pp. 10-11; *id*. at 4.3 Handheld mirror simulation, pp. 13-15; Figs. 7-9; 12-13. *See also Software Architecture for Immersipresence* (2003) at 1 (Abstract); *id*. at pp. 8-10. *See also An Architectural Framework for the Design, Analysis and Implementation of Interactive Systems* (2010) at pp. 1194-96; Figs. 6; 8. **Haan.** *See* paras. [0056]-[0058], [0059]-[0063], [0065]-[0066], [0073]-[0074], FIGs 2-4, 7. **Hatanaka.** *See* paras. [0001], [0008]-[0013], [0028]-[0029], [0033]-[0035], [0037], [0051], [0057], [0066], [0081]. **Iwabuchi**. *See* 2. Smart Makeup Mirror, p.496, 3.1 Automatic Zoom and Pan, p.497, 5 Adjusting Position of Display, pp. 501-502, Fig. 1, 5. **Kurtz.** *See* paras. [0046], [0047], [0048], [0150], Fig. 3A, 3B. **Lizee.** *See* paras. [0040], [0041], [0047], [0053], [0063]. **Miyaoku.** *See* Abstract, paras. [0014]-[0016], [0021]-[0025], [0028]-[0031]. **Ohba.** *See* 1:59-2:8. 8:22-34. **Okumura I.** *See* p. 6190, Fig. 11.

Asserted Claim of the '110 Patent	Exemplary Citations to the '110 Patent References
	Ooi. *See* paras. [0006]-[0007], [0008], [0039]-[0044], [0047]-[0048], [0052]-[0060], [0067]-[0069], [0071]-[0076], [0081]-[0084], [0094]-[0099], [0115]-[0121], Fig. 1-4, 7 **Rosenberg.** *See* para. [0025] **Shen.** *See* p. 1, 3 **Straka I.** *See* p. 2, 6, 8-9 **Suggs.** *See* paras. [0015], [0022], [0024], [0044], [0052] **Tripathi.** *See* 1:60-2:8, 4:36-42, 4:59-67, 5:37-57, 6:10-20, 6:24-42, 9:30-10:24, 11:44-12:24, Fig. 10-11, 16-19 **Magic Mirror.** *See* CNN Money at 1 **Okumura II.** *See* p. 6190, Fig. 11 **Straka II.** *See* p. 2, 6, 8-9 **Geisner.** *See* paras. [0003]-[0004], [0024]-[0030], [0034]-[0040], [0046]-[0052], [0054], [0062], [0073], [0101]-[0107], [0109]-[0110], [0118]-[0119], [[0129]-[0137], Figs. 1-2, 5-7, 9-10 **Ikui.** *See* para. [0014]. **Rowles.** *See* Abstract, 5:3-6, 7:20-31, 8:34-43, 15:9-19, 15:43-58 **Goto.** *See* paras. [0126]-[0128], [0141], [0151], [0179], [0182]-[0184] **Shiseido.** *See* Goto at paras. [0126]-[0128], [0141], [0151], [0179], [0182]-[0184]

Asserted Claim of the '110 Patent	Exemplary Citations to the '110 Patent References
	Francois III. *See Handheld Mirror Simulation*, p. 745, Figs. 1, 6; *A Handheld Virtual Mirror* at Figs. 1-2 **Tojo.** *See* paras. [0041], [0048]-[0050], [0071], [0075], Fig. 4 **Wolf.** *See* pars. [0023], [0067], [0072] **Jeon.** *See* 3:63-4:3 Further, this limitation would have been obvious to a person of ordinary skill in the art based on (1) the above citations; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts.
1[c]. operating the processor to apply adaptive transformation mapping to the stream of images captured by the camera to generate modified images that appear to be captured from a different point of view of the camera's actual point of view; and	Each reference below discloses or suggests this feature, alone or in combination with the other references shown for this limitation. **Enstad.** *See* paras. [0030]; [0031]. **Francois I.** *See* 1.INTRODUCTION, p. 745; 2.3 User view synthesis, pp. 746-47; Figs. 4-6. **Francois II.** *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at the introductory paragraph; *id*. at Section 1.Problem formulation and geometric analysis; *id*. at Section 2.2.System integration; *id*. at Section 3.Perspectives; Figs. 1-2. *See also Mirror symmetry -> 2-view stereo geometry* (2003) at 137 (Abstract); *id*. at pp. 137-138; *id*. at 5.1. Calibrated pinhole camera case, pp. 139-140; *id*. at 5.2. Stealth fighter model, pp. 142-143; *id*. at 5.3. Face model, p. 143; Figs. 2; 3a-3d; 4a-4c. *See also Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 1 (Abstract); *id*. at 4.3 Handheld mirror simulation, pp. 13-15; *id*. at 4.5 Live video in animated 3-D graphics, pp. 16-17; Figs. 12-16.

Asserted Claim of the '110 Patent	Exemplary Citations to the '110 Patent References
	Haan. *See* paras. [0018]-[0019], [0025]-[0027], [0033], [0056]-[0059], [0060]-[0064], [0071]-[0074], [0075]-[0076], [0095], FIGs 2, 7. **Hatanaka.** *See* paras. [0020], [0024]-[0028], [0037]-[0039], [0040]-[0047], [0048]-[0051], [0067]-[0069], [0070]-[0077], [0078]-[0079]. **Iwabuchi**. *See* 2. Smart Makeup Mirror, p.496, 3 Makeup Support Function, pp. 496-97, 3.1 Automatic Zoom and Pan, p.497, 3.2 Intuitive Magnification Rate Control, pp. 497-498, 3.3 Left and Right Reversing Mirror, p.498, 3.4 Profile Check, p. 498, 3.5 Lighting Mode, p. 498, 4.1 Test by the Author, p. 500, Fig. 1, 3. **Kurtz.** *See* paras. [0019], [0047], [0048], [0073], [0139], [0140], [0143]-[0144], Fig. 10. **Lizee.** *See* paras. [0048], [0057], [0061]-[0063]. **Miyaoku.** *See* Abstract, paras. [0014]-[0016], [0021]-[0025], [0034]-[0037], [0073]-[0080], [0081]-[0084], Fig. 6, 7, 8, Claim 1. **Ohba.** *See* 5:34-46, 7:25-34. **Okumura I.** *See* pp. 6187-6188, Fig. 4. **Ooi.** *See* paras. [0062]-[0063] **Rosenberg.** *See* paras. [0006]-[0008], [0025]-[0029], [0035], [0074] **Shen.** *See* p. 4, Fig. 2 **Straka I.** *See* p. 1-3, 7, Fig. 4a, 1b, 5(a) **Suggs.** *See* paras. [0034]-[0036], [0053]

Asserted Claim of the '110 Patent	Exemplary Citations to the '110 Patent References
	Tripathi. *See* 3:53-61, 6:6-28, 9:62-67, 10:40-50, 10:17-24, 11:54-12:24, Fig. 2-3, 18-19 **Magic Mirror.** *See* CNN Money at 1 **Okumura II.** *See* pp. 6187-6188, Fig. 4 **Straka II.** *See* p. 1-3, 7, Fig. 4a, 1b, 5(a) **Geisner.** *See* paras. [0039], [0047]-[0049], [0051]-[0054], [0062], [0066]-[0068], [0103], [0124]-[0127], [0129]-[0134]. [0153]-[0154], Figs. 2, 9-10, 12-13 **Rowles.** *See* Abstract, 3:37-7:3, 7:20-8:43 8:53-9:17, 10:4-12, 10:21-11:6, 11:44-12:55, 13:43-58, 14:6-56, 16:12-23, 17:20-33, Figs. 1A-B, 2D, 3A-B, 4A-4B, 5A-5B **Goto.** *See* paras. [0103]-[0104], [0108]-[0109]; Daily Mail at 3; Trend Hunter at 2; YouTube at 0:015 **Shiseido.** *See* Goto at paras. [0103]-[0104], [0108]-[0109]; **Francois III.** *See Handheld Mirror Simulation*, pp. 745-47, Figs. 1, 6; *A Handheld Virtual Mirror* at Figs. 1-2 **Tojo.** *See* paras. [0041], [0048]-[0050], [0070], [0072], Figs. 3A-4 **Wolf.** *See* para. [0108] **Jeon.** *See* 4:13-42, 4:46-63, Figs. 7A-9 Further, this limitation would have been obvious to a person of ordinary skill in the art based on (1) the above citations; (2) knowledge of a personal of ordinary skill in the art,

Asserted Claim of the '110 Patent	Exemplary Citations to the '110 Patent References
	and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts.
1[d]. displaying the modified images on the monitor;	Each reference below discloses or suggests this feature, alone or in combination with the other references shown for this limitation. **Enstad.** *See* para. [0057]; Figs. 1; 12. **Francois I.** *See* Abstract, p. 745; 1.INTRODUCTION, p. 745; 3.SYSTEM INTEGRATION, p. 747; Figs. 1; 6-7. **Francois II.** *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at the introductory paragraph; *id*. at Section 1.Problem formulation and geometric analysis; *id*. at Section 2.2.System integration; *id*. at Section 3.Perspectives; Figs. 1-2. *See also Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 1 (Abstract); *id*. at 4.3 Handheld mirror simulation, pp. 13-15; *id*. at 4.5 Live video in animated 3-D graphics, pp. 16-17; Figs. 12-13; 15-16. **Haan.** *See* paras. [0006]-[0011], [0056]-[0058], [0072], [0076], Fig. 2, Claim 1. **Hatanaka.** *See* paras. [0020], [0024]-[0028], [0037]-[0039], [0040]-[0047], [0048]-[0051], [0067]-[0069], [0070]-[0077], [0078]-[0079]. **Iwabuchi**. *See* Abstract, p.495, 2. Smart Makeup Mirror, p.496, 3 Makeup Support Function, pp. 496-497, 3.6 Makeup Log, p. 498, 3.6 Makeup Log, p. 499, Fig. 1, 2. **Kurtz.** *See* paras. [0019], [0139], [0143]-[0144]. **Lizee.** *See* paras. [0034]. **Miyaoku.** *See* Abstract, paras. [0002]-[0008], [0011], [0015], [0022]-[0025], [0028]-[0031], [0073]-[0080], [0081]-[0084], Fig. 1, 7, 8.

Asserted Claim of the '110 Patent	Exemplary Citations to the '110 Patent References
	Ohba. *See* 8:34-43. **Okumura I.** *See* p. 6190, 6191, Fig. 11, 13. **Ooi.** *See* paras. [0001], [0005]-[0007], [0008], [0036]-[0044], [0047]-[0055], [0066]-[0067], Fig. 1, 2 **Rosenberg.** *See* paras. [0038], [0048], [0062]-[0063], [0074], [0077], Fig. 3, 5 **Shen.** *See* p. 4, Fig. 2 **Straka I.** *See* p. 3-4, 5-6, Fig. 5(a)-(c) **Suggs.** *See* paras. [0019], [0021], [0034], [0035]-[0037], [0057] **Tripathi.** *See* 3:53-61, 6:6-28, 9:62-67, 10:40-50, 10:17-24, 11:54-12:24, Fig. 2-3, 18-19 **Magic Mirror.** *See* Forbes at 3, CNN Money at 1, CBC at 1-2 **Okumura II.** *See* p. 6190, 6190-6191, 6191, Fig. 11, 13 **Straka II.** *See* p. 3-6, Fig. 5(a)-(c) **Geisner.** *See* paras. [0003]-[0004], [0061]-[0063], [0072]-[0075], [0079]-[0081], [0121]-[0125], [0129]-[0132], Figs. 8-9. 12-13 **Ikui.** *See* paras. [0005]-[0006], [0016], [0020]. [0038], [0043], [0045] **Rowles.** *See* Abstract, 3:37-7:3, 7:20-8:43 8:53-9:17, 10:4-12, 10:21-11:6, 11:44-12:55, 13:43-58, 14:6-56, 16:12-23, 17:20-33, Figs. 1A-B, 2D, 3A-B, 4A-4B, 5A-5B

Asserted Claim of the '110 Patent	Exemplary Citations to the '110 Patent References
	Goto. *See* paras. [0007], [0085], [0088], [0104], [0129]; Daily Mail at 3; Trend Hunter at 2; YouTube at 0:015 **Shiseido.** *See* Goto at paras. [0007], [0085], [0088], [0104], [0129]; Daily Mail at 3; Trend Hunter at 2; YouTube at 0:015 **Francois III.** *See Handheld Mirror Simulation*, pp. 745-47, Figs. 1, 6; *A Handheld Virtual Mirror* at Figs. 1-2 **Tojo.** *See* paras. [0049], [0072], Figs. 3A-3B **Wolf.** *See* paras. [0023], [0080] **Jeon.** *See* 1:63-2:9, Fig. 4 Further, this limitation would have been obvious to a person of ordinary skill in the art based on (1) the above citations; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts.
1[e]. wherein the different point of view corresponds to an image taken from a different angle and a different distance than the actual images captured by the camera; and	Each reference below discloses or suggests this feature, alone or in combination with the other references shown for this limitation. **Enstad.** *See* paras. [0030]-[0033]; Fig. 3. **Francois I.** *See* 2.3 User view synthesis, pp. 746-47; Figs. 4-6. **Francois II.** *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at the introductory paragraph; *id*. at Section 1.Problem formulation and geometric analysis; *id*. at Section 2.2.System integration; *id*. at Section 3.Perspectives; Figs. 1-2. *See also Mirror symmetry -> 2-view stereo geometry* (2003) at 137 (Abstract); *id*. at pp. 137-138; *id*. at 5.1. Calibrated pinhole camera case,

Asserted Claim of the '110 Patent	Exemplary Citations to the '110 Patent References
	pp. 139-140; *id*. at 5.2. Stealth fighter model, pp. 142-143; *id*. at 5.3. Face model, p. 143; Figs. 2; 3a-3d; 4a-4c. **Haan.** *See* paras. [0056]-[0059], [0060]-[0061], [0070]-[0071], [0072]-[0074], [0075]-[0076], [0095]-[0097] Figs. 2, 6, 7. **Hatanaka.** *See* paras. [0027], [0037]-[0039], [0040]-[0047], [0048]-[0051], [0067]-[0069], [0070]-[0077], [0078]-[0079]. **Iwabuchi**. *See* 3.4 Profile Check, p. 498, 3.1 Automatic Zoom and Pan, p. 497, 3.2 Intuitive Magnification Rate Control, pp. 497-498. **Kurtz.** *See* paras. [0019], [0139], [0143]-[0144]. **Lizee.** *See* paras. [0040]-[0041], [0043], [0045], [0048], [0050], [0056], [0058], [0063], Claims 12-13. **Miyaoku.** *See* Abstract, paras. [0010], [0016]-[0018], [0034]-[0037], [0045]-[0049], [0054], Fig. 3. **Ohba.** *See* 3:40-47, 8:34-43, 10:51-57, 10:66-11:18. **Okumura I.** *See* pp. 6187-6188, Fig. 4. **Ooi.** *See* paras. [0052], [0059]-[0060] **Rosenberg.** *See* paras. [0037], [0050]-[0052], [0061]-[0063] **Shen.** *See* p. 4, Fig. 2 **Straka I.** *See* p. 1-3, Fig. 5(a)

Asserted Claim of the '110 Patent	Exemplary Citations to the '110 Patent References
	Suggs. *See* paras. [0015], [0020]-[0021], [0033], [0035], [0047]-[0048] **Magic Mirror.** *See* CNN Money at 1 **Okumura II.** *See* 6187-6188, Fig. 4 **Straka II.** *See* pp. 1-3, Fig. 5(a) **Geisner.** *See* paras. [0039], [0047]-[0049], [0051]-[0054], [0062], [0066]-[0068], [0103], [0111], [0124]-[0127], [0129]-[0134], [0153]-[0154], Figs. 2, 9-10 **Rowles.** *See* Abstract, 3:61-4:30, 4:4-59, 5:41-52, 5:61-6:15, 6:33-63, 7:20-7:31, 7:65-8:43, 8:53-9:17, 10:4-12, 10:21-52, 10:53-11:6, 11:44-12:55, 13:43-58, 14:6-56, 16:12-23, 17:20-33, Figs. 1A-B, 2D, 3A-B, 4A-4B, 5A-5B **Goto.** *See* paras. [0103]-[0104], [0108]-[0109] **Shiseido.** *See* Goto at paras. [0103]-[0104], [0108]-[0109]; Daily Mail at 3; Trend Hunter at 2; YouTube at 0:015 **Francois III.** *See Handheld Mirror Simulation*, pp. 745-47, Figs. 1, 6; *A Handheld Virtual Mirror* at Figs. 1-2 **Tojo.** *See* paras. [0048]-[0050], [0072], [0075], Figs. 3A-B **Wolf.** *See* paras. [0023], [0108] **Jeon.** *See* 4:13-42, 4:46-63, Figs. 7A-9 Further, this limitation would have been obvious to a person of ordinary skill in the art based on (1) the above citations; (2) knowledge of a personal of ordinary skill in the art,

Asserted Claim of the '110 Patent	Exemplary Citations to the '110 Patent References
	and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts.
1[f]. wherein during mirror tracking mode the processor utilizes the angle of the images captured by the camera and applies parametric input for a mapping transformation that changes imaging perspective of the images captured by the camera.	Each reference below discloses or suggests this feature, alone or in combination with the other references shown for this limitation. **Enstad.** *See* paras. [0030]-[0033]; [0040]-[0046]; Figs. 3; 6-7. **Francois I.** *See* 2.3 User view synthesis, pp. 746-47; Figs. 4-6. **Francois II.** *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at the introductory paragraph; *id*. at Section 1.Problem formulation and geometric analysis; *id*. at Section 2.2.System integration; *id*. at Section 3.Perspectives; Figs. 1-2. *See also Mirror symmetry -> 2-view stereo geometry* (2003) at 137 (Abstract); *id*. at pp. 137-138; *id*. at 5.1. Calibrated pinhole camera case, pp. 139-140; *id*. at 5.2. Stealth fighter model, pp. 142-143; *id*. at 5.3. Face model, p. 143; Figs. 2; 3a-3d; 4a-4c. **Haan.** *See* paras. [0014], [0056]-[0059], [0060]-[0061], [0070]-[0071], [0072]-[0074], [0075]-[0076], [0095], Figs. 2, 6, 7. **Hatanaka.** *See* paras. [0027], [0037]-[0039], [0040]-[0047], [0048]-[0051], [0067]-[0069], [0070]-[0077], [0078]-[0079]. **Iwabuchi**. *See* 3.4 Profile Check, p. 498, 3.1 Automatic Zoom and Pan, p. 497, 3.2 Intuitive Magnification Rate Control, pp. 497-498. **Kurtz.** *See* paras. [0019], [0047], [0048], [0073], [0139], [0140], [0143]-[0144], Fig. 10. **Lizee.** *See* paras. [0040]-[0041], [0043], [0045], [0048], [0050], [0056], [0058], [0063], Claims 12-13.

Asserted Claim of the '110 Patent	Exemplary Citations to the '110 Patent References
	Miyaoku. *See* Abstract, paras. [0010], [0016]-[0018], [0034]-[0037], [0045]-[0049], [0054], Fig. 3. **Ohba.** *See* 5:14-29, 5:34-46. **Okumura I.** *See* pp. 6187-6188, Fig. 4. **Ooi.** *See* paras. [0062]-[0063] **Rosenberg.** *See* paras. [0037]-[0039], [0050]-[0052], [0061]-[0063] **Shen.** *See* p. 2, 4, 6 **Straka I.** *See* Abstract, Straka I at p. 2, 9 **Suggs.** *See* paras. [0035]-[0036], [0053] **Magic Mirror.** *See* CNN Money at 1 **Okumura II.** *See* 6187-6188, Fig. 4 **Straka II.** *See* Abstract, p. 2, 9 **Geisner.** *See* paras. [0039], [0047]-[0049], [0051]-[0054], [0062], [0066]-[0068], [0103], [0124]-[0127], [0129]-[0134], [0153]-[0154], Figs. 2, 9-10 **Rowles.** *See* Abstract, 3:37-7:3, 7:20-8:43 8:53-9:17, 10:4-12, 10:21-11:6, 11:44-12:55, 13:43-58, 14:6-56, 16:12-23, 17:20-33, Figs. 1A-B, 2D, 3A-B, 4A-4B, 5A-5B **Francois III.** *See Handheld Mirror Simulation*, pp. 745-47, Figs. 1, 6; *A Handheld Virtual Mirror* at Figs. 1-2

Asserted Claim of the '110 Patent	Exemplary Citations to the '110 Patent References
	Tojo. *See* paras. [0054], [0072] **Wolf.** *See* paras. [0094]-[0095], Fig. 5 **Jeon.** *See* 4:13-42, 4:46-63, Figs. 7A-9 Further, this limitation would have been obvious to a person of ordinary skill in the art based on (1) the above citations; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts.

Asserted Claim of the '110 Patent	Exemplary Citations to the '110 Patent References
Claim 2	
2. The method of claim 1, wherein the mapping transformation comprises a combination of at least two of the following transformations: vertical flips about a vertical axis, a projection transformation, rotation, resize, two-dimensional offset, optic distortion correction, and polynomial mapping on part or entire captured image.	Each reference below discloses or suggests this feature, alone or in combination with the other references shown for this limitation. **Enstad.** *See* paras. [0030]-[0033]; Fig. 3. **Francois I.** *See* 1.INTRODUCTION, p. 745; 2.GEOMETRIC ANALYSIS, pp. 746-47; 2.3 User view synthesis, p. 746; Figs. 3; 5. **Francois II.** *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at the introductory paragraph; *id*. at Section 1.Problem formulation and geometric analysis; *id*. at Section 2.2.System integration; *id*. at Section 3.Perspectives; Figs. 1-2. *See also Mirror symmetry -> 2-view stereo geometry* (2003) at 137 (Abstract); *id*. at pp. 137-138; *id*. at 5.1. Calibrated pinhole camera case, pp. 139-140; *id*. at 5.2. Stealth fighter model, pp. 142-143; *id*. at 5.3. Face model, p. 143; Figs. 2; 3a-3d; 4a-4c. *See also Software Architecture for Computer Vision: Beyond Pipes*

Asserted Claim of the '110 Patent	Exemplary Citations to the '110 Patent References
	and Filters (2003) at 1 (Abstract); *id*. at 4.3 Handheld mirror simulation, pp. 13-15; *id*. at 4.5 Live video in animated 3-D graphics, pp. 16-17 ; Figs. 12-13; 15-16. **Haan.** *See* paras. [0006]-[0011], [0022]-[0023], [0028], [0056]-[0059], [0060]-[0064], [0070]-[0071], [0072]-[0074], [0075]-[0076], [0095], Figs. 2, 6, 7. **Hatanaka.** *See* paras. [0020], [0024]-[0028], [0037]-[0039], [0040]-[0047], [0048]-[0051], [0067]-[0069], [0070]-[0077], [0078]-[0079]. **Iwabuchi**. *See* 3 Makeup Support Function, p. 497, 3.1 Automatic Zoom and Pan, p. 497, 3.2 Intuitive Magnification Rate Control, pp. 497-498, 3.3 Left and Right Reversing Mirror, p. 498, 4.2 Test by Ordinary Women, p. 500. **Kurtz.** *See* paras. [0010], [0013], [0048], [0049]. **Lizee.** *See* paras. [0040]-[0041], [0043], [0045], [0048], [0050], [0056], [0058], [0063], Claim 1. **Miyaoku.** *See* paras. [0020], [0033]-[0034], [0035]-[0036], [0052]-[0062], [0063]-[0066], [0067]-[0072], [0073]-[0080], Fig. 2, 6, 7. **Ohba.** *See* 5:34-46, 7:25-34, 8:34-43. **Okumura I.** *See* pp. 6187-6188, Fig. 4. **Rosenberg.** *See* paras. [0025]-[0027], [0035]-[0037], [0042]-[0043], [0048], [0052], [0061], [0077], [0039], [0050]-[0052], Fig. 5 **Shen.** *See* p. 4, Fig. 2 **Straka I.** *See* 1, 4 ,8

Asserted Claim of the '110 Patent	Exemplary Citations to the '110 Patent References
	Suggs. *See* paras. [0015], [0032], [0034], [0057] **Tripathi.** *See* 1:6-31, 1:35-2:12, 3:35-4:35, 5:1-16, 5:37-6:20, 6:21-42, 6:43-7:35, 7:36-63, 9:12-67, 10:1-24, 10:25-39, 10:40-60, 10:61-11:24, 11:25-44, 11:45-53, 11:54-12:10, 12:11-35, 12:36-53, 12:54-67, Fig. 2-5, 9-13, 16-21 **Magic Mirror.** *See* CNN Money at 1 **Okumura II.** *See* 6187-6188, Fig. 4 **Straka II.** *See* p. 1, 4, 8 **Geisner.** *See* paras. [0039], [0047]-[0049], [0051]-[0054], [0062], [0066]-[0068], [0103], [0111], [0124]-[0127], [0129]-[0132], [0153]-[0154], Figs. 9-10 **Rowles.** *See* Abstract, 3:37-7:3, 7:20-8:43 8:53-9:17, 10:4-12, 10:21-11:6, 11:44-12:55, 13:43-58, 14:6-56, 16:12-23, 17:20-33, Figs. 1A-B, 2D, 3A-B, 4A-4B, 5A-5B **Goto.** *See* paras. [0103]-[0104], [0108]-[0109], [0167]-[0168]; Daily Mail at 3; Trend Hunter at 2; YouTube at 0:015 **Shiseido.** *See* Goto at paras. [0103]-[0104], [0108]-[0109], [0167]-[0168]; **Francois III.** *See Handheld Mirror Simulation*, pp. 745-47, Figs. 1, 3, 5-6; *A Handheld Virtual Mirror* at Figs. 1-2 **Tojo.** *See* paras. [0054], [0072], Figs. 3A-B **Wolf.** *See* paras. [0108], [0157]-[0158] **Jeon.** *See* 4:13-42, 4:46-63, Figs. 7A-9

Asserted Claim of the '110 Patent	Exemplary Citations to the '110 Patent References
	Further, this limitation would have been obvious to a person of ordinary skill in the art based on (1) the above citations; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts.

Asserted Claim of the '110 Patent	Exemplary Citations to the '110 Patent References
Claim 3	
3. The method of claim 1, wherein during idle mode the camera continuously sends captured images to the processor, and the user presence is identified by the processor detecting a body part in the images.	Each reference below discloses or suggests this feature, alone or in combination with the other references shown for this limitation. **Enstad.** *See* paras. [0006]-[0007]; [0009]; [0027]; [0030]; [0035]-[0039]; Figs. 2; 5. **Francois I.** *See* 1.INTRODUCTION, p. 745; 3.SYSTEM INTEGRATION, p. 747; Figs. 1; 6. **Francois II.** *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at the introductory paragraph; *id*. at Section 2.2.System integration; Figs. 1-2. *See also Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 4.1 Real-time video segmentation and tracking, pp. 10-11; *id*. at 4.3 Handheld mirror simulation, pp. 13-15; Figs. 7-9; 12-13. **Haan.** *See* paras. [0036], [0058]. **Hatanaka.** *See* paras. [0001], [0008]-[0013], [0028]-[0029], [0033]-[0035], [0037], [0051], [0057]-[0066], [0081]. **Iwabuchi**. *See* 2. Smart Makeup Mirror, p.496, 3.1 Automatic Zoom and Pan, p.497, 5 Adjusting Position of Display, pp. 501-502, Fig. 1, 5.

Asserted Claim of the '110 Patent	Exemplary Citations to the '110 Patent References
	Kurtz. *See* paras. [0013], [0019], [0047], [0085], [0139], [0140], [0143]-[0144], Fig. 10. **Lizee.** *See* paras. [0040], [0041], [0047], [0053], [0063]. **Miyaoku.** *See* Abstract, paras. [0014]-[0016], [0021]-[0025], [0028]-[0031], [0033]-[0034], [0035]-[0036], [0047], [0075], Fig. 1, 2, 7. **Ohba.** *See* 1:59-2:8, 8:22-34. **Okumura I.** *See* p. 6190, Fig. 11. **Ooi.** *See* paras. [0006]-[0007], [0008], [0039]-[0044], [0047]-[0048], [0052]-[0060], [0067]-[0069], [0071]-[0076], [0081]-[0084], [0094]-[0099], [0115]-[0121], Fig. 1-4, 7 **Rosenberg.** *See* paras. [0069], [0052], [0056] **Shen.** *See* pp. 1-4, 6 **Straka I.** *See* pp. 2, 6, 8-9 **Suggs.** *See* paras. [0024], [0043], [0056]-[0057] **Tripathi.** *See* 1:60-2:8, 4:36-42, 4:59-67, 5:37-57, 6:10-20, 6:24-42, 9:30-10:24, 11:44-12:24, Fig. 10-11, 16-19 **Okumura II.** *See* p. 6190, Fig. 11 **Straka II.** *See* p. 2, 6, 8-9 **Geisner.** *See* paras. [0003]-[0004], [0024]-[0030], [0034]-[0040], [0046]-[0052], [0054], [0062], [0073], [0101]-[0107], [0109]-[0110], [0118]-[0119], [0129]-[0134], [0135]-[0137], Figs. 1-2, 5-7, 9-10

Asserted Claim of the ’110 Patent	Exemplary Citations to the ’110 Patent References
	Ikui. *See* para. [0114] **Rowles.** *See* Abstract, 5:3-6, 7:20-31, 8:34-43, 15:9-19, 15:43-58 **Goto.** *See* paras. [0123]-[0125], [0141], [0151], [0159], [0179], [0182]-[0184]; Daily Mail at 3; Trend Hunter at 2; YouTube at 0:015 **Shiseido.** *See* Goto at paras. [0123]-[0125], [0141], [0151], [0159], [0179], [0182]-[0184]; **Francois III.** *See Handheld Mirror Simulation*, pp. 745-47, Figs. 1, 6; *A Handheld Virtual Mirror* at Figs. 1-2 **Tojo.** *See* paras. [0041], [0048]-[0050], [0071], [0075] **Wolf.** *See* para. [0024] **Jeon.** *See* 3:6-11 Further, this limitation would have been obvious to a person of ordinary skill in the art based on (1) the above citations; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts.

Asserted Claim of the '110 Patent	Exemplary Citations to the '110 Patent References
Claim 4	
4. The method of claim 3, wherein the body part comprises one of legs, face, eyes, and hands.	Each reference below discloses or suggests this feature, alone or in combination with the other references shown for this limitation. **Enstad.** *See* paras. [0006]-[0007]; [0009]; [0027]; [0030]; [0035]-[0039]; Figs. 2; 5. **Francois I.** *See* 1.INTRODUCTION, p. 745; 3.SYSTEM INTEGRATION, p. 747; Figs. 1; 6. **Francois II.** *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at the introductory paragraph; *id*. at Section 2.2.System integration; Figs. 1-2. *See also Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 4.1 Real-time video segmentation and tracking, pp. 10-11; *id*. at 4.3 Handheld mirror simulation, pp. 13-15; Figs. 7-9; 12-13. **Haan.** *See* paras. [0036], [0058], [0078], [0099]-[0100], Fig. 11. **Hatanaka.** *See* paras. [0001], [0008]-[0013], [0028]-[0029], [0033]-[0035], [0037], [0051], [0057]-[0066], [0081]. **Iwabuchi**. *See* 2. Smart Makeup Mirror, p.496, 3.1 Automatic Zoom and Pan, p.497, 5 Adjusting Position of Display, pp. 501-502, Fig. 1, 5. **Kurtz.** *See* paras. [0019], [0047], [0085], [0139], [0140], [0143]-[0144], Fig. 10. **Lizee.** *See* paras. [0065]. **Miyaoku.** *See* Abstract, paras. [0014]-[0016], [0021]-[0025], [0028]-[0031], [0033]-[0034], [0035]-[0036], [0047], [0075], Fig. 1, 2. **Ohba.** *See* 8:22-34, 11:9-18.

Asserted Claim of the '110 Patent	Exemplary Citations to the '110 Patent References
	Ooi. *See* paras. [0006]-[0007], [0008], [0039]-[0044], [0047]-[0048], [0052]-[0060], [0067]-[0069], [0071]-[0007]6 ,[0081]-[0084], [0094]-[0099], [0115]-[0121], Fig. 1-4, 7 **Shen.** *See* p. 3 **Straka I.** *See* p. 2, 6, 8-9 **Suggs.** *See* paras. [0024], [0043], [0057] **Tripathi.** *See* 1:60-2:8, 4:36-42, 4:59-67, 5:37-57, 6:10-20, 6:24-42, 9:30-10:24, 11:44-12:24, Fig. 10-11, 16-19 **Straka II.** *See* p. 2, 6, 8-9 **Geisner.** [0003]-[0004], [0024]-[0030], [0034]-[0040], [0046]-[0052], [0054], [0062], [0073], [0101]-[0107], [0109]-[0110], [0118]-[0119], [0129]-[0134], [0135]-[0137], Figs. 1-2, 5-7, 9-10 **Rowles.** *See* Abstract, 5:3-6, 7:20-31, 8:34-43, 15:9-19, 15:43-58 **Goto.** *See* paras. [0126]-[0128], [0141], [0151], [0159], [0179], [0182]-[0184] **Shiseido.** *See* Goto at paras. [0126]-[0128], [0141], [0151], [0159], [0179], [0182]-[0184]; **Francois III.** *See Handheld Mirror Simulation*, pp. 745-47, Figs. 1, 6; *A Handheld Virtual Mirror* at Figs. 1-2 **Tojo.** *See* paras. [0041], [0048]-[0050], [0071], [0075] **Wolf.** *See* para. [0024], [0072]

Asserted Claim of the '110 Patent	Exemplary Citations to the '110 Patent References
	Jeon. *See* 3:6-11 Further, this limitation would have been obvious to a person of ordinary skill in the art based on (1) the above citations; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts.

Asserted Claim of the '110 Patent	Exemplary Citations to the '110 Patent References
Claim 5	
5. The method of claim 1, further comprising receiving user input and operating the processor to vary image magnitude or field-of-view of the modified images according to the user input.	Each reference below discloses or suggests this feature, alone or in combination with the other references shown for this limitation. **Enstad.** *See* paras. [0026]; [0030]-[0031]; Fig. 1. **Francois I.** *See* Abstract, p. 745; 1.INTRODUCTION, p. 745; 2.GEOMETRIC ANALYSIS, p. 745-46; 2.3 User view synthesis, pp. 746-47; 3.SYSTEM INTEGRATION, p. 747; Figs. 1-2; 4-6. **Francois II.** *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at the introductory paragraph; *id*. at Section 1.Problem formulation and geometric analysis; *id*. at Section 2.2.System integration; *id*. at Section 3.Perspectives; Figs. 1-2. *See also Mirror symmetry -> 2-view stereo geometry* (2003) at 137 (Abstract); *id*. at pp. 137-138; *id*. at 5.1. Calibrated pinhole camera case, pp. 139-140; *id*. at 5.2. Stealth fighter model, pp. 142-143; *id*. at 5.3. Face model, p. 143; Figs. 2; 3a-3d; 4a-4c. *See also Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 1 (Abstract); *id*. at 4.3 Handheld mirror simulation, pp. 13-15; *id*. at 4.5 Live video in animated 3-D graphics, pp. 16-17; Figs. 12-13; 15-16.

Asserted Claim of the '110 Patent	Exemplary Citations to the '110 Patent References
	Haan. *See* paras. [0006]-[0011], [0056]-[0059], [0060]-[0064], [0070]-[0071], [0072]-[0074], [0075]-[0076], [0095], [0097], Figs. 2, 6, 7. **Hatanaka.** *See* paras. [0020], [0024]-[0028], [0037]-[0039], [0040]-[0047], [0048]-[0051], [0067]-[0069], [0070]-[0077], [0078]-[0079]. **Iwabuchi**. *See* 3 Makeup Support Function, p. 497, 3.1 Automatic Zoom and Pan, p. 497, 3.2 Intuitive Magnification Rate Control, pp. 497-498. **Kurtz.** *See* paras. [0072], [0075]. **Lizee.** *See* paras. [0051], [0056]-[0057], Figs. 3-4. **Miyaoku.** *See* paras. [0020], [0033]-[0034], [0035]-[0036], [0052]-[0062], [0063]-[0066], [0067]-[0072], [0073]-[0080], Fig. 2, 6, 7. **Ohba.** *See* 3:40-47, 8:34-43. **Okumura I.** *See* pp. 6187-6188, Fig. 4. **Rosenberg.** *See* paras. [0025], [0049]-[0052], [0077]-[0080], Fig. 5 **Shen.** *See* p. 4, Fig. 2 **Straka I.** *See* p. 3, Fig. 1(b) **Suggs.** *See* paras. [0057] **Tripathi.** *See* 1:35-2:12, 3:53-61, 4:16-5:15, 5:37-6:20, 6:21-42, 9:62-67, 10:40-50, FIG 2-3 **Magic Mirror.** *See* CNN Money at 1

Asserted Claim of the '110 Patent	Exemplary Citations to the '110 Patent References
	Okumura II. *See* pp. 6187-6188, Fig. 4 **Straka II.** *See* p. 3, Fig. 1(b) **Geisner.** *See* paras. [0039], [0047]-[0049], [0051]-[0054], [0062], [0066]-[0068], [0073], [0101]-[0103], [0111], [0124]-[0127], [0129]-[0134], [0153]-[0154], Figs. 2, 9-10 **Rowles.** *See* Abstract, 3:61-4:30, 5:19-7:3, 8:14-8:43, 9:4-9:17, 10:4-12, 10:53-11:6, 11:44-12:55, 14:6-56, 16:24-38, Figs. 1C, 2A, 3A, 3C, 6A **Francois III.** *See Handheld Mirror Simulation*, pp. 745-47, Figs. 4, 6; *A Handheld Virtual Mirror* at Figs. 1-2 **Tojo.** *See* paras. [0053]-[0055], [0072], Figs. 3A-B **Wolf.** *See* paras. [0040], [0077] **Jeon.** *See* 3:23-52 Further, this limitation would have been obvious to a person of ordinary skill in the art based on (1) the above citations; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts.

Asserted Claim of the '110 Patent	Exemplary Citations to the '110 Patent References
Claim 6	
6. The method of claim 5, wherein the processor varies the image magnitude or field-of-view mapping to display a partial or full body of the user in the modified images.	Each reference below discloses or suggests this feature, alone or in combination with the other references shown for this limitation. **Enstad.** *See* paras. [0030]-[0031]; Fig. 6. **Francois I.** *See* 2.3 User view synthesis, pp. 746-47; Figs. 4-6. **Francois II.** *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at the introductory paragraph; *id*. at Section 1.Problem formulation and geometric analysis; *id*. at Section 2.2.System integration; *id*. at Section 3.Perspectives; Figs. 1-2. *See also Mirror symmetry -> 2-view stereo geometry* (2003) at 137 (Abstract); *id*. at pp. 137-138; *id*. at 5.1. Calibrated pinhole camera case, pp. 139-140; *id*. at 5.2. Stealth fighter model, pp. 142-143; *id*. at 5.3. Face model, p. 143; Figs. 2; 3a-3d; 4a-4c. *See also Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 1 (Abstract); *id*. at 4.3 Handheld mirror simulation, pp. 13-15; *id*. at 4.5 Live video in animated 3-D graphics, pp. 16-17; Figs. 12-13; 15-16. **Haan.** *See* paras. [0006]-[0011], [0056]-[0059], [0060]-[0064], [0070]-[0071], [0072]-[0074], [0075]-[0076], [0095], Figs. 2, 6, 7. **Hatanaka.** *See* paras. [0020], [0024]-[0028], [0037]-[0039], [0040]-[0047], [0048]-[0051], [0067]-[0069], [0070]-[0077], [0078]-[0079]. **Iwabuchi**. *See* 3 Makeup Support Function, p. 497, 3.1 Automatic Zoom and Pan, p. 497, 3.2 Intuitive Magnification Rate Control, pp. 497-498. **Kurtz.** *See* paras. [0072], [0075]. **Lizee.** *See* paras. [0056]-[0057].

Asserted Claim of the '110 Patent	Exemplary Citations to the '110 Patent References
	Miyaoku. *See* paras. [0020], [0033]-[0034], [0035]-[0036], [0052]-[0062], [0063]-[0066], [0067]-[0072], [0073]-[0080], Fig. 2, 6, 7. **Ohba.** *See* 3:40-47, 8:34-43. **Okumura I.** *See* pp. 6187-6188, Fig. 4. **Rosenberg.** *See* Claim 6, paras. [0049]-[0052], [0077]-[0080], [0096]-[0100], Fig. 5 **Shen.** *See* p. 4, Fig. 2 **Straka I.** *See* p. 3, Fig. 1(b) **Tripathi.** *See* 3:53-61, 6:6-28, 9:62-67, 10:17-24, 10:40-50, 11:54-12:24, Fig. 18-19 **Okumura II.** *See* pp. 6187-6188, Fig. 4 **Straka II.** *See* p. 3, Fig. 1(b) **Geisner.** *See* paras. [0039], [0047]-[0049], [0051]-[0054], [0062], [0066]-[0068], [0103], [0111], [0124]-[0127], [0129]-[0134], [0153]-[0154], Figs. 2, 9-10 **Rowles.** *See* 3:47-60, 5:2-6, 6:7-15, 6:33-63, 7:20-31, 8:14-43, 9:4-17, Figs. 1C, 2A, 3A, 3C, 6A **Francois III.** *See Handheld Mirror Simulation*, pp. 745-47, Figs. 4, 6; *A Handheld Virtual Mirror* at Figs. 1-2 **Tojo.** *See* paras. [0053]-[0055], [0072], Figs. 3A-B **Wolf.** *See* paras. [0077]

Asserted Claim of the '110 Patent	Exemplary Citations to the '110 Patent References
	Jeon. *See* 3:23-52 Further, this limitation would have been obvious to a person of ordinary skill in the art based on (1) the above citations; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts.

Asserted Claim of the '110 Patent	Exemplary Citations to the '110 Patent References
Claim 10	
10. The method of claim 1, further comprising operating the processor to augment the modified images by overlaying virtual objects on a user's image appearing within the modified images.	Each reference below discloses or suggests this feature, alone or in combination with the other references shown for this limitation. **Francois II.** *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 4.1 Real-time video segmentation and tracking, pp. 10-11; *id*. at 4.2 Real-time video painting, pp. 12-13; *id*. at 4.5 Live video in animated 3-D graphics, pp. 16-17; Figs. 7; 10-11; 16. **Haan.** *See* paras. 0110-0118. **Kurtz.** *See* para. [0123] **Miyaoku.** *See* Abstract, paras. [0011], [0016]-[0019], [0023], [0073]-[0074], Fig. 6, 7. **Ohba.** *See* 5:14-29, 9:23-42, 9:55-67, 10:23-32, Figs. 11-14, Fig. 10. **Rosenberg.** *See* paras. 0111, [0052]-[0053], [0105]-[0107] **Straka I.** *See* p. 3, 4

Asserted Claim of the '110 Patent	Exemplary Citations to the '110 Patent References
	Tripathi. *See* 6:6-28, 10:17-24, 11:54-12:24, Fig. 2-3, 18-19 **Magic Mirror.** *See* Forbes at 3, CNN Money at 1, CBC at 1-2, Sidney Morning Herald, Digital Commerce 260 at 2 **Straka II.** *See* p. 3, 4 **Geisner.** *See* paras. [0156]-[0161], Figs. 12-13 **Rowles.** *See* 4:47-54, 7:65-8:43, Fig. 1A **Goto.** *See* paras. [0104], [0107], [0128]-[0129], [0159], [0204], Figs. 16, 37-38 **Shiseido.** *See* Goto at paras. [0104], [0107], [0128]-[0129], [0159], [0204], Figs. 16, 37-38; Daily Mail at 3; Trend Hunter at 2; YouTube at 0:015 **Tojo.** *See* paras. [0041], [0048]-[0050], [0070], [0072], Figs. 3A-B **Wolf.** *See* para. [0024] Further, this limitation would have been obvious to a person of ordinary skill in the art based on (1) the above citations; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts.

Asserted Claim of the '110 Patent	Exemplary Citations to the '110 Patent References
Claim 11	
11. The method of claim 1, further comprising operating the processor to transmit the modified image over a network.	Each reference below discloses or suggests this feature, alone or in combination with the other references shown for this limitation. **Enstad.** *See* paras. [0025]; [0063]-[0065]; Fig. 12. **Francois II.** *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 4.4 IMSC Communicator, pp. 15-16; *id*. at 4.5 Live video in animated 3-D graphics, pp. 16-17; Figs. 14-16. **Hatanaka.** *See* paras. [0018]-[0019], [0034], [0064]-[0065]. **Iwabuchi**. *See* 6 Internet Voting, pp. 502-503, Fig. 6. **Kurtz.** *See* paras. [0042], Fig. 1. **Lizee.** *See* paras. [0078]. **Miyaoku.** *See* Abstract, paras. [0002]-[0008], [0009]-[0013], [0027], [0028]-[0031], Fig. 1, 6, 8. **Ooi.** *See* paras. [0045] **Rosenberg.** *See* paras. [0074], 0109, Fig. 13 **Shen.** *See* p. 4 **Tripathi.** *See* 1:8-15, 1:52-2:12, 3:35-61, 4:59-67, 7:45-50, 9:35-49, 11:45-53, Fig. 1, 19 **Magic Mirror.** *See* Forbes at 3, CBC at 1-2, Sydney Morning Herald, Digital Commerce 360 at 2, CSA at 2

Asserted Claim of the ’110 Patent	Exemplary Citations to the ’110 Patent References
	Geisner. *See* paras. [0099]-[0100] **Ikui.** *See* paras. [0013], [0015], [0049] **Rowles.** *See* 5:19-23, 16:48-57, 16:66-17:19 **Tojo.** *See* paras. [0041], [0045], [0048]-[0050], [00710, [0072], Figs. 3A-B **Wolf.** *See* paras. [0024], [0080], [0083], [0085]-[0086] **Jeon.** *See* 1:25-50, 3:6-11 Further, this limitation would have been obvious to a person of ordinary skill in the art based on (1) the above citations; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts.

Asserted Claim of the ’110 Patent	Exemplary Citations to the ’110 Patent References
Claim 12	
12. The method of claim 1, further comprising displaying the modified image on a remote screen for video telepresence.	Each reference below discloses or suggests this feature, alone or in combination with the other references shown for this limitation. **Enstad.** *See* paras. [0008]-[0009]; [0025]-[0026]; Figs. 1; 12. **Francois II.** *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 4.4 IMSC Communicator, pp. 15-16; *id*. at 4.5 Live video in animated 3-D graphics, pp. 16-17; Figs. 14-16. **Hatanaka.** *See* paras. [0018]-[0019], [0034], [0064]-[0065].

Asserted Claim of the '110 Patent	Exemplary Citations to the '110 Patent References
	Iwabuchi. *See* 6 Internet Voting, pp. 502-503, Fig. 6. **Kurtz.** *See* paras. [0042], Fig. 1. **Lizee.** *See* paras. [0078]. **Miyaoku.** *See* Abstract, paras. [0002]-[0008], [0011], [0015], [0022]-[0025], [0028]-[0031], [0073]-[0080], [0081]-[0084], Fig. 1, 7, 8. **Ooi.** *See* paras. [0045], **Rosenberg.** *See* paras. [0005], [0074], [0109] **Tripathi.** *See* 1:8-15, 1:52-2:12, 3:35-61, 4:59-67, 7:45-50, 9:35-49, 11:45-53, Fig. 1, 19 **Magic Mirror.** *See* Forbes at 3, CBC at 1-2, Sydney Morning Herald, Digital Commerce 360 at 2 **Geisner.** *See* paras. [0099]-[0100] **Rowles.** *See* 5:19-23, 16:48-57, 16:66-17:19 **Tojo.** *See* paras. [0045], [0049], [0072], Figs. 3A-B **Wolf.** *See* paras. [0080], [0083], [0085]-[0086] **Jeon.** *See* 1:25-50, 3:6-11 Further, this limitation would have been obvious to a person of ordinary skill in the art based on (1) the above citations; (2) knowledge of a personal of ordinary skill in the art,

Asserted Claim of the '110 Patent	Exemplary Citations to the '110 Patent References
	and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts.

Asserted Claim of the '110 Patent	Exemplary Citations to the '110 Patent References
Claim 16	
16. The method of claim 1, wherein the processor operates on the images from the camera to generate background segmentation, and replaces segments on the images by replacement segments.	Each reference below discloses or suggests this feature, alone or in combination with the other references shown for this limitation. **Enstad.** *See* paras. [0030]-[0033]; [0038]-[0039]; [0040]-[0046]; Figs. 3; 6-7. **Francois II.** *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 4.1 Real-time video segmentation and tracking, pp. 10-11; *id*. at 4.5 Live video in animated 3-D graphics, pp. 16-17; Figs. 7; 15-16. **Haan.** *See* paras. [0001], [0016], [0017]. **Hatanaka.** *See* paras. [0006]-[0007], [0027], [0037]-[0039], [0040]-[0047], [0048]-[0051], [0067]-[0069], [0070]-[0077]. **Kurtz.** *See* paras. 0123. **Lizee.** *See* paras. [0073]-[0075]. **Miyaoku.** *See* paras. [0051]-[0056], [0059]-[0061], 0068-[0069], [0075]-[0076], [0080], Fig. 5. **Okumura I.** *See* p. 6190. **Ooi.** *See* paras. [0062]-[0063]

Asserted Claim of the ’110 Patent	Exemplary Citations to the ’110 Patent References
	Rosenberg. *See* paras. [0044]-[0048] **Straka I.** *See* p. 3, 4 **Tripathi.** *See* 1:6-31, 1:35-2:12, 3:35-4:35, 5:1-16, 5:37-6:20, 6:21-42, 6:43-7:35, 7:36-63, 9:12-67, 10:1-24, 10:25-39, 10:40-60, 10:61-11:24, 11:25-44, 11:45-53, 11:54-12:10, 12:11-35, 12:36-53, 12:54-67, Fig. 1-5, 9-13, 16-21 **Magic Mirror.** *See* Forbes at 3, CNN Money at 1, CBC at 1-2, Sidney Morning Herald, Digital Commerce 360 at 2 **Okumura II.** *See* p. 6190 **Straka II.** *See* p. 3, 4 **Geisner.** *See* paras. [0102], [0111], [0114], [0119]-[0120], [0153]-[0159] **Rowles.** *See* 13:43-58 **Tojo.** *See* para. [0045] **Jeon.** *See* 4:13-42, 4:46-63, Figs. 7A-9 Further, this limitation would have been obvious to a person of ordinary skill in the art based on (1) the above citations; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts.

Asserted Claim of the '110 Patent	Exemplary Citations to the '110 Patent References
Claim 17	
17. The method of claim 16, wherein the replacement segments comprise virtual background or background that was captured in a different setting.	The '110 Patent References expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. **Francois II.** *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 4.1 Real-time video segmentation and tracking, pp. 10-11; *id*. at 4.5 Live video in animated 3-D graphics, pp. 16-17; Figs. 7; 15-16. **Haan.** *See* paras. [0001], [0016], [0017]. **Kurtz.** *See* paras. 0123. **Lizee.** *See* paras. [0073]-[0075]. **Miyaoku.** *See* paras. [0051]-[0056], [0059]-[0061], [0068]-[0069], [0075]-[0076], [0080], Fig. 5. **Okumura I.** *See* p. 6190. **Rosenberg.** *See* paras. [0044]-[0048] **Straka I.** *See* p. 3, 4 **Tripathi.** *See* 6:6-28, 9:12-67, Fig. 2-3 **Okumura II.** *See* 6190 **Straka II.** *See* p. 3, 4 **Geisner.** *See* paras. [0102], [0111], [0114], [0119]-[0120], [0153]-[0159] **Tojo.** *See* para. [0045]

Asserted Claim of the ’110 Patent	Exemplary Citations to the ’110 Patent References
	Jeon. *See* 4:13-42, 4:46-63, Figs. 7A-9 This limitation would have been obvious to a person of ordinary skill in the art based on (1) The ’110 Patent References alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ invalidity contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in section [X] of the cover document.

Exhibit B-01: Invalidity of U.S. Patent No. 8,982,110 in view of U.S. Patent Pub. No. 12/171,938 ("Enstad")

This chart is subject to all reservations, objections, and disclaimers in Defendants' Invalidity Contentions and any amendment, supplement, or modification thereof, which are incorporated herein by reference in their entirety.

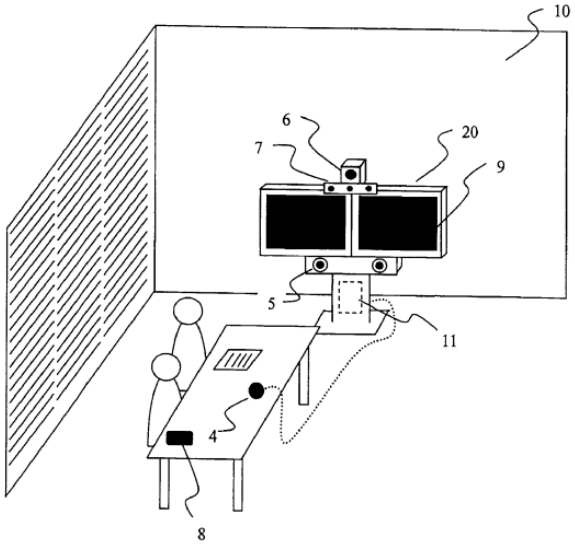
Enstad was originally filed July 11, 2008 and published on January 15, 2009, and thus is available as prior art to U.S. Patent No. 8,982,110 (the "'110 Patent") under at least 35 U.S.C. §§ 102(a), (b) and (e).

Enstad anticipates the Asserted Claims of the '110 Patent. To the extent it is found Enstad does not expressly disclose certain limitations in the Asserted Claims, such limitations are at least implicitly or inherently disclosed. Moreover, to the extent it is found that Enstad does not anticipate the Asserted Claims, Enstad renders obvious the Asserted Claims, either alone or in combination with other prior art identified in the cover pleading or herein, and/or in combination with the general knowledge of a person having ordinary skill in the art.

In these contentions, Defendants have relied in part on Plaintiff's Infringement Contentions. In those contentions, Plaintiff appears to pursue overly broad claim constructions in an effort to assert infringement where none exists, and to accuse products that do not infringe the claims. Defendants' assertion that a particular limitation is disclosed by a prior art reference and/or is disclosed in a particular manner may be based in part on Plaintiff's apparent claim interpretations. In relying on Plaintiff's apparent claim interpretations, Defendants do not admit that Plaintiff's apparent claim interpretations are supportable or proper or that the claim limitations in question are definite or otherwise amenable to construction.

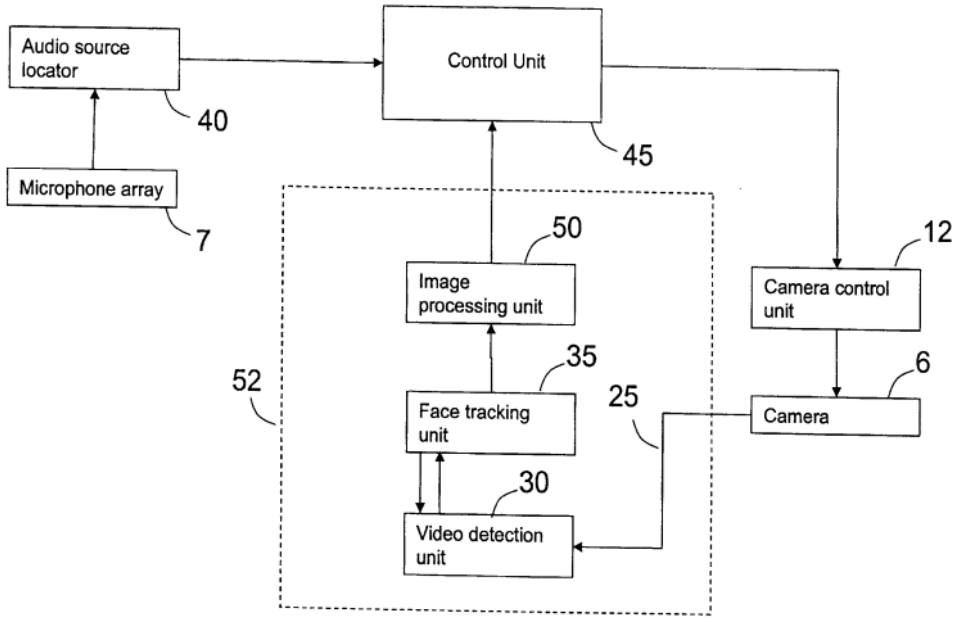
Defendants have endeavored to provide as much detail as possible in these contentions and, in doing so, have exceeded the level of detail required. The inclusion of specific details in some areas is not a concession that such details are required or that the omission of similar details in other areas is a defect. These citations to portions of any reference in this chart are exemplary only. Defendants will rely on the entirety of the references cited in this chart to show that the Asserted Claims are invalid.

Asserted Claim of the '110 Patent	Exemplary Citations to Enstad
Claim 1	
1[pre]. A computerized method for operating a display system, the display system having a camera, a monitor, and a processor, the method comprising:	To the extent the preamble is limiting, Enstad expressly and/or inherently discloses and/or renders obvious a computerized method for operating a display system, the display system having a camera, a monitor, and a processor. *See*, *e.g.*, disclosures below. "The present invention relates to automatic adjustment of camera orientation and zoom in situations, such as but not limited to, video conferencing." *See* para. [0002]. "It is an object of the present invention to provide a method and a system solving at least one of the above-mentioned problems in conventional systems. A non-limiting embodiment includes an automatic field adjustment system that ensures a good camera orientation for multiple situations (i.e., multiple configurations of people and/or equipment) in a video conferencing room. A non-limiting embodiment includes a method for automatically determining an orientation and zoom of an image pickup device associated with a video conferencing system, wherein the method includes the steps of: generating, at the image pickup device, an image signal representative of an image framed by the image pickup device; processing the image signal to identify objects plural users of the video conferencing system in the image; steering the image pickup device to an initial orientation; determining a location of all the identified objects relative to a reference point and determining respective sizes of the identified objects; defining an area of interest in the image, wherein the area of interest includes all the identified objects; and steering the image pickup device to frame the defined area of interest including all the identified objects where a center of the frame substantially coincides with a center of all the identified objects." *See* paras. [0008]-[0009]. "FIG. 1 illustrates a typical video conferencing room 10, with an exemplary video conferencing system 20. Video conferencing systems 20 may, for example, consist of the following components: a codec 11 (for coding and decoding audio and video information), a user input device 8 (i.e. remote control or keyboard), a image capture

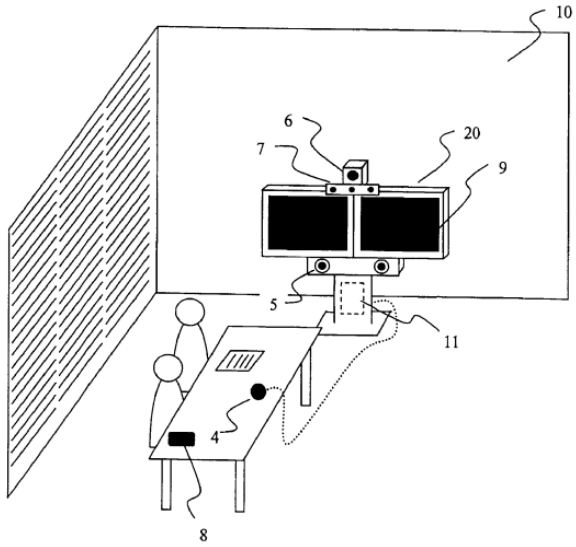
Asserted Claim of the '110 Patent	Exemplary Citations to Enstad
	device 6 (a camera, which can be a high-definition camera), an audio capture device 4 and/or 7 (microphone), a video display 9 (a screen which can be a high-definition display) and an audio reproduction device 5 (loudspeakers). Often, high end video conferencing systems (VCS) use high quality cameras 6 with motorized pan-, tilt-, and zoom capabilities." *See* para. [0026].  **Figure 1** "FIG. 2 schematically shows the components in the "best view" locator 52 according to a non-limiting embodiment of the present invention. While FIG. 2 shows examples of hardware, it should be understood that the present invention can be implement in hardware, software, firmware, or a combination of these. A video detection unit 30 is configured to continuously (or with very short intervals on an order of a second or millisecond) detect objects, e.g. faces and/or heads, in the frames

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	of a captured video signal. At predefined events (e.g. when the VCS is switched on, when initiated through the user input device 8, etc.) the camera zooms out to its maximum field of view (or near maximum field of view) and moves to a predefined pan- and tilt-orientation (azimuth- and elevation-angle), capturing as much as possible of the room 10 where the system is situated. The video detection unit 30 analyses the frames in the video signal and detects all the faces/heads and their location in the video frame relative to a predetermined and static reference point (e.g. the center of the frame). The face/head location and size (or area) in the video image is transformed into camera coordinates (azimuth- and elevation angles and zoom factors) Information about each detected face/head (e.g. position, size, etc.) is sent to an image processing unit 50 via face tracking unit 35. Based on said face/head information the image processing unit defines a rectangular area that at least comprises all the detected faces/heads. A predefined set of rules dictates how the area should be defined, and the area represents the best view of the people in the frame (or video conferencing room 10). The camera coordinates (azimuth- and elevation angles and zoom factors) for the defined area and its location are sent to a control unit 45. The control unit instructs a camera control unit 12 to move the camera to said camera coordinates, and the camera's 6 pan, tilt and zoom is adjusted to frame an image corresponding to the defined area. The image pickup device (or camera) 6 includes a camera control unit 12 for positioning the image pickup device. The camera control unit 12 is the steering mechanism. In one embodiment, the steering mechanism includes motors, controlling the pan- and tilt-orientation and the degree of zoom of the image pickup device 6. In another embodiment, the steering mechanism (or control unit 12) is configured to implement digital tilt, digital pan and digital zoom (i.e., digital pan/tilt/zoom). Digital zoom may be accomplished by cropping an image down to a centered area with the same aspect ratio as the original, and interpolating the result back up to the pixel dimensions of the original. It is accomplished electronically, without any adjustment of the camera's optics. Digital pan and tilt may be accomplished by using the cropped image and adjusting a viewing area within the larger original image. Also, other techniques of digital pan/tilt/zoom known to those of ordinary skill in the art may be used. It is possible that a combination of digital

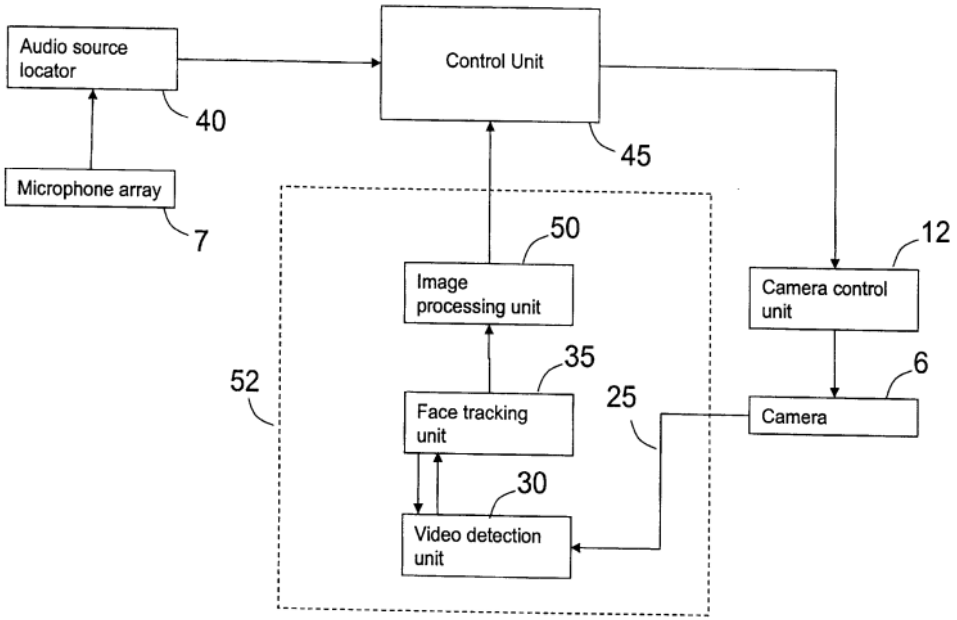
Asserted Claim of the ’110 Patent	Exemplary Citations to Enstad
	steering (digital pan/tilt/zoom) and mechanical steering may be used. An example of a camera with digital pan/tilt/zoom capability is the Tandberg 1000 camera. The camera control unit 12 can also report back its current azimuth- and elevation angles and zoom factors on demand. The image processing unit 50 and the control unit 45 may supply control signals to the camera control unit 12. Camera control unit 12 uses a camera coordinate system which indicates a location based on azimuth- and elevation angles and zoom factors which describe the direction of the captured frame relative to camera 6 and the degree of zoom. Video detection unit 30 is configured to convert coordinate measurements expressed in a video (or image) coordinate system to coordinate measurements expressed in the camera coordinate system using the azimuth- and elevation angles and zoom factors of camera 6 when the frame was captured by camera 6.” *See* paras. [0029]-[0032].

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	 **Figure 2** This limitation would have been obvious to a person of ordinary skill in the art based on (1) Enstad alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[a]. operating the camera to generate a stream of images of the user;	To the extent the preamble is limiting, Enstad expressly and/or inherently discloses and/or renders obvious operating the camera to generate a stream of images of the user. *See*, *e.g.*, disclosures below.

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	"The present invention relates to automatic adjustment of camera orientation and zoom in situations, such as but not limited to, video conferencing." *See* para. [0002]. "It is an object of the present invention to provide a method and a system solving at least one of the above-mentioned problems in conventional systems. A non-limiting embodiment includes an automatic field adjustment system that ensures a good camera orientation for multiple situations (i.e., multiple configurations of people and/or equipment) in a video conferencing room. A non-limiting embodiment includes a method for automatically determining an orientation and zoom of an image pickup device associated with a video conferencing system, wherein the method includes the steps of: generating, at the image pickup device, an image signal representative of an image framed by the image pickup device; processing the image signal to identify objects plural users of the video conferencing system in the image; steering the image pickup device to an initial orientation; determining a location of all the identified objects relative to a reference point and determining respective sizes of the identified objects; defining an area of interest in the image, wherein the area of interest includes all the identified objects; and steering the image pickup device to frame the defined area of interest including all the identified objects where a center of the frame substantially coincides with a center of all the identified objects." *See* paras. [0008]-[0009]. "FIG. 1 illustrates a typical video conferencing room 10, with an exemplary video conferencing system 20. Video conferencing systems 20 may, for example, consist of the following components: a codec 11 (for coding and decoding audio and video information), a user input device 8 (i.e. remote control or keyboard), a image capture device 6 (a camera, which can be a high-definition camera), an audio capture device 4 and/or 7 (microphone), a video display 9 (a screen which can be a high-definition display) and an audio reproduction device 5 (loudspeakers). Often, high end video conferencing systems (VCS) use high quality cameras 6 with motorized pan-, tilt-, and zoom capabilities." *See* para. [0026].

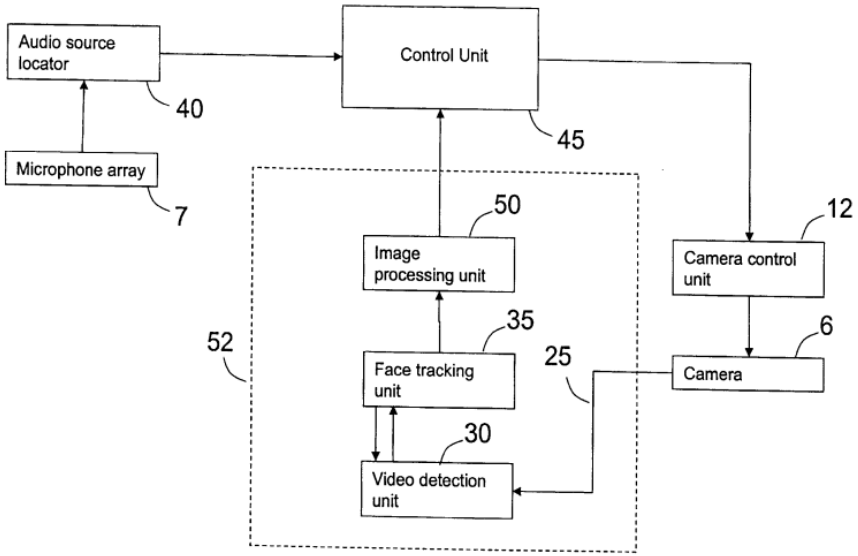
Asserted Claim of the ’110 Patent	Exemplary Citations to Enstad
	 **Figure 1** “FIG. 2 schematically shows the components in the “best view” locator 52 according to a non-limiting embodiment of the present invention. While FIG. 2 shows examples of hardware, it should be understood that the present invention can be implement in hardware, software, firmware, or a combination of these. A video detection unit 30 is configured to continuously (or with very short intervals on an order of a second or millisecond) detect objects, e.g. faces and/or heads, in the frames of a captured video signal. At predefined events (e.g. when the VCS is switched on, when initiated through the user input device 8, etc.) the camera zooms out to its maximum field of view (or near maximum field of view) and moves to a predefined pan- and tilt-orientation (azimuth- and elevation-angle), capturing as much as possible of the room 10 where the system is situated. The video detection unit 30 analyses the frames in the video signal and detects all the faces/heads and their location in the video frame

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	relative to a predetermined and static reference point (e.g. the center of the frame). The face/head location and size (or area) in the video image is transformed into camera coordinates (azimuth- and elevation angles and zoom factors) Information about each detected face/head (e.g. position, size, etc.) is sent to an image processing unit 50 via face tracking unit 35. Based on said face/head information the image processing unit defines a rectangular area that at least comprises all the detected faces/heads. A predefined set of rules dictates how the area should be defined, and the area represents the best view of the people in the frame (or video conferencing room 10). The camera coordinates (azimuth- and elevation angles and zoom factors) for the defined area and its location are sent to a control unit 45. The control unit instructs a camera control unit 12 to move the camera to said camera coordinates, and the camera's 6 pan, tilt and zoom is adjusted to frame an image corresponding to the defined area. The image pickup device (or camera) 6 includes a camera control unit 12 for positioning the image pickup device. The camera control unit 12 is the steering mechanism. In one embodiment, the steering mechanism includes motors, controlling the pan- and tilt-orientation and the degree of zoom of the image pickup device 6. In another embodiment, the steering mechanism (or control unit 12) is configured to implement digital tilt, digital pan and digital zoom (i.e., digital pan/tilt/zoom). Digital zoom may be accomplished by cropping an image down to a centered area with the same aspect ratio as the original, and interpolating the result back up to the pixel dimensions of the original. It is accomplished electronically, without any adjustment of the camera's optics. Digital pan and tilt may be accomplished by using the cropped image and adjusting a viewing area within the larger original image. Also, other techniques of digital pan/tilt/zoom known to those of ordinary skill in the art may be used. It is possible that a combination of digital steering (digital pan/tilt/zoom) and mechanical steering may be used. An example of a camera with digital pan/tilt/zoom capability is the Tandberg 1000 camera. The camera control unit 12 can also report back its current azimuth- and elevation angles and zoom factors on demand. The image processing unit 50 and the control unit 45 may supply control signals to the camera control unit 12. Camera control unit 12 uses a camera coordinate system which indicates a location based on azimuth- and elevation

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	angles and zoom factors which describe the direction of the captured frame relative to camera 6 and the degree of zoom. Video detection unit 30 is configured to convert coordinate measurements expressed in a video (or image) coordinate system to coordinate measurements expressed in the camera coordinate system using the azimuth- and elevation angles and zoom factors of camera 6 when the frame was captured by camera 6." *See* paras. [0029]-[0032].  **Figure 2** This limitation would have been obvious to a person of ordinary skill in the art based on (1) Enstad alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of

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	Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[b]. operating the processor to detect the presence of the user in the stream of image;	Enstad expressly and/or inherently discloses and/or renders obvious operating the processor to detect the presence of the user in the stream of image. *See*, *e.g.*, disclosures below. "Some video conferencing systems with Camera Tracking capabilities exist. However, the purpose of these systems is to automatically focus the camera on an active speaker. These systems are typically based on speaker localization by audio signal processing with a microphone array, and/or in combination with image processing. Some digital video cameras (for instance web-cams) use video analysis to detect, center on and follow the face of one person within a limited range of digital pan, tilt and zoom. However, these systems are only suitable for one person, require that the camera is initially correctly positioned and have a very limited digital working range. Hence, none of the conventional systems mentioned above describe a system for automated configuration of the camera in a video-conference setting." *See* paras. [0006]-[0007]. "A non-limiting embodiment includes a method for automatically determining an orientation and zoom of an image pickup device associated with a video conferencing system, wherein the method includes the steps of: generating, at the image pickup device, an image signal representative of an image framed by the image pickup device; processing the image signal to identify objects plural users of the video conferencing system in the image; steering the image pickup device to an initial orientation; determining a location of all the identified objects relative to a reference point and determining respective sizes of the identified objects; defining an area of interest in the image, wherein the area of interest includes all the identified objects; and steering the image pickup device to frame the defined area of interest including all the identified objects where a center of the frame substantially coincides with a center of all the identified objects." *See* para. [0009].

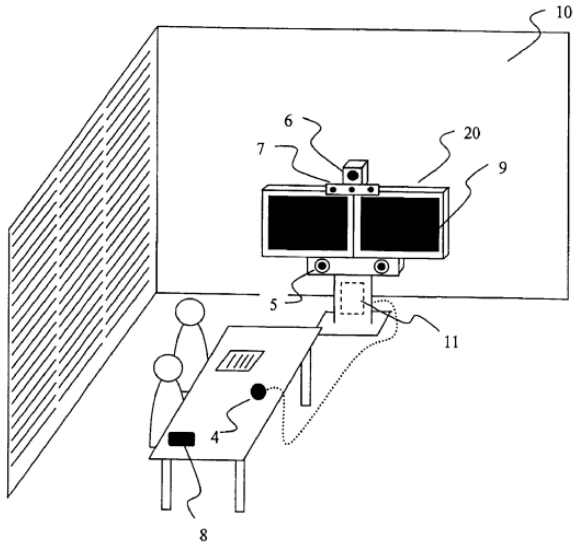
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	“Non-limiting embodiments of the present invention use video detection techniques to detect participants and their respective locations in video frames captured by the camera 6, and based on the location and sizes of the detected participants automatically determine and use the optimal camera orientation and zoom for capturing the best view of all the participants.” *See* para. [0027]. “A video detection unit 30 is configured to continuously (or with very short intervals on an order of a second or millisecond) detect objects, e.g. faces and/or heads, in the frames of a captured video signal. At predefined events (e.g. when the VCS is switched on, when initiated through the user input device 8, etc.) the camera zooms out to its maximum field of view (or near maximum field of view) and moves to a predefined pan- and tilt-orientation (azimuth- and elevation-angle), capturing as much as possible of the room 10 where the system is situated. The video detection unit 30 analyses the frames in the video signal and detects all the faces/heads and their location in the video frame relative to a predetermined and static reference point (e.g. the center of the frame). The face/head location and size (or area) in the video image is transformed into camera coordinates (azimuth- and elevation angles and zoom factors) Information about each detected face/head (e.g. position, size, etc.) is sent to an image processing unit 50 via face tracking unit 35. Based on said face/head information the image processing unit defines a rectangular area that at least comprises all the detected faces/heads. A predefined set of rules dictates how the area should be defined, and the area represents the best view of the people in the frame (or video conferencing room 10). The camera coordinates (azimuth- and elevation angles and zoom factors) for the defined area and its location are sent to a control unit 45. The control unit instructs a camera control unit 12 to move the camera to said camera coordinates, and the camera's 6 pan, tilt and zoom is adjusted to frame an image corresponding to the defined area.” *See* para. [0030].

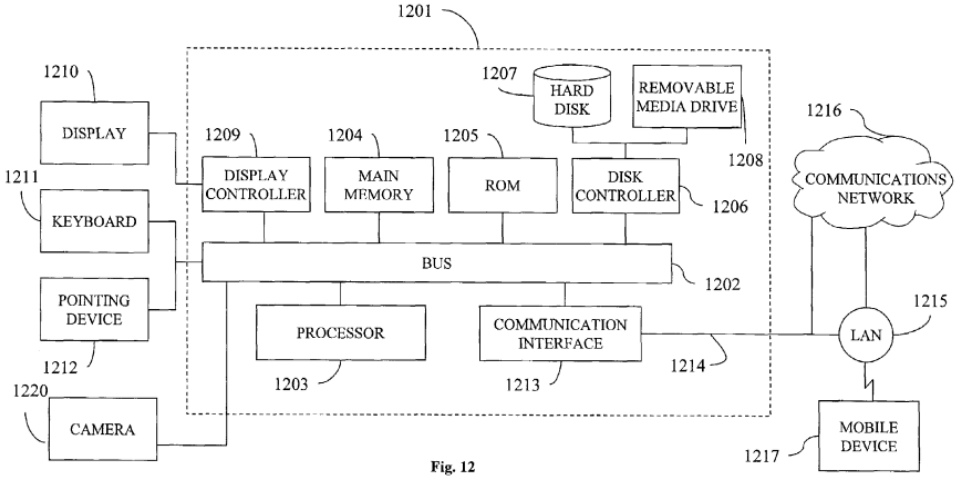
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	 **Figure 2** “According to another exemplary embodiment of the invention, the camera is configured to capture the entire room by examining a set of initial orientations (14, 15) with a maximum field of view, and where the set's fields of view overlaps. In most cases, a set of 2 orientations will suffice. However, the number of orientations will depend on the cameras maximum field of view, and may be 3, 4, 5, 6, etc. For each orientation (14, 15) the one or more video frames are analyzed by video detection unit 30 to detect faces and/or heads and their respective locations. After analyzing all the orientations, the image processing unit 50 calculates the pan- and tilt orientation that includes all or a maximum amount possible of the detected participants, and defines said calculated orientation as the initial orientation.

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	A video detection unit 30 analyzes the video signals 25 from the camera 6 to detect and localize faces and/or heads (step 70) in a video frame. The video detection unit 30 measures the offset of the location of the detected faces/heads from some pre-determined and static reference point (for example, the center of the video image). Different algorithms can be used for the object detection. Given an arbitrary video frame, the goal of face detection algorithms is to determine whether or not there are any faces in the image, and if present, return the image location and area (size) of each image of a face. Referring to FIG. 5, according to one exemplary embodiment of the present invention, an analysis window 33 is moved (or scanned) over the image. For each position of the analysis window 33, the image information within the analysis window 33 is analyzed at least with respect to the presence of typical facial features. However, it should be understood that the present invention is not limited to the use of this type of face detection. Further, head detection algorithms, known to those of ordinary skill in the art, may also be used to detect participants whose heads are not orientated towards the camera. When an image of a face/head is detected, the video detection unit 30 defines a rectangular segment (or box) surrounding said image of a face/head. According to one embodiment of the invention, said rectangular segment is the analysis window 33. The location of said segment containing an image of a face/head is measured relative to a video coordinate system which is based on the video frame. The video coordinate system applies to each frame captured by camera 6. The video coordinate system has a horizontal or x-axis and a vertical or y-axis. When determining a position of a pixel or an image, video detection unit 30 determine that position relative the x-axis and the y-axis of that pixel's or image's video frame. In one exemplary embodiment of the invention, the analysis window 33 center point 31 (pixel in the middle of the window) is the location reference point, and its location is defined by the coordinates x and y in said video coordinate system. When the video detection unit 30 has calculated the location (x,y) and size (e.g. dx=20 dy=24 pixels) of all the faces/heads in a frame, the video detection unit 30 uses knowledge of the video frame, optics and mechanics to calculate (step 80) the corresponding location (α,φ) and size (Δα,Δφ) in azimuth and elevation

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	angles in the camera coordinate system for each image of a face/head. The camera coordinates for each face/head are then sent to a face tracking unit 35. Face tracking unit 35 correlates the detected faces from the current video frame to the detected faces in the previous video frames and hence tracks the detected faces through a series of frames. Only if a face/head is detected at substantially the same location throughout a series of frames, the detection is validated or registered as a positive detection. First of all this prevents false face detections, unless the same detection occurs in several consecutive video frames. Also, if the face detection unit fails to detect a face in the substantially same coordinates as a face has been detected before, the image tracking unit does not consider the face as absent from the image unless the detection has failed in several consecutive frames. This is to prevent false negative detections. Further, the tracking allows for obtaining a proper position of a participant who may be moving in a video frame. To perform this tracking, face tracking unit 35 creates and maintains a track file for each detected face. The track file can, for example, be stored in a memory device such as random access memory or a hard drive." *See* paras. [0035]-[0039]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Enstad alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[c]. operating the processor to apply adaptive transformation mapping to the stream of images captured by the camera to generate modified images that appear to be captured from a different point of view of the camera's actual point of view; and	Enstad expressly and/or inherently discloses and/or renders obvious operating the processor to apply adaptive transformation mapping to the stream of images captured by the camera to generate modified images that appear to be captured from a different point of view of the camera's actual point of view. *See*, *e.g.*, disclosures below. "The video detection unit 30 analyses the frames in the video signal and detects all the faces/heads and their location in the video frame relative to a predetermined and static reference point (e.g. the center of the frame). The face/head location and size (or area)

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	in the video image is transformed into camera coordinates (azimuth- and elevation angles and zoom factors) Information about each detected face/head (e.g. position, size, etc.) is sent to an image processing unit 50 via face tracking unit 35. Based on said face/head information the image processing unit defines a rectangular area that at least comprises all the detected faces/heads. A predefined set of rules dictates how the area should be defined, and the area represents the best view of the people in the frame (or video conferencing room 10). The camera coordinates (azimuth- and elevation angles and zoom factors) for the defined area and its location are sent to a control unit 45. The control unit instructs a camera control unit 12 to move the camera to said camera coordinates, and the camera's 6 pan, tilt and zoom is adjusted to frame an image corresponding to the defined area." *See* para. [0030]. "Digital zoom may be accomplished by cropping an image down to a centered area with the same aspect ratio as the original, and interpolating the result back up to the pixel dimensions of the original. It is accomplished electronically, without any adjustment of the camera's optics. Digital pan and tilt may be accomplished by using the cropped image and adjusting a viewing area within the larger original image. Also, other techniques of digital pan/tilt/zoom known to those of ordinary skill in the art may be used. It is possible that a combination of digital steering (digital pan/tilt/zoom) and mechanical steering may be used. An example of a camera with digital pan/tilt/zoom capability is the Tandberg 1000 camera." *See* para. [0031]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Enstad alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[d]. displaying the modified images on the monitor;	Enstad expressly and/or inherently discloses and/or renders obvious displaying the modified images on the monitor. *See*, *e.g.*, disclosures below.

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	 **Figure 1** “The computer system 1201 may also include a display controller 1209 coupled to the bus 1202 to control a display 1210, such as a cathode ray tube (CRT) or LCD display, for displaying information to a computer user. The computer system includes input devices, such as a keyboard 1211 and a pointing device 1212, for interacting with a computer user and providing information to the processor 1203. The pointing device 1212, for example, may be a mouse, a trackball, or a pointing stick for communicating direction information and command selections to the processor 1203 and for controlling cursor movement on the display 1210. In addition, a printer may provide printed listings of data stored and/or generated by the computer system 1201.” *See* para. [0057].

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	 Fig. 12 This limitation would have been obvious to a person of ordinary skill in the art based on (1) Enstad alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[e]. wherein the different point of view corresponds to an image taken from a different angle and a different distance than the actual images captured by the camera; and	Enstad expressly and/or inherently discloses and/or renders obvious wherein the different point of view corresponds to an image taken from a different angle and a different distance than the actual images captured by the camera. *See*, *e.g.*, disclosures below. "The video detection unit 30 analyses the frames in the video signal and detects all the faces/heads and their location in the video frame relative to a predetermined and static reference point (e.g. the center of the frame). The face/head location and size (or area) in the video image is transformed into camera coordinates (azimuth- and elevation angles and zoom factors) Information about each detected face/head (e.g. position, size, etc.) is sent to an image processing unit 50 via face tracking unit 35. Based on said face/head

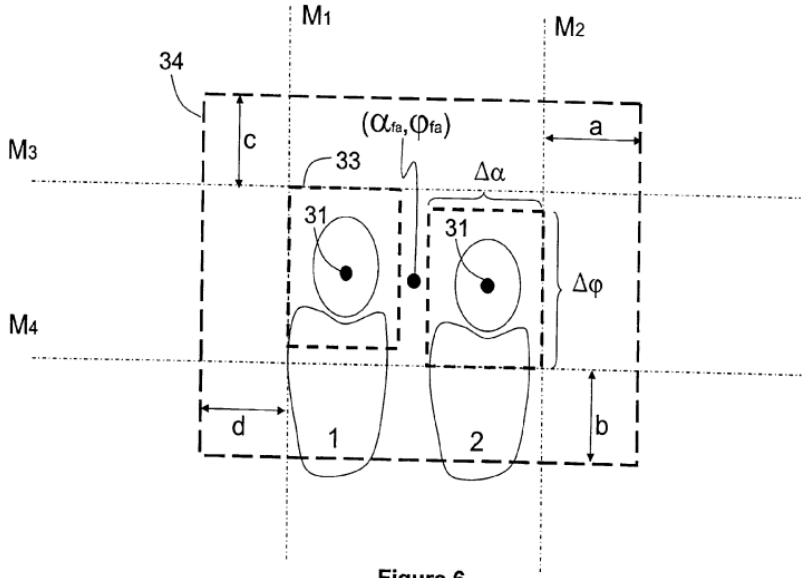
Asserted Claim of the ’110 Patent	Exemplary Citations to Enstad
	information the image processing unit defines a rectangular area that at least comprises all the detected faces/heads. A predefined set of rules dictates how the area should be defined, and the area represents the best view of the people in the frame (or video conferencing room 10). The camera coordinates (azimuth- and elevation angles and zoom factors) for the defined area and its location are sent to a control unit 45. The control unit instructs a camera control unit 12 to move the camera to said camera coordinates, and the camera's 6 pan, tilt and zoom is adjusted to frame an image corresponding to the defined area. Digital zoom may be accomplished by cropping an image down to a centered area with the same aspect ratio as the original, and interpolating the result back up to the pixel dimensions of the original. It is accomplished electronically, without any adjustment of the camera's optics. Digital pan and tilt may be accomplished by using the cropped image and adjusting a viewing area within the larger original image. Also, other techniques of digital pan/tilt/zoom known to those of ordinary skill in the art may be used. It is possible that a combination of digital steering (digital pan/tilt/zoom) and mechanical steering may be used. An example of a camera with digital pan/tilt/zoom capability is the Tandberg 1000 camera. The camera control unit 12 can also report back its current azimuth- and elevation angles and zoom factors on demand. The image processing unit 50 and the control unit 45 may supply control signals to the camera control unit 12. Camera control unit 12 uses a camera coordinate system which indicates a location based on azimuth- and elevation angles and zoom factors which describe the direction of the captured frame relative to camera 6 and the degree of zoom. Video detection unit 30 is configured to convert coordinate measurements expressed in a video (or image) coordinate system to coordinate measurements expressed in the camera coordinate system using the azimuth- and elevation angles and zoom factors of camera 6 when the frame was captured by camera 6. FIG. 3 is a flow chart of the operation of the “best view” locator 52. Camera 6 outputs a video signal comprising a series of frames (images). The frames are analyzed by the

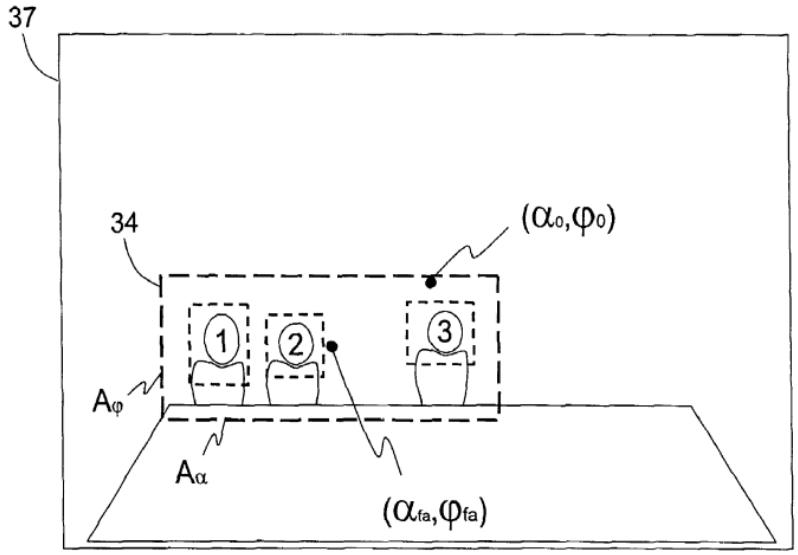
Asserted Claim of the '110 Patent	Exemplary Citations to Enstad
	video detection unit 30. At predefined events, the camera control unit 12 is instructed to move the camera to an initial orientation (step 60). The object of the initial orientation is to make sure that the camera can "see" all the persons in the meeting room. There are several ways of deciding such an initial orientation." *See* paras. [0030]-[0033]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Enstad alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[f]. wherein during mirror tracking mode the processor utilizes the angle of the images captured by the camera and applies parametric input for a mapping transformation that changes imaging perspective of the images captured by the camera.	Enstad expressly and/or inherently discloses and/or renders obvious wherein during mirror tracking mode the processor utilizes the angle of the images captured by the camera and applies parametric input for a mapping transformation that changes imaging perspective of the images captured by the camera. *See*, *e.g.*, disclosures below. "The video detection unit 30 analyses the frames in the video signal and detects all the faces/heads and their location in the video frame relative to a predetermined and static reference point (e.g. the center of the frame). The face/head location and size (or area) in the video image is transformed into camera coordinates (azimuth- and elevation angles and zoom factors) Information about each detected face/head (e.g. position, size, etc.) is sent to an image processing unit 50 via face tracking unit 35. Based on said face/head information the image processing unit defines a rectangular area that at least comprises all the detected faces/heads. A predefined set of rules dictates how the area should be defined, and the area represents the best view of the people in the frame (or video conferencing room 10). The camera coordinates (azimuth- and elevation angles and zoom factors) for the defined area and its location are sent to a control unit 45. The control unit instructs a camera control unit 12 to move the camera to said camera coordinates, and the camera's 6 pan, tilt and zoom is adjusted to frame an image corresponding to the defined area.

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	Digital zoom may be accomplished by cropping an image down to a centered area with the same aspect ratio as the original, and interpolating the result back up to the pixel dimensions of the original. It is accomplished electronically, without any adjustment of the camera's optics. Digital pan and tilt may be accomplished by using the cropped image and adjusting a viewing area within the larger original image. Also, other techniques of digital pan/tilt/zoom known to those of ordinary skill in the art may be used. It is possible that a combination of digital steering (digital pan/tilt/zoom) and mechanical steering may be used. An example of a camera with digital pan/tilt/zoom capability is the Tandberg 1000 camera. The camera control unit 12 can also report back its current azimuth- and elevation angles and zoom factors on demand. The image processing unit 50 and the control unit 45 may supply control signals to the camera control unit 12. Camera control unit 12 uses a camera coordinate system which indicates a location based on azimuth- and elevation angles and zoom factors which describe the direction of the captured frame relative to camera 6 and the degree of zoom. Video detection unit 30 is configured to convert coordinate measurements expressed in a video (or image) coordinate system to coordinate measurements expressed in the camera coordinate system using the azimuth- and elevation angles and zoom factors of camera 6 when the frame was captured by camera 6. FIG. 3 is a flow chart of the operation of the "best view" locator 52. Camera 6 outputs a video signal comprising a series of frames (images). The frames are analyzed by the video detection unit 30. At predefined events, the camera control unit 12 is instructed to move the camera to an initial orientation (step 60). The object of the initial orientation is to make sure that the camera can "see" all the persons in the meeting room. There are several ways of deciding such an initial orientation." *See* paras. [0030]-[0033]. "In step 90, the image processing unit 50 defines an area of interest 34 (best view). The area of interest 34 is shown in the in FIG. 6, where the area 34 at least comprises all the detected images of faces in that frame.

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	According to one embodiment of the invention, based on the location (α,φ) of each face and their corresponding sizes (Δα,Δφ), the image processing unit 50 may calculate a first area restricted by a set of margins (M1, M2, M3 and M4), where the margins are derived from the left side of the leftmost face segment (M1), upper side of the uppermost face segment (M3), right side of the rightmost face segment (M2) and the bottom side of the bottommost face segment (M4). The location of the center (αfa,φfa) of the first area can now be calculated in camera coordinates based on the margins. The location of the first area is relative to a reference point (α0,φ0), typically the direction of the camera when azimuth and elevation angle is zero. Further, the width and height of the first area is transformed into a zoom factor (Zfa). This first area is very close to the participants' faces and may not represent the most comfortable view (best view) of the participants, especially when only two participants are present as shown in this exemplary embodiment. Therefore, when said margins (M1, M2, M3 and M4) has been calculated, a second area (best view frame 34) is defined by expanding the margins by a set of offset values a,b,c and d. These offset values may be equal, or they may differ, e.g. to capture more of the table in front of the participants than above a participants head. The offset values may be preset and static, or they may be calculated to fit each situation. According to another exemplary embodiment, the best view frame 34 is defined by just subtracting a compensation value Zc from the calculated zoom factor Zfa, making the camera zoom out an additional distance. The compensation value Zc may be static, or vary linearly depending on the size of the first area zoom factor Zfa. FIG. 7 schematically shows an exemplary video frame taken from an initial camera orientation. 3 faces have been detected in the video frame, and the image processing unit 50 has defined a best view frame 34, and calculated the location (αfa,φfa) of the best view frame. Most image pickup devices 6 for video conferencing systems operate with standard television image aspect ratios, e.g. 4:3 (1.33:1) or 16:9 (1.78:1). Since most calculated

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	best view frames 34 as described above have aspect ratios that deviate from the standards, e.g. 4:3 or 16:9, some considerations must be made when deciding the zoom coordinate. Since Aφ is the shortest edge of area 34, if the camera zooms in to capture the exact height Aφ, large parts of the area will miss the light sensitive area (e.g. image sensor) in the camera because its aspect ratio is different than the defined area. If the camera zooms in to capture the exact width Aα of the defined area 34, no information is lost. Therefore, according to one exemplary embodiment of the present invention, the two sides Aφ and Aα of the best view frame 34 are compared. Each of the two sides defines a zoom factor needed to fit the area of interest in the image frame, in the horizontal and vertical direction respectively. Thus, the degree of zoom is defined by the smallest of the two calculated zoom factors, ensuring that the area of interest is not cropped when zooming to the area of interest.” *See* paras. [0040]-[0046].

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	 Figure 6

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	 **Figure 7** This limitation would have been obvious to a person of ordinary skill in the art based on (1) Enstad alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

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Claim 2	
2. The method of claim 1, wherein the mapping transformation comprises a	Enstad expressly and/or inherently discloses and/or renders obvious wherein the mapping transformation comprises a combination of at least two of the following

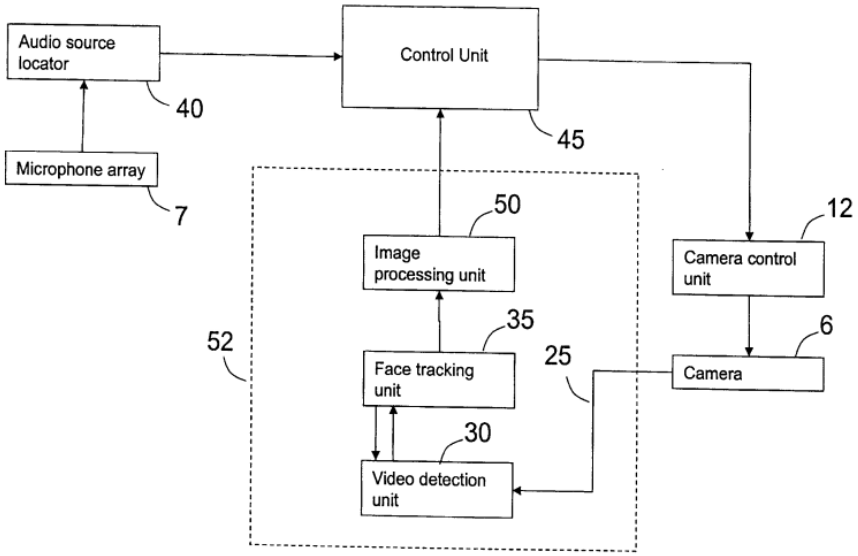
Asserted Claim of the '110 Patent	Exemplary Citations to Enstad
combination of at least two of the following transformations: vertical flips about a vertical axis, a projection transformation, rotation, resize, two-dimensional offset, optic distortion correction, and polynomial mapping on part or entire captured image.	transformations: vertical flips about a vertical axis, a projection transformation, rotation, resize, two-dimensional offset, optic distortion correction, and polynomial mapping on part or entire captured image. *See*, *e.g.*, disclosures below. "The video detection unit 30 analyses the frames in the video signal and detects all the faces/heads and their location in the video frame relative to a predetermined and static reference point (e.g. the center of the frame). The face/head location and size (or area) in the video image is transformed into camera coordinates (azimuth- and elevation angles and zoom factors) Information about each detected face/head (e.g. position, size, etc.) is sent to an image processing unit 50 via face tracking unit 35. Based on said face/head information the image processing unit defines a rectangular area that at least comprises all the detected faces/heads. A predefined set of rules dictates how the area should be defined, and the area represents the best view of the people in the frame (or video conferencing room 10). The camera coordinates (azimuth- and elevation angles and zoom factors) for the defined area and its location are sent to a control unit 45. The control unit instructs a camera control unit 12 to move the camera to said camera coordinates, and the camera's 6 pan, tilt and zoom is adjusted to frame an image corresponding to the defined area. Digital zoom may be accomplished by cropping an image down to a centered area with the same aspect ratio as the original, and interpolating the result back up to the pixel dimensions of the original. It is accomplished electronically, without any adjustment of the camera's optics. Digital pan and tilt may be accomplished by using the cropped image and adjusting a viewing area within the larger original image. Also, other techniques of digital pan/tilt/zoom known to those of ordinary skill in the art may be used. It is possible that a combination of digital steering (digital pan/tilt/zoom) and mechanical steering may be used. An example of a camera with digital pan/tilt/zoom capability is the Tandberg 1000 camera. The camera control unit 12 can also report back its current azimuth- and elevation angles and zoom factors on demand. The image processing unit 50 and the control unit 45 may supply control signals to the camera control unit 12. Camera control unit 12 uses a

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	camera coordinate system which indicates a location based on azimuth- and elevation angles and zoom factors which describe the direction of the captured frame relative to camera 6 and the degree of zoom. Video detection unit 30 is configured to convert coordinate measurements expressed in a video (or image) coordinate system to coordinate measurements expressed in the camera coordinate system using the azimuth- and elevation angles and zoom factors of camera 6 when the frame was captured by camera 6. FIG. 3 is a flow chart of the operation of the "best view" locator 52. Camera 6 outputs a video signal comprising a series of frames (images). The frames are analyzed by the video detection unit 30. At predefined events, the camera control unit 12 is instructed to move the camera to an initial orientation (step 60). The object of the initial orientation is to make sure that the camera can "see" all the persons in the meeting room. There are several ways of deciding such an initial orientation." *See* paras. [0030]-[0033]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Enstad alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

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Claim 3	
3. The method of claim 1, wherein during idle mode the camera continuously sends captured images to the processor, and the user presence is identified by the processor detecting a body part in the images.	Enstad expressly and/or inherently discloses and/or renders obvious wherein during idle mode the camera continuously sends captured images to the processor, and the user presence is identified by the processor detecting a body part in the images. *See*, *e.g.*, disclosures below.

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	"Some video conferencing systems with Camera Tracking capabilities exist. However, the purpose of these systems is to automatically focus the camera on an active speaker. These systems are typically based on speaker localization by audio signal processing with a microphone array, and/or in combination with image processing. Some digital video cameras (for instance web-cams) use video analysis to detect, center on and follow the face of one person within a limited range of digital pan, tilt and zoom. However, these systems are only suitable for one person, require that the camera is initially correctly positioned and have a very limited digital working range. Hence, none of the conventional systems mentioned above describe a system for automated configuration of the camera in a video-conference setting." *See* paras. [0006]-[0007]. "A non-limiting embodiment includes a method for automatically determining an orientation and zoom of an image pickup device associated with a video conferencing system, wherein the method includes the steps of: generating, at the image pickup device, an image signal representative of an image framed by the image pickup device; processing the image signal to identify objects plural users of the video conferencing system in the image; steering the image pickup device to an initial orientation; determining a location of all the identified objects relative to a reference point and determining respective sizes of the identified objects; defining an area of interest in the image, wherein the area of interest includes all the identified objects; and steering the image pickup device to frame the defined area of interest including all the identified objects where a center of the frame substantially coincides with a center of all the identified objects." *See* para. [0009]. "Non-limiting embodiments of the present invention use video detection techniques to detect participants and their respective locations in video frames captured by the camera 6, and based on the location and sizes of the detected participants automatically determine and use the optimal camera orientation and zoom for capturing the best view of all the participants." *See* para. [0027].

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	“A video detection unit 30 is configured to continuously (or with very short intervals on an order of a second or millisecond) detect objects, e.g. faces and/or heads, in the frames of a captured video signal. At predefined events (e.g. when the VCS is switched on, when initiated through the user input device 8, etc.) the camera zooms out to its maximum field of view (or near maximum field of view) and moves to a predefined pan- and tilt-orientation (azimuth- and elevation-angle), capturing as much as possible of the room 10 where the system is situated. The video detection unit 30 analyses the frames in the video signal and detects all the faces/heads and their location in the video frame relative to a predetermined and static reference point (e.g. the center of the frame). The face/head location and size (or area) in the video image is transformed into camera coordinates (azimuth- and elevation angles and zoom factors) Information about each detected face/head (e.g. position, size, etc.) is sent to an image processing unit 50 via face tracking unit 35. Based on said face/head information the image processing unit defines a rectangular area that at least comprises all the detected faces/heads. A predefined set of rules dictates how the area should be defined, and the area represents the best view of the people in the frame (or video conferencing room 10). The camera coordinates (azimuth- and elevation angles and zoom factors) for the defined area and its location are sent to a control unit 45. The control unit instructs a camera control unit 12 to move the camera to said camera coordinates, and the camera's 6 pan, tilt and zoom is adjusted to frame an image corresponding to the defined area.” *See* para. [0030].

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	 **Figure 2** “According to another exemplary embodiment of the invention, the camera is configured to capture the entire room by examining a set of initial orientations (14, 15) with a maximum field of view, and where the set's fields of view overlaps. In most cases, a set of 2 orientations will suffice. However, the number of orientations will depend on the cameras maximum field of view, and may be 3, 4, 5, 6, etc. For each orientation (14, 15) the one or more video frames are analyzed by video detection unit 30 to detect faces and/or heads and their respective locations. After analyzing all the orientations, the image processing unit 50 calculates the pan- and tilt orientation that includes all or a maximum amount possible of the detected participants, and defines said calculated orientation as the initial orientation.

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	A video detection unit 30 analyzes the video signals 25 from the camera 6 to detect and localize faces and/or heads (step 70) in a video frame. The video detection unit 30 measures the offset of the location of the detected faces/heads from some pre-determined and static reference point (for example, the center of the video image). Different algorithms can be used for the object detection. Given an arbitrary video frame, the goal of face detection algorithms is to determine whether or not there are any faces in the image, and if present, return the image location and area (size) of each image of a face. Referring to FIG. 5, according to one exemplary embodiment of the present invention, an analysis window 33 is moved (or scanned) over the image. For each position of the analysis window 33, the image information within the analysis window 33 is analyzed at least with respect to the presence of typical facial features. However, it should be understood that the present invention is not limited to the use of this type of face detection. Further, head detection algorithms, known to those of ordinary skill in the art, may also be used to detect participants whose heads are not orientated towards the camera. When an image of a face/head is detected, the video detection unit 30 defines a rectangular segment (or box) surrounding said image of a face/head. According to one embodiment of the invention, said rectangular segment is the analysis window 33. The location of said segment containing an image of a face/head is measured relative to a video coordinate system which is based on the video frame. The video coordinate system applies to each frame captured by camera 6. The video coordinate system has a horizontal or x-axis and a vertical or y-axis. When determining a position of a pixel or an image, video detection unit 30 determine that position relative the x-axis and the y-axis of that pixel's or image's video frame. In one exemplary embodiment of the invention, the analysis window 33 center point 31 (pixel in the middle of the window) is the location reference point, and its location is defined by the coordinates x and y in said video coordinate system. When the video detection unit 30 has calculated the location (x,y) and size (e.g. dx=20 dy=24 pixels) of all the faces/heads in a frame, the video detection unit 30 uses knowledge of the video frame, optics and mechanics to calculate (step 80) the corresponding location (α,φ) and size (Δα,Δφ) in azimuth and elevation

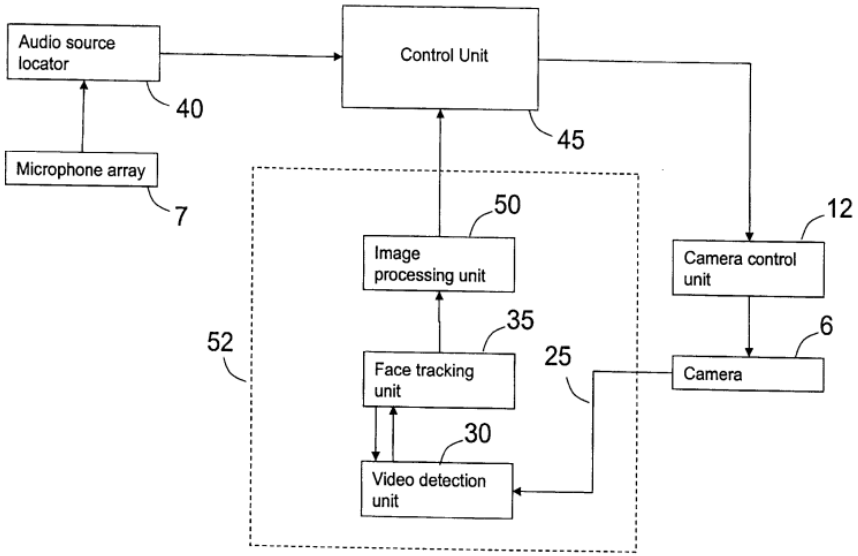
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	angles in the camera coordinate system for each image of a face/head. The camera coordinates for each face/head are then sent to a face tracking unit 35. Face tracking unit 35 correlates the detected faces from the current video frame to the detected faces in the previous video frames and hence tracks the detected faces through a series of frames. Only if a face/head is detected at substantially the same location throughout a series of frames, the detection is validated or registered as a positive detection. First of all this prevents false face detections, unless the same detection occurs in several consecutive video frames. Also, if the face detection unit fails to detect a face in the substantially same coordinates as a face has been detected before, the image tracking unit does not consider the face as absent from the image unless the detection has failed in several consecutive frames. This is to prevent false negative detections. Further, the tracking allows for obtaining a proper position of a participant who may be moving in a video frame. To perform this tracking, face tracking unit 35 creates and maintains a track file for each detected face. The track file can, for example, be stored in a memory device such as random access memory or a hard drive.” *See* paras. [0035]-[0039]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Enstad alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

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Claim 4	

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4. The method of claim 3, wherein the body part comprises one of legs, face, eyes, and hands.	Enstad expressly and/or inherently discloses and/or renders obvious wherein the body part comprises one of legs, face, eyes, and hands. *See*, *e.g.*, disclosures below. "Some video conferencing systems with Camera Tracking capabilities exist. However, the purpose of these systems is to automatically focus the camera on an active speaker. These systems are typically based on speaker localization by audio signal processing with a microphone array, and/or in combination with image processing. Some digital video cameras (for instance web-cams) use video analysis to detect, center on and follow the face of one person within a limited range of digital pan, tilt and zoom. However, these systems are only suitable for one person, require that the camera is initially correctly positioned and have a very limited digital working range. Hence, none of the conventional systems mentioned above describe a system for automated configuration of the camera in a video-conference setting." *See* paras. [0006]-[0007]. "A non-limiting embodiment includes a method for automatically determining an orientation and zoom of an image pickup device associated with a video conferencing system, wherein the method includes the steps of: generating, at the image pickup device, an image signal representative of an image framed by the image pickup device; processing the image signal to identify objects plural users of the video conferencing system in the image; steering the image pickup device to an initial orientation; determining a location of all the identified objects relative to a reference point and determining respective sizes of the identified objects; defining an area of interest in the image, wherein the area of interest includes all the identified objects; and steering the image pickup device to frame the defined area of interest including all the identified objects where a center of the frame substantially coincides with a center of all the identified objects." *See* para. [0009]. "Non-limiting embodiments of the present invention use video detection techniques to detect participants and their respective locations in video frames captured by the camera 6, and based on the location and sizes of the detected participants automatically

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	determine and use the optimal camera orientation and zoom for capturing the best view of all the participants.” *See* para. [0027]. “A video detection unit 30 is configured to continuously (or with very short intervals on an order of a second or millisecond) detect objects, e.g. faces and/or heads, in the frames of a captured video signal. At predefined events (e.g. when the VCS is switched on, when initiated through the user input device 8, etc.) the camera zooms out to its maximum field of view (or near maximum field of view) and moves to a predefined pan- and tilt-orientation (azimuth- and elevation-angle), capturing as much as possible of the room 10 where the system is situated. The video detection unit 30 analyses the frames in the video signal and detects all the faces/heads and their location in the video frame relative to a predetermined and static reference point (e.g. the center of the frame). The face/head location and size (or area) in the video image is transformed into camera coordinates (azimuth- and elevation angles and zoom factors) Information about each detected face/head (e.g. position, size, etc.) is sent to an image processing unit 50 via face tracking unit 35. Based on said face/head information the image processing unit defines a rectangular area that at least comprises all the detected faces/heads. A predefined set of rules dictates how the area should be defined, and the area represents the best view of the people in the frame (or video conferencing room 10). The camera coordinates (azimuth- and elevation angles and zoom factors) for the defined area and its location are sent to a control unit 45. The control unit instructs a camera control unit 12 to move the camera to said camera coordinates, and the camera's 6 pan, tilt and zoom is adjusted to frame an image corresponding to the defined area.” *See* para. [0030].

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	 **Figure 2** “According to another exemplary embodiment of the invention, the camera is configured to capture the entire room by examining a set of initial orientations (14, 15) with a maximum field of view, and where the set's fields of view overlaps. In most cases, a set of 2 orientations will suffice. However, the number of orientations will depend on the cameras maximum field of view, and may be 3, 4, 5, 6, etc. For each orientation (14, 15) the one or more video frames are analyzed by video detection unit 30 to detect faces and/or heads and their respective locations. After analyzing all the orientations, the image processing unit 50 calculates the pan- and tilt orientation that includes all or a maximum amount possible of the detected participants, and defines said calculated orientation as the initial orientation.

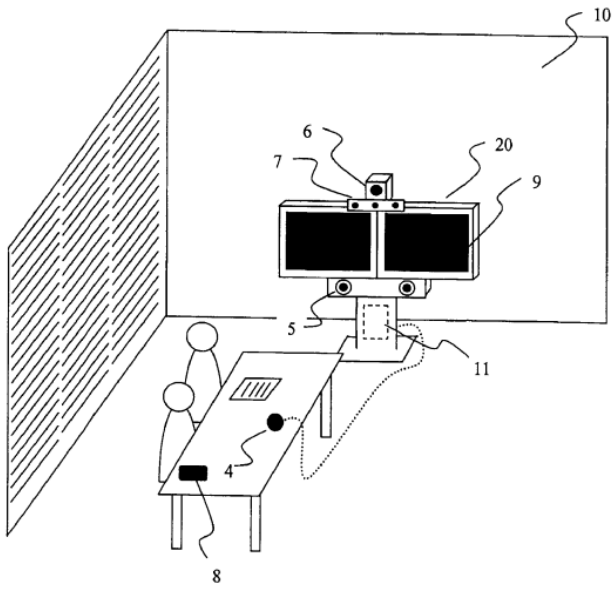
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	A video detection unit 30 analyzes the video signals 25 from the camera 6 to detect and localize faces and/or heads (step 70) in a video frame. The video detection unit 30 measures the offset of the location of the detected faces/heads from some pre-determined and static reference point (for example, the center of the video image). Different algorithms can be used for the object detection. Given an arbitrary video frame, the goal of face detection algorithms is to determine whether or not there are any faces in the image, and if present, return the image location and area (size) of each image of a face. Referring to FIG. 5, according to one exemplary embodiment of the present invention, an analysis window 33 is moved (or scanned) over the image. For each position of the analysis window 33, the image information within the analysis window 33 is analyzed at least with respect to the presence of typical facial features. However, it should be understood that the present invention is not limited to the use of this type of face detection. Further, head detection algorithms, known to those of ordinary skill in the art, may also be used to detect participants whose heads are not orientated towards the camera. When an image of a face/head is detected, the video detection unit 30 defines a rectangular segment (or box) surrounding said image of a face/head. According to one embodiment of the invention, said rectangular segment is the analysis window 33. The location of said segment containing an image of a face/head is measured relative to a video coordinate system which is based on the video frame. The video coordinate system applies to each frame captured by camera 6. The video coordinate system has a horizontal or x-axis and a vertical or y-axis. When determining a position of a pixel or an image, video detection unit 30 determine that position relative the x-axis and the y-axis of that pixel's or image's video frame. In one exemplary embodiment of the invention, the analysis window 33 center point 31 (pixel in the middle of the window) is the location reference point, and its location is defined by the coordinates x and y in said video coordinate system. When the video detection unit 30 has calculated the location (x,y) and size (e.g. dx=20 dy=24 pixels) of all the faces/heads in a frame, the video detection unit 30 uses knowledge of the video frame, optics and mechanics to calculate (step 80) the corresponding location (α,φ) and size (Δα,Δφ) in azimuth and elevation

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	angles in the camera coordinate system for each image of a face/head. The camera coordinates for each face/head are then sent to a face tracking unit 35. Face tracking unit 35 correlates the detected faces from the current video frame to the detected faces in the previous video frames and hence tracks the detected faces through a series of frames. Only if a face/head is detected at substantially the same location throughout a series of frames, the detection is validated or registered as a positive detection. First of all this prevents false face detections, unless the same detection occurs in several consecutive video frames. Also, if the face detection unit fails to detect a face in the substantially same coordinates as a face has been detected before, the image tracking unit does not consider the face as absent from the image unless the detection has failed in several consecutive frames. This is to prevent false negative detections. Further, the tracking allows for obtaining a proper position of a participant who may be moving in a video frame. To perform this tracking, face tracking unit 35 creates and maintains a track file for each detected face. The track file can, for example, be stored in a memory device such as random access memory or a hard drive.” *See* paras. [0035]-[0039]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Enstad alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the ’110 Patent	Exemplary Citations to Enstad
Claim 5	

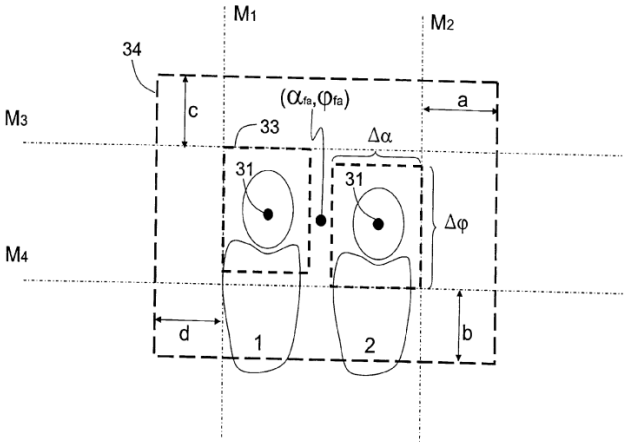
EyesMatch Ex2005
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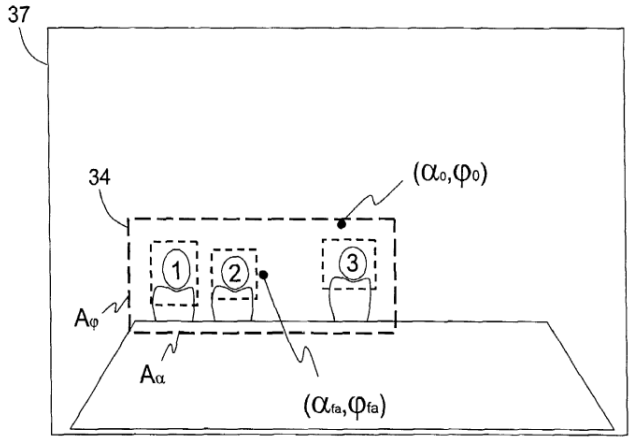
Asserted Claim of the '110 Patent	Exemplary Citations to Enstad
5. The method of claim 1, further comprising receiving user input and operating the processor to vary image magnitude or field-of-view of the modified images according to the user input.	Enstad expressly and/or inherently discloses and/or renders obvious receiving user input and operating the processor to vary image magnitude or field-of-view of the modified images according to the user input. *See*, *e.g.*, disclosures below. "FIG. 1 illustrates a typical video conferencing room 10, with an exemplary video conferencing system 20. Video conferencing systems 20 may, for example, consist of the following components: a codec 11 (for coding and decoding audio and video information), a user input device 8 (i.e. remote control or keyboard), a image capture device 6 (a camera, which can be a high-definition camera), an audio capture device 4 and/or 7 (microphone), a video display 9 (a screen which can be a high-definition display) and an audio reproduction device 5 (loudspeakers). Often, high end video conferencing systems (VCS) use high quality cameras 6 with motorized pan-, tilt-, and zoom capabilities." *See* para. [0026].

Asserted Claim of the ’110 Patent	Exemplary Citations to Enstad
	 **Figure 1** “A video detection unit 30 is configured to continuously (or with very short intervals on an order of a second or millisecond) detect objects, e.g. faces and/or heads, in the frames of a captured video signal. At predefined events (e.g. when the VCS is switched on, when initiated through the user input device 8, etc.) the camera zooms out to its maximum field of view (or near maximum field of view) and moves to a predefined pan- and tilt-orientation (azimuth- and elevation-angle), capturing as much as possible of the room 10 where the system is situated. The video detection unit 30 analyses the frames in the video signal and detects all the faces/heads and their location in the video frame relative to a predetermined and static reference point (e.g. the center of the frame). The face/head location and size (or area) in the video image is transformed into camera coordinates (azimuth- and elevation angles and zoom factors) Information about each detected face/head (e.g. position, size, etc.) is sent to an image processing unit 50 via

Asserted Claim of the ’110 Patent	Exemplary Citations to Enstad
	face tracking unit 35. Based on said face/head information the image processing unit defines a rectangular area that at least comprises all the detected faces/heads. A predefined set of rules dictates how the area should be defined, and the area represents the best view of the people in the frame (or video conferencing room 10). The camera coordinates (azimuth- and elevation angles and zoom factors) for the defined area and its location are sent to a control unit 45. The control unit instructs a camera control unit 12 to move the camera to said camera coordinates, and the camera's 6 pan, tilt and zoom is adjusted to frame an image corresponding to the defined area. The image pickup device (or camera) 6 includes a camera control unit 12 for positioning the image pickup device. The camera control unit 12 is the steering mechanism. In one embodiment, the steering mechanism includes motors, controlling the pan- and tilt-orientation and the degree of zoom of the image pickup device 6. In another embodiment, the steering mechanism (or control unit 12) is configured to implement digital tilt, digital pan and digital zoom (i.e., digital pan/tilt/zoom). Digital zoom may be accomplished by cropping an image down to a centered area with the same aspect ratio as the original, and interpolating the result back up to the pixel dimensions of the original. It is accomplished electronically, without any adjustment of the camera's optics. Digital pan and tilt may be accomplished by using the cropped image and adjusting a viewing area within the larger original image. Also, other techniques of digital pan/tilt/zoom known to those of ordinary skill in the art may be used. It is possible that a combination of digital steering (digital pan/tilt/zoom) and mechanical steering may be used. An example of a camera with digital pan/tilt/zoom capability is the Tandberg 1000 camera.” *See* paras. [0030]-[0031]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Enstad alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '110 Patent	Exemplary Citations to Enstad
Claim 6	
6. The method of claim 5, wherein the processor varies the image magnitude or field-of-view mapping to display a partial or full body of the user in the modified images.	Enstad expressly and/or inherently discloses and/or renders obvious wherein the processor varies the image magnitude or field-of-view mapping to display a partial or full body of the user in the modified images. *See*, *e.g.*, disclosures below. "A video detection unit 30 is configured to continuously (or with very short intervals on an order of a second or millisecond) detect objects, e.g. faces and/or heads, in the frames of a captured video signal. At predefined events (e.g. when the VCS is switched on, when initiated through the user input device 8, etc.) the camera zooms out to its maximum field of view (or near maximum field of view) and moves to a predefined pan- and tilt-orientation (azimuth- and elevation-angle), capturing as much as possible of the room 10 where the system is situated. The video detection unit 30 analyses the frames in the video signal and detects all the faces/heads and their location in the video frame relative to a predetermined and static reference point (e.g. the center of the frame). The face/head location and size (or area) in the video image is transformed into camera coordinates (azimuth- and elevation angles and zoom factors) Information about each detected face/head (e.g. position, size, etc.) is sent to an image processing unit 50 via face tracking unit 35. Based on said face/head information the image processing unit defines a rectangular area that at least comprises all the detected faces/heads. A predefined set of rules dictates how the area should be defined, and the area represents the best view of the people in the frame (or video conferencing room 10). The camera coordinates (azimuth- and elevation angles and zoom factors) for the defined area and its location are sent to a control unit 45. The control unit instructs a camera control unit 12 to move the camera to said camera coordinates, and the camera's 6 pan, tilt and zoom is adjusted to frame an image corresponding to the defined area. The image pickup device (or camera) 6 includes a camera control unit 12 for positioning the image pickup device. The camera control unit 12 is the steering mechanism. In one embodiment, the steering mechanism includes motors, controlling the pan- and tilt-orientation and the degree of zoom of the image pickup device 6. In another embodiment, the steering mechanism (or control unit 12) is configured to implement digital tilt, digital

Asserted Claim of the ’110 Patent	Exemplary Citations to Enstad
	pan and digital zoom (i.e., digital pan/tilt/zoom). Digital zoom may be accomplished by cropping an image down to a centered area with the same aspect ratio as the original, and interpolating the result back up to the pixel dimensions of the original. It is accomplished electronically, without any adjustment of the camera's optics. Digital pan and tilt may be accomplished by using the cropped image and adjusting a viewing area within the larger original image. Also, other techniques of digital pan/tilt/zoom known to those of ordinary skill in the art may be used. It is possible that a combination of digital steering (digital pan/tilt/zoom) and mechanical steering may be used. An example of a camera with digital pan/tilt/zoom capability is the Tandberg 1000 camera.” *See* paras. [0030]-[0031].  Figure 6

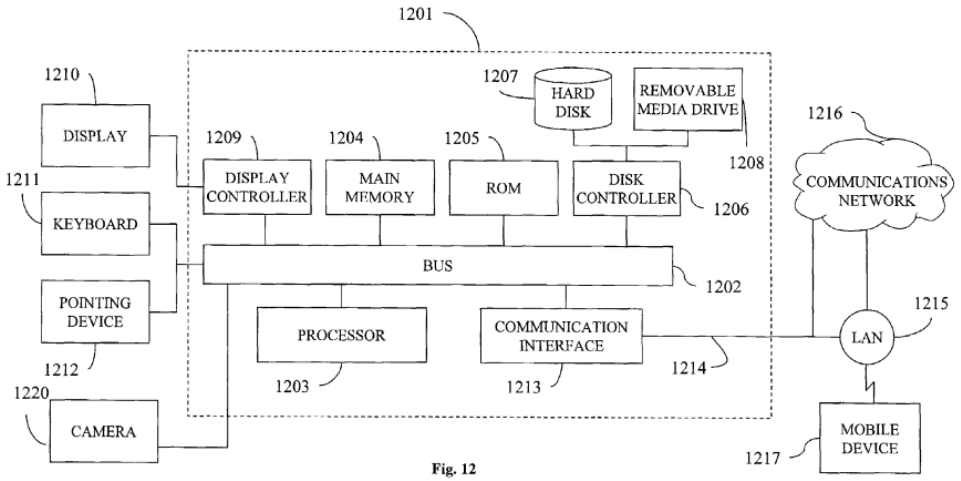
Asserted Claim of the ’110 Patent	Exemplary Citations to Enstad
	 This limitation would have been obvious to a person of ordinary skill in the art based on (1) Enstad alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the ’110 Patent	Exemplary Citations to Enstad
Claim 10	
10. The method of claim 1, further comprising operating the processor to augment the modified images by overlaying virtual objects on a user's image appearing within the modified images.	Enstad expressly and/or inherently discloses and/or renders obvious operating the processor to augment the modified images by overlaying virtual objects on a user's image appearing within the modified images. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Enstad alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’

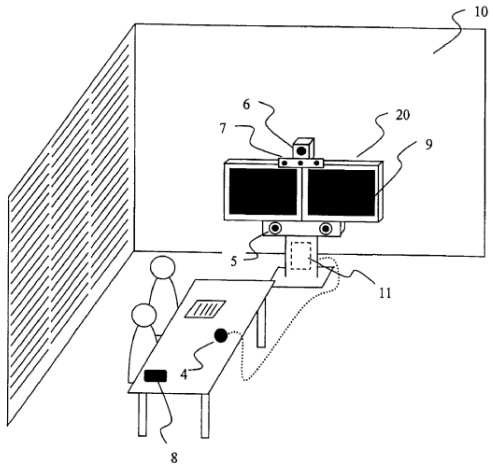
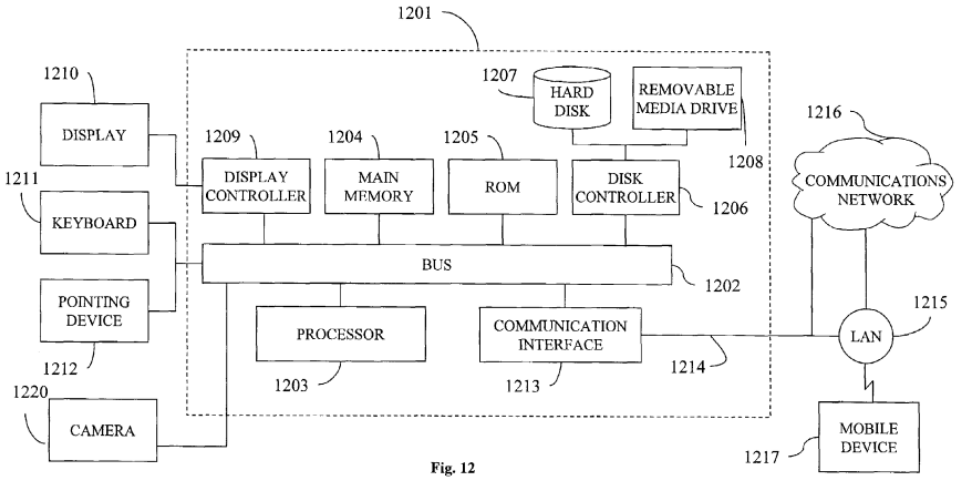
Asserted Claim of the ’110 Patent	Exemplary Citations to Enstad
	other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the ’110 Patent	Exemplary Citations to Enstad
Claim 11	
11. The method of claim 1, further comprising operating the processor to transmit the modified image over a network.	Enstad expressly and/or inherently discloses and/or renders obvious operating the processor to transmit the modified image over a network. *See*, *e.g.*, disclosures below. “The embodiments below discuss the present invention in the context of a video conferencing system or in a video conference room. However, these are only exemplary embodiments and the present invention is envisioned to work in other systems and situations where automatic camera control is desired, such as the creation of internet video with a web camera. A person of ordinary skill in the art would understand that the present invention is applicable to systems that do not require a video conference.” *See* para. [0025]. “Various forms of computer readable storage media may be involved in carrying out one or more sequences of one or more instructions to processor 1203 for execution. For example, the instructions may initially be carried on a magnetic disk of a remote computer. The remote computer can load the instructions for implementing all or a portion of the present invention remotely into a dynamic memory and send the instructions over a telephone line using a modem. A modem local to the computer system 1201 may receive the data on the telephone line and use an infrared transmitter to convert the data to an infrared signal. An infrared detector coupled to the bus 1202 can receive the data carried in the infrared signal and place the data on the bus 1202. The bus 1202 carries the data to the main memory 1204, from which the processor 1203 retrieves and executes the instructions. The instructions received by the main memory 1204 may

Asserted Claim of the ’110 Patent	Exemplary Citations to Enstad
	optionally be stored on storage device 1207 or 1208 either before or after execution by processor 1203. The computer system 1201 also includes a communication interface 1213 coupled to the bus 1202. The communication interface 1213 provides a two-way data communication coupling to a network link 1214 that is connected to, for example, a local area network (LAN) 1215, or to another communications network 1216 such as the Internet. For example, the communication interface 1213 may be a network interface card to attach to any packet switched LAN. As another example, the communication interface 1213 may be an asymmetrical digital subscriber line (ADSL) card, an integrated services digital network (ISDN) card or a modem to provide a data communication connection to a corresponding type of communications line. Wireless links may also be implemented. In any such implementation, the communication interface 1213 sends and receives electrical, electromagnetic or optical signals that carry digital data streams representing various types of information. The network link 1214 typically provides data communication through one or more networks to other data devices. For example, the network link 1214 may provide a connection to another computer through a local network 1215 (e.g., a LAN) or through equipment operated by a service provider, which provides communication services through a communications network 1216. The local network 1214 and the communications network 1216 use, for example, electrical, electromagnetic, or optical signals that carry digital data streams, and the associated physical layer (e.g., CAT 5 cable, coaxial cable, optical fiber, etc). The signals through the various networks and the signals on the network link 1214 and through the communication interface 1213, which carry the digital data to and from the computer system 1201 maybe implemented in baseband signals, or carrier wave based signals. The baseband signals convey the digital data as unmodulated electrical pulses that are descriptive of a stream of digital data bits, where the term “bits” is to be construed broadly to mean symbol, where each symbol conveys at least one or more information bits. The digital data may also be used to modulate a carrier wave, such as with amplitude, phase and/or frequency shift keyed signals that are propagated over a conductive media, or transmitted as electromagnetic

Asserted Claim of the '110 Patent	Exemplary Citations to Enstad
	waves through a propagation medium. Thus, the digital data may be sent as unmodulated baseband data through a "wired" communication channel and/or sent within a predetermined frequency band, different than baseband, by modulating a carrier wave. The computer system 1201 can transmit and receive data, including program code, through the network(s) 1215 and 1216, the network link 1214 and the communication interface 1213. Moreover, the network link 1214 may provide a connection through a LAN 1215 to a mobile device 1217 such as a personal digital assistant (PDA) laptop computer, or cellular telephone." *See* paras. [0063]-[0065].  Fig. 12 This limitation would have been obvious to a person of ordinary skill in the art based on (1) Enstad alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '110 Patent	Exemplary Citations to Enstad
Claim 12	
12. The method of claim 1, further comprising displaying the modified image on a remote screen for video telepresence.	Enstad expressly and/or inherently discloses and/or renders obvious displaying the modified image on a remote screen for video telepresence. *See*, *e.g.*, disclosures below. "SUMMARY OF THE INVENTION It is an object of the present invention to provide a method and a system solving at least one of the above-mentioned problems in conventional systems. A non-limiting embodiment includes an automatic field adjustment system that ensures a good camera orientation for multiple situations (i.e., multiple configurations of people and/or equipment) in a video conferencing room. A non-limiting embodiment includes a method for automatically determining an orientation and zoom of an image pickup device associated with a video conferencing system, wherein the method includes the steps of: generating, at the image pickup device, an image signal representative of an image framed by the image pickup device; processing the image signal to identify objects plural users of the video conferencing system in the image; steering the image pickup device to an initial orientation; determining a location of all the identified objects relative to a reference point and determining respective sizes of the identified objects; defining an area of interest in the image, wherein the area of interest includes all the identified objects; and steering the image pickup device to frame the defined area of interest including all the identified objects where a center of the frame substantially coincides with a center of all the identified objects." *See* paras. [0008]-[0009].

Asserted Claim of the ’110 Patent	Exemplary Citations to Enstad
	 **Figure 1**  **Fig. 12**

Asserted Claim of the '110 Patent	Exemplary Citations to Enstad
	"The embodiments below discuss the present invention in the context of a video conferencing system or in a video conference room. However, these are only exemplary embodiments and the present invention is envisioned to work in other systems and situations where automatic camera control is desired, such as the creation of internet video with a web camera. A person of ordinary skill in the art would understand that the present invention is applicable to systems that do not require a video conference. FIG. 1 illustrates a typical video conferencing room 10, with an exemplary video conferencing system 20. Video conferencing systems 20 may, for example, consist of the following components: a codec 11 (for coding and decoding audio and video information), a user input device 8 (i.e. remote control or keyboard), a image capture device 6 (a camera, which can be a high-definition camera), an audio capture device 4 and/or 7 (microphone), a video display 9 (a screen which can be a high-definition display) and an audio reproduction device 5 (loudspeakers). Often, high end video conferencing systems (VCS) use high quality cameras 6 with motorized pan-, tilt-, and zoom capabilities." *See* paras. [0025]-[0026]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Enstad alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

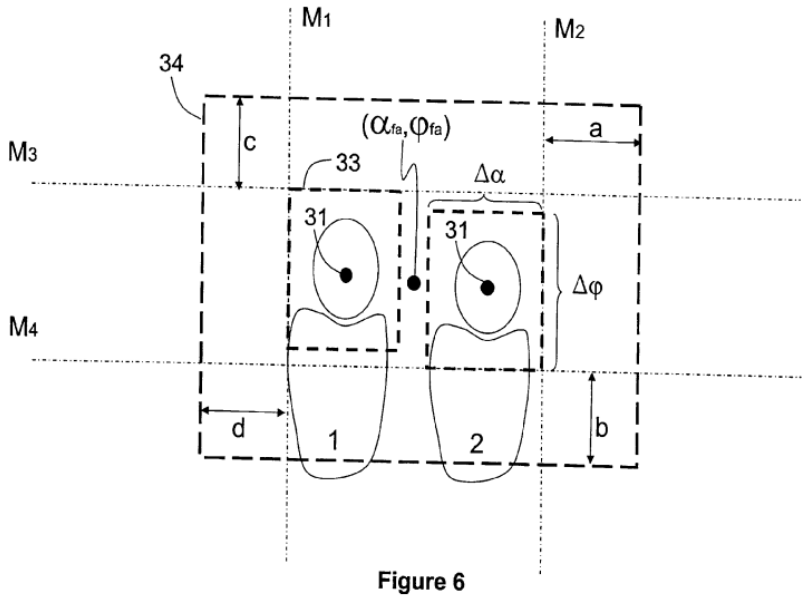
Asserted Claim of the '110 Patent	Exemplary Citations to Enstad
Claim 16	
16. The method of claim 1, wherein the processor operates on the images from the camera to generate background	Enstad expressly and/or inherently discloses and/or renders obvious wherein the processor operates on the images from the camera to generate background segmentation,

Asserted Claim of the '110 Patent	Exemplary Citations to Enstad
segmentation, and replaces segments on the images by replacement segments.	and replaces segments on the images by replacement segments. *See*, *e.g.*, disclosures below. "When an image of a face/head is detected, the video detection unit 30 defines a rectangular segment (or box) surrounding said image of a face/head. According to one embodiment of the invention, said rectangular segment is the analysis window 33. The location of said segment containing an image of a face/head is measured relative to a video coordinate system which is based on the video frame. The video coordinate system applies to each frame captured by camera 6. The video coordinate system has a horizontal or x-axis and a vertical or y-axis. When determining a position of a pixel or an image, video detection unit 30 determine that position relative the x-axis and the y-axis of that pixel's or image's video frame. In one exemplary embodiment of the invention, the analysis window 33 center point 31 (pixel in the middle of the window) is the location reference point, and its location is defined by the coordinates x and y in said video coordinate system. When the video detection unit 30 has calculated the location (x,y) and size (e.g. dx=20 dy=24 pixels) of all the faces/heads in a frame, the video detection unit 30 uses knowledge of the video frame, optics and mechanics to calculate (step 80) the corresponding location (α,φ) and size (Δα,Δφ) in azimuth and elevation angles in the camera coordinate system for each image of a face/head. The camera coordinates for each face/head are then sent to a face tracking unit 35. Face tracking unit 35 correlates the detected faces from the current video frame to the detected faces in the previous video frames and hence tracks the detected faces through a series of frames. Only if a face/head is detected at substantially the same location throughout a series of frames, the detection is validated or registered as a positive detection. First of all this prevents false face detections, unless the same detection occurs in several consecutive video frames. Also, if the face detection unit fails to detect a face in the substantially same coordinates as a face has been detected before, the image tracking unit does not consider the face as absent from the image unless the detection has failed in several consecutive frames. This is to prevent false negative detections. Further, the tracking allows for obtaining a proper position of a participant who may be moving in a video frame. To perform this tracking, face tracking unit 35 creates and

Asserted Claim of the '110 Patent	Exemplary Citations to Enstad
	maintains a track file for each detected face. The track file can, for example, be stored in a memory device such as random access memory or a hard drive." *See* paras. [0038]-[0039]. "The video detection unit 30 analyses the frames in the video signal and detects all the faces/heads and their location in the video frame relative to a predetermined and static reference point (e.g. the center of the frame). The face/head location and size (or area) in the video image is transformed into camera coordinates (azimuth- and elevation angles and zoom factors) Information about each detected face/head (e.g. position, size, etc.) is sent to an image processing unit 50 via face tracking unit 35. Based on said face/head information the image processing unit defines a rectangular area that at least comprises all the detected faces/heads. A predefined set of rules dictates how the area should be defined, and the area represents the best view of the people in the frame (or video conferencing room 10). The camera coordinates (azimuth- and elevation angles and zoom factors) for the defined area and its location are sent to a control unit 45. The control unit instructs a camera control unit 12 to move the camera to said camera coordinates, and the camera's 6 pan, tilt and zoom is adjusted to frame an image corresponding to the defined area. Digital zoom may be accomplished by cropping an image down to a centered area with the same aspect ratio as the original, and interpolating the result back up to the pixel dimensions of the original. It is accomplished electronically, without any adjustment of the camera's optics. Digital pan and tilt may be accomplished by using the cropped image and adjusting a viewing area within the larger original image. Also, other techniques of digital pan/tilt/zoom known to those of ordinary skill in the art may be used. It is possible that a combination of digital steering (digital pan/tilt/zoom) and mechanical steering may be used. An example of a camera with digital pan/tilt/zoom capability is the Tandberg 1000 camera. The camera control unit 12 can also report back its current azimuth- and elevation angles and zoom factors on demand. The image processing unit 50 and the control unit 45 may supply control signals to the camera control unit 12. Camera control unit 12 uses a

Asserted Claim of the ’110 Patent	Exemplary Citations to Enstad
	camera coordinate system which indicates a location based on azimuth- and elevation angles and zoom factors which describe the direction of the captured frame relative to camera 6 and the degree of zoom. Video detection unit 30 is configured to convert coordinate measurements expressed in a video (or image) coordinate system to coordinate measurements expressed in the camera coordinate system using the azimuth- and elevation angles and zoom factors of camera 6 when the frame was captured by camera 6. FIG. 3 is a flow chart of the operation of the “best view” locator 52. Camera 6 outputs a video signal comprising a series of frames (images). The frames are analyzed by the video detection unit 30. At predefined events, the camera control unit 12 is instructed to move the camera to an initial orientation (step 60). The object of the initial orientation is to make sure that the camera can “see” all the persons in the meeting room. There are several ways of deciding such an initial orientation.” *See* paras. [0030]-[0033]. “In step 90, the image processing unit 50 defines an area of interest 34 (best view). The area of interest 34 is shown in the in FIG. 6, where the area 34 at least comprises all the detected images of faces in that frame. According to one embodiment of the invention, based on the location (α,φ) of each face and their corresponding sizes (Δα,Δφ), the image processing unit 50 may calculate a first area restricted by a set of margins (M1, M2, M3 and M4), where the margins are derived from the left side of the leftmost face segment (M1), upper side of the uppermost face segment (M3), right side of the rightmost face segment (M2) and the bottom side of the bottommost face segment (M4). The location of the center (αfa,φfa) of the first area can now be calculated in camera coordinates based on the margins. The location of the first area is relative to a reference point (α0,φ0), typically the direction of the camera when azimuth and elevation angle is zero. Further, the width and height of the first area is transformed into a zoom factor (Zfa). This first area is very close to the participants' faces and may not represent the most comfortable view (best view) of the participants, especially when only two participants

Asserted Claim of the ’110 Patent	Exemplary Citations to Enstad
	are present as shown in this exemplary embodiment. Therefore, when said margins (M1, M2, M3 and M4) has been calculated, a second area (best view frame 34) is defined by expanding the margins by a set of offset values a,b,c and d. These offset values may be equal, or they may differ, e.g. to capture more of the table in front of the participants than above a participants head. The offset values may be preset and static, or they may be calculated to fit each situation. According to another exemplary embodiment, the best view frame 34 is defined by just subtracting a compensation value Zc from the calculated zoom factor Zfa, making the camera zoom out an additional distance. The compensation value Zc may be static, or vary linearly depending on the size of the first area zoom factor Zfa. FIG. 7 schematically shows an exemplary video frame taken from an initial camera orientation. 3 faces have been detected in the video frame, and the image processing unit 50 has defined a best view frame 34, and calculated the location (αfa,φfa) of the best view frame. Most image pickup devices 6 for video conferencing systems operate with standard television image aspect ratios, e.g. 4:3 (1.33:1) or 16:9 (1.78:1). Since most calculated best view frames 34 as described above have aspect ratios that deviate from the standards, e.g. 4:3 or 16:9, some considerations must be made when deciding the zoom coordinate. Since Aφ is the shortest edge of area 34, if the camera zooms in to capture the exact height Aφ, large parts of the area will miss the light sensitive area (e.g. image sensor) in the camera because its aspect ratio is different than the defined area. If the camera zooms in to capture the exact width Aα of the defined area 34, no information is lost. Therefore, according to one exemplary embodiment of the present invention, the two sides Aφ and Aα of the best view frame 34 are compared. Each of the two sides defines a zoom factor needed to fit the area of interest in the image frame, in the horizontal and vertical direction respectively. Thus, the degree of zoom is defined by the smallest of the

Asserted Claim of the ’110 Patent	Exemplary Citations to Enstad
	two calculated zoom factors, ensuring that the area of interest is not cropped when zooming to the area of interest.” *See* paras. [0040]-[0046].  **Figure 6** This limitation would have been obvious to a person of ordinary skill in the art based on (1) Enstad alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the ’110 Patent	Exemplary Citations to Enstad
Claim 17	
17. The method of claim 16, wherein the replacement segments comprise virtual background or background that was captured in a different setting.	Enstad expressly and/or inherently discloses and/or renders obvious wherein the replacement segments comprise virtual background or background that was captured in a different setting. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Enstad alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Exhibit B-02: Invalidity of U.S. Patent No. 8,982,110 in view of *A Handheld Mirror Simulation*, Alexandre R.J. Francois et al., ("Francois I")

This chart is subject to all reservations, objections, and disclaimers in Defendant's Invalidity Contentions and any amendment, supplement, or modification thereof, which are incorporated herein by reference in their entirety.

Francois I was at least published by 2003, and thus is available as prior art to U.S. Patent No. 8,982,110 (the "'110 Patent") under at least 35 U.S.C. §§ 102(a) and (b).

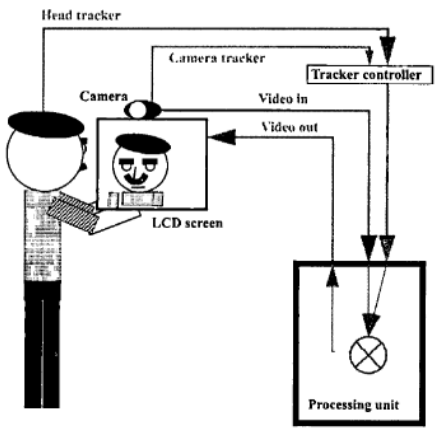
Francois I anticipates the Asserted Claims of the '110 Patent. To the extent it is found Francois I does not expressly disclose certain limitations in the Asserted Claims, such limitations are at least implicitly or inherently disclosed. Moreover, to the extent it is found that Francois I does not anticipate the Asserted Claims, Francois I renders obvious the asserted claim, either alone or in combination with other prior art identified in the cover pleading or herein, and/or in combination with the general knowledge of a person having ordinary skill in the art.

In these contentions, Defendants have relied in part on Plaintiff's Infringement Contentions. In those contentions, Plaintiff appears to pursue overly broad claim constructions in an effort to assert infringement where none exists, and to accuse products that do not infringe the claims. Defendants' assertion that a particular limitation is disclosed by a prior art reference and/or is disclosed in a particular manner may be based in part on Plaintiff's apparent claim interpretations. In relying on Plaintiff's apparent claim interpretations, Defendants do not admit that Plaintiff's apparent claim interpretations are supportable or proper or that the claim limitations in question are definite or otherwise amenable to construction.

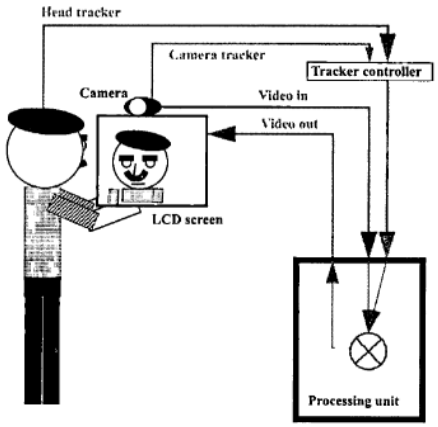
Defendants have endeavored to provide as much detail as possible in these contentions and, in doing so, have exceeded the level of detail required. The inclusion of specific details in some areas is not a concession that such details are required or that the omission of similar details in other areas is a defect. These citations to portions of any reference in this chart are exemplary only. Defendants will rely on the entirety of the references cited in this chart to show that the Asserted Claims are invalid.

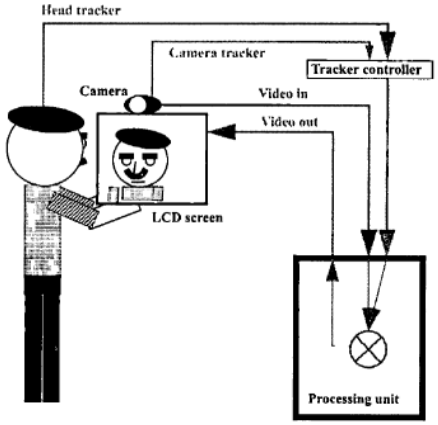
Asserted Claim of the ’110 Patent	Exemplary Citations to Francois I
Claim 1	
1[pre]. A computerized method for operating a display system, the display system having a camera, a monitor, and a processor, the method comprising:	To the extent the preamble is limiting, Francois I expressly and/or inherently discloses and/or renders obvious a computerized method for operating a display system, the display system having a camera, a monitor, and a processor. *See*, *e.g.*, disclosures below. “We present the design and construction of a handheld mirror simulation device. The perception of the world reflected through a mirror depends on the viewer's position with respect to the mirror and the 3-D geometry of the world. In order to simulate a real mirror on a computer screen, images of the observed world, consistent with the viewer's position, must be synthesized and displayed in realtime. Our system is build around a LCD screen manipulated by the user, a single camera fixed on the screen, and a tracking device. The continuous input video stream and tracker data is used to synthesize, in real-time, a continuous video stream displayed on the LCD screen. The synthesized video stream is a close approximation of what the user would see on the screen surface if it were a real mirror. Our system provides a generic interface for applications involving rich, first-person interaction, such as the Virtual Daguerreotype.” *See* Abstract, page 745. “We present the design and construction of a handheld mirror simulation device. Rather than attempting to solve the difficult vision problem of a general, exact mirror simution, our focus is on the design and construction of a first person Human-Computer Interface (HCI) to be used in new interactive experiments and applications. While remaining simple, our first prototype must provide a better experience to the user than the traditional fixed camera / fixed display / horizontal image flip mirror setting. A major novelty in our approach is the hands-on aspect, which requires a more elaborate model to convincingly reproduce the interaction between the user and the mirror as an object. One important clue is the evolution of the user's field of view in the mirror as her position with respect to the mirror changes. Furthermore, our goal is to produce a working but

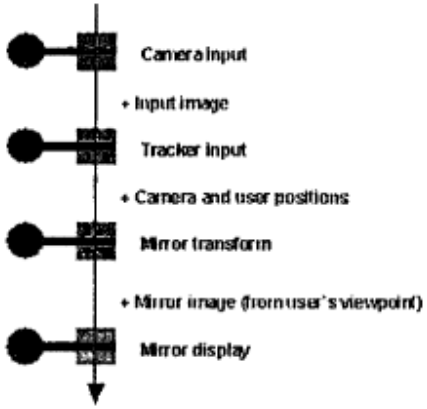
Asserted Claim of the ’110 Patent	Exemplary Citations to Francois I
	extensible system, to serve as a platform for future enhancements to the HCI device subsystem itself, as well as to allow easy integration in applications Our system is composed of a handheld LCD screen manipulated by the user, a single camera fixed on the screen, and two 6 degrees of freedom trackers giving in real time the positions and orientations of the camera and the user's head. The major system components and their relations are illustrated in figure 1. The user sees on the screen what they would see on a real mirror. The perception of the world reflected through a mirror depends on the viewer's position with respect to the mirror and the 3-D geometry of the world. In order to simulate a real mirror on a computer screen, images of the observed world, consistent with the viewer's position, must be synthesized and displayed in real-time. The continuous input video stream and tracker data is used to synthesize, in real-time, a continuous video stream displayed on the LCD screen. The synthesized video stream is a close approximation of what the user would see on the screen surface if it were a real mirror.” *See* 1.INTRODUCTION, page 745.

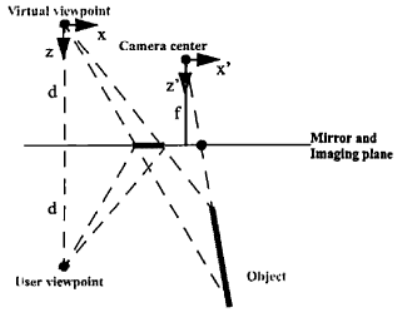
Asserted Claim of the '110 Patent	Exemplary Citations to Francois I
	 **Figure 1. Handheld mirror simulation system.** This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois I alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[a]. operating the camera to generate a stream of images of the user;	To the extent the preamble is limiting, Francois I expressly and/or inherently discloses and/or renders obvious operating the camera to generate a stream of images of the user. *See*, *e.g.*, disclosures below. "We present the design and construction of a handheld mirror simulation device. The perception of the world reflected through a mirror depends on the viewer's position with respect to the mirror and the 3-D geometry of the world. In order to simulate a real mirror on a computer screen, images of the observed world, consistent with the viewer's position, must be synthesized and displayed in realtime. Our system is build around a LCD screen manipulated by the user, a single camera fixed on the screen, and a tracking device. The continuous input video stream and tracker data is used to synthesize, in real-

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois I
	time, a continuous video stream displayed on the LCD screen. The synthesized video stream is a close approximation of what the user would see on the screen surface if it were a real mirror. Our system provides a generic interface for applications involving rich, first-person interaction, such as the Virtual Daguerreotype.” *See* Abstract, page 745. “We present the design and construction of a handheld mirror simulation device. Rather than attempting to solve the difficult vision problem of a general, exact mirror simution, our focus is on the design and construction of a first person Human-Computer Interface (HCI) to be used in new interactive experiments and applications. While remaining simple, our first prototype must provide a better experience to the user than the traditional fixed camera / fixed display / horizontal image flip mirror setting. A major novelty in our approach is the hands-on aspect, which requires a more elaborate model to convincingly reproduce the interaction between the user and the mirror as an object. One important clue is the evolution of the user's field of view in the mirror as her position with respect to the mirror changes. Furthermore, our goal is to produce a working but extensible system, to serve as a platform for future enhancements to the HCI device subsystem itself, as well as to allow easy integration in applications Our system is composed of a handheld LCD screen manipulated by the user, a single camera fixed on the screen, and two 6 degrees of freedom trackers giving in real time the positions and orientations of the camera and the user's head. The major system components and their relations are illustrated in figure 1. The user sees on the screen what they would see on a real mirror. The perception of the world reflected through a mirror depends on the viewer's position with respect to the mirror and the 3-D geometry of the world. In order to simulate a real mirror on a computer screen, images of the observed world, consistent with the viewer's position, must be synthesized and displayed in real-time. The continuous input video stream and tracker data is used to synthesize, in real-time, a continuous video stream displayed on the LCD screen. The synthesized video stream is a close approximation of

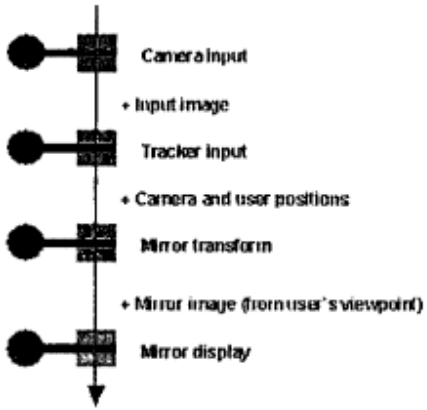
Asserted Claim of the '110 Patent	Exemplary Citations to Francois I
	what the user would see on the screen surface if it were a real mirror." *See* 1.INTRODUCTION, page 745.  **Figure 1. Handheld mirror simulation system.** This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois I alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[b]. operating the processor to detect the presence of the user in the stream of image;	Francois I expressly and/or inherently discloses and/or renders obvious operating the processor to detect the presence of the user in the stream of image. *See*, *e.g.*, disclosures below. "Our system is composed of a handheld LCD screen manipulated by the user, a single camera fixed on the screen, and two 6 degrees of freedom trackers giving in real time the positions and orientations of the camera and the user's head. The major system

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois I
	components and their relations are illustrated in figure 1. The user sees on the screen what they would see on a real mirror.” *See* 1.INTRODUCTION, page 745.  **Figure 1. Handheld mirror simulation system.** “The only parameters are f, d and [txtytz]. The theoretical focal length of the camera can be obtained by various calibration methods. The positions and orientations of the user's viewpoint and the camera center provided by the tracking devices, allow to compute both the distance d and the change of referential translation parameters.” *See* 3.SYSTEM INTEGRATION, page 747.

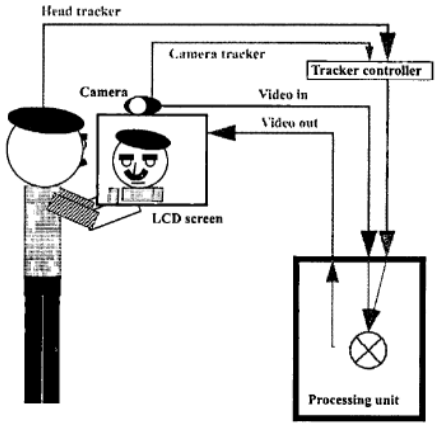
Asserted Claim of the '110 Patent	Exemplary Citations to Francois I
	 **Figure 6. Mirror simulation application graph.** This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois I alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[c]. operating the processor to apply adaptive transformation mapping to the stream of images captured by the camera to generate modified images that appear to be captured from a different point of view of the camera's actual point of view; and	Francois I expressly and/or inherently discloses and/or renders obvious operating the processor to apply adaptive transformation mapping to the stream of images captured by the camera to generate modified images that appear to be captured from a different point of view of the camera's actual point of view. *See*, *e.g.*, disclosures below. "This paper is organized as follows. In section 2, we outline the geometric analysis of mirror and camera imaging, leading to the image transform for mirror simulation, based on the flat world assumption. In section 3, we briefly explain the software and hard1ware design of our prototype. In section 4, we relate our work to other mirror experiments,

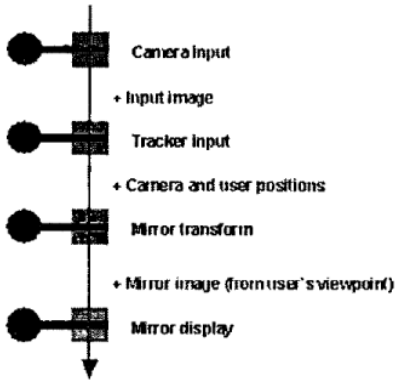
Asserted Claim of the ’110 Patent	Exemplary Citations to Francois I
	and to upcoming applications. Finally, we conclude the paper in section 5.” *See* 1.INTRODUCTION, page 745. “In order to synthesize the images corresponding to the user's view1point from the images captured by the camera, we must relate them geometrically, i.e. express x_p and y_p in terms of x'_p and y'_p. $$\begin{bmatrix} x \\ y \\ z \\ 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & t_x \\ 0 & 1 & 0 & t_y \\ 0 & 0 & 1 & t_z \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x' \\ y' \\ z' \\ 1 \end{bmatrix}$$ The mirror projection equations become: $$\begin{bmatrix} U_p \\ V_p \\ W_p \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & t_x \\ 0 & 1 & 0 & t_y \\ 0 & 0 & 1/d & t_z/d \end{bmatrix} \begin{bmatrix} x' \\ y' \\ z' \\ 1 \end{bmatrix} \quad x_p = d(x' + t_x)/(z' + t_z) \quad y_p = d(y' + t_y)/(z' + t_z)$$  **Figure 4. An underconstrained problem.** Express xp and yp in terms of x'p and /p thus requires to recover the actual 3-D position of each point from its image projection. This is obviously an underconstrained problem, as an image pixel might potentially be the projection of any world point on a ray passing

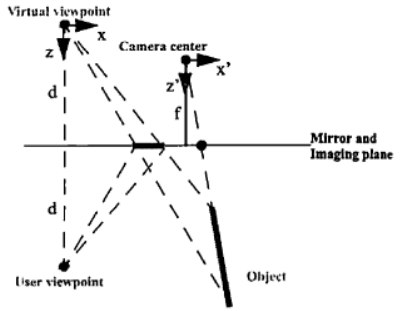
Asserted Claim of the '110 Patent	Exemplary Citations to Francois I
	through the camera center and the pixel, as illustrated in figure 4. Various computer vision techniques could be used to attempt to recover the 3-13 geometry of the world from images in some cases. Another solution would be to use a 3-D model of the environment, if available. For our first prototype, we followed a simpler approximate approach. Since we are designing our mirror as a first person interaction tool, we assume that the center of interest is the user himself, and that the background is of lesser importance. We thus model the world as a plane parallel to the mirror/imaging plane, at the same distance as the user's viewpoint (see figure 5). The z' component of each world point is thus fixed to $z' = f + d$ in the camera centered coordinate system. We can now inverse the camera projection equations: $$x'_p = fx'/(f+d) \Leftrightarrow x' = (f+d)x'_p/f$$ $$y'_p = fy'/(f+d) \Leftrightarrow y' = (f+d)y'_p/f$$ The transformation equations that relate the user's view to the camera image are thus: $$x_p = d((f+d)x'_p/f + t_x)/((f+d) + t_z)$$ $$y_p = d((f+d)y'_p/f + t_y)/((f+d) + t_z)$$ The only parameters are f, d and [txtytz]. The theoretical focal length of the camera can be obtained by various calibration methods. The positions and orientations of the user's viewpoint and the camera center provided by the tracking devices, allow to compute both the distance d and the change of referential translation parameters. Note that under our assumptions, the transform relating the user's view to the camera view is reduced to a scaling and a translation. This model provides a straightforward and efficient way of synthesizing the viewer's image stream from the camera stream, while remaining a

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	reasonable approximation for a large class of applications. The major field-of-view variations occuring when varying the angle of view and the distance to the mirror, are convincingly simulated.  **Figure 6. Mirror simulation application graph.** *See* 2.3 User view synthesis, pages 746-47. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois I alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[d]. displaying the modified images on the monitor;	To the extent the preamble is limiting, Francois I expressly and/or inherently discloses and/or renders obvious displaying the modified images on the monitor. *See*, *e.g.*, disclosures below.

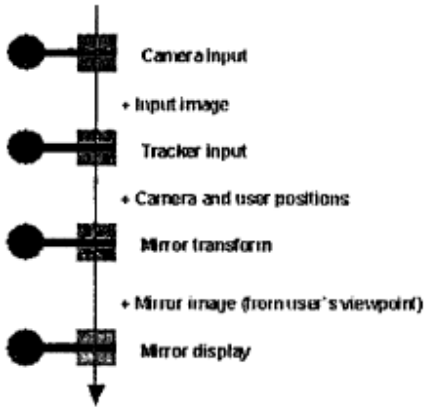
Asserted Claim of the ’110 Patent	Exemplary Citations to Francois I
	“We present the design and construction of a handheld mirror simulation device. The perception of the world reflected through a mirror depends on the viewer's position with respect to the mirror and the 3-D geometry of the world. In order to simulate a real mirror on a computer screen, images of the observed world, consistent with the viewer's position, must be synthesized and displayed in realtime. Our system is build around a LCD screen manipulated by the user, a single camera fixed on the screen, and a tracking device. The continuous input video stream and tracker data is used to synthesize, in real-time, a continuous video stream displayed on the LCD screen. The synthesized video stream is a close approximation of what the user would see on the screen surface if it were a real mirror. Our system provides a generic interface for applications involving rich, first-person interaction, such as the Virtual Daguerreotype.” *See* Abstract, page 745. “We present the design and construction of a handheld mirror simulation device. Rather than attempting to solve the difficult vision problem of a general, exact mirror simution, our focus is on the design and construction of a first person Human-Computer Interface (HCI) to be used in new interactive experiments and applications. While remaining simple, our first prototype must provide a better experience to the user than the traditional fixed camera / fixed display / horizontal image flip mirror setting. A major novelty in our approach is the hands-on aspect, which requires a more elaborate model to convincingly reproduce the interaction between the user and the mirror as an object. One important clue is the evolution of the user's field of view in the mirror as her position with respect to the mirror changes. Furthermore, our goal is to produce a working but extensible system, to serve as a platform for future enhancements to the HCI device subsystem itself, as well as to allow easy integration in applications Our system is composed of a handheld LCD screen manipulated by the user, a single camera fixed on the screen, and two 6 degrees of freedom trackers giving in real time the positions and orientations of the camera and the user's head. The major system components and their relations are illustrated in figure 1. The user sees on the screen what they would see on a real mirror.

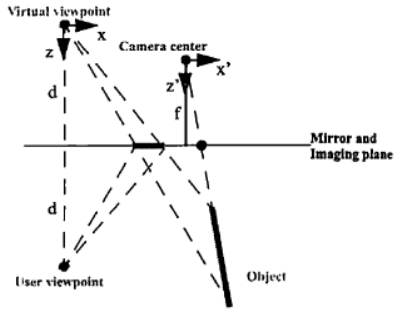
Asserted Claim of the ’110 Patent	Exemplary Citations to Francois I
	The perception of the world reflected through a mirror depends on the viewer's position with respect to the mirror and the 3-D geometry of the world. In order to simulate a real mirror on a computer screen, images of the observed world, consistent with the viewer's position, must be synthesized and displayed in real-time. The continuous input video stream and tracker data is used to synthesize, in real-time, a continuous video stream displayed on the LCD screen. The synthesized video stream is a close approximation of what the user would see on the screen surface if it were a real mirror.” *See* 1.INTRODUCTION, page 745.  **Figure 1. Handheld mirror simulation system.** “The application graph for the mirror simulation is presented in figure 6. Generic modules such as video capture and display were already available. Note that thanks to the modularity of the framework, any processing can be carried on the images before or after the mirror transform. The prototype system is composed of a handheld 10" LCD screen fitted with a camera and a magnetic tracker sensor (see figure 7), a fixed processing unit, a fixed magnetic tracker transmitter, and a second magnetic tracker sensor placed on the user. Real-time

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	camera and tracker inputs are used to synthesize the mirror image stream and display it in real-time on the LCD screen. The result is a convincing handheld mirror simulation, in spite of the inherent limitations of our mirror transform model." *See* 3.SYSTEM INTEGRATION, page 747.  **Figure 6. Mirror simulation application graph.** This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois I alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[e]. wherein the different point of view corresponds to an image taken from a different angle and a different distance than the actual images captured by the camera; and	Francois I expressly and/or inherently discloses and/or renders obvious wherein the different point of view corresponds to an image taken from a different angle and a different distance than the actual images captured by the camera. *See*, *e.g.*, disclosures below.

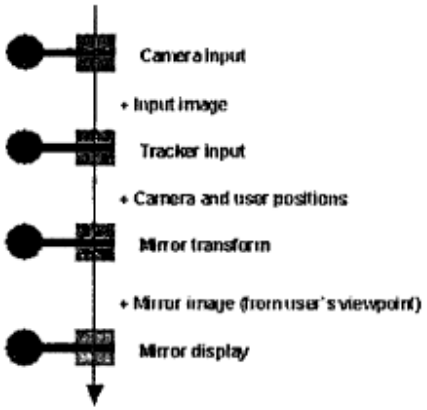
Asserted Claim of the ’110 Patent	Exemplary Citations to Francois I
	“In order to synthesize the images corresponding to the user's view1point from the images captured by the camera, we must relate them geometrically, i.e. express x_p and y_p in terms of x'_p and y'_p. $$\begin{bmatrix} x \\ y \\ z \\ 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & t_x \\ 0 & 1 & 0 & t_y \\ 0 & 0 & 1 & t_z \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x' \\ y' \\ z' \\ 1 \end{bmatrix}$$ The mirror projection equations become: $$\begin{bmatrix} U_p \\ V_p \\ W_p \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & t_x \\ 0 & 1 & 0 & t_y \\ 0 & 0 & 1/d & t_z/d \end{bmatrix} \begin{bmatrix} x' \\ y' \\ z' \\ 1 \end{bmatrix} \quad \begin{aligned} x_p &= d(x' + t_x)/(z' + t_z) \\ y_p &= d(y' + t_y)/(z' + t_z) \end{aligned}$$  **Figure 4. An underconstrained problem.** Express xp and yp in terms of x'p and /p thus requires to recover the actual 3-D position of each point from its image projection. This is obviously an underconstrained problem, as an image pixel might potentially be the projection of any world point on a ray passing through the camera center and the pixel, as illustrated in figure 4. Various computer vision techniques could be used to attempt to recover the 3-13 geometry of the world

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	from images in some cases. Another solution would be to use a 3-D model of the environment, if available. For our first prototype, we followed a simpler approximate approach. Since we are designing our mirror as a first person interaction tool, we assume that the center of interest is the user himself, and that the background is of lesser importance. We thus model the world as a plane parallel to the mirror/imaging plane, at the same distance as the user's viewpoint (see figure 5). The z' component of each world point is thus fixed to $z' = f + d$ in the camera centered coordinate system. We can now inverse the camera projection equations: $$x'_p = fx'/(f+d) \Leftrightarrow x' = (f+d)x'_p/f$$ $$y'_p = fy'/(f+d) \Leftrightarrow y' = (f+d)y'_p/f$$ The transformation equations that relate the user's view to the camera image are thus: $$x_p = d((f+d)x'_p/f + t_x)/((f+d) + t_z)$$ $$y_p = d((f+d)y'_p/f + t_y)/((f+d) + t_z)$$ The only parameters are f, d and [txtytz]. The theoretical focal length of the camera can be obtained by various calibration methods. The positions and orientations of the user's viewpoint and the camera center provided by the tracking devices, allow to compute both the distance d and the change of referential translation parameters. Note that under our assumptions, the transform relating the user's view to the camera view is reduced to a scaling and a translation. This model provides a straightforward and efficient way of synthesizing the viewer's image stream from the camera stream, while remaining a reasonable approximation for a large class of applications. The major field-of-view

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	variations occuring when varying the angle of view and the distance to the mirror, are convincingly simulated.  **Figure 6. Mirror simulation application graph.** *See* 2.3 User view synthesis, pages 746-47. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois I alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[f]. wherein during mirror tracking mode the processor utilizes the angle of the images captured by the camera and applies parametric input for a mapping transformation that changes imaging	Francois I expressly and/or inherently discloses and/or renders obvious wherein during mirror tracking mode the processor utilizes the angle of the images captured by the camera and applies parametric input for a mapping transformation that changes imaging perspective of the images captured by the camera. *See*, *e.g.*, disclosures below.

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois I
perspective of the images captured by the camera.	“In order to synthesize the images corresponding to the user's view1point from the images captured by the camera, we must relate them geometrically, i.e. express x_p and y_p in terms of x'_p and y'_p. $$\begin{bmatrix} x \\ y \\ z \\ 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & t_x \\ 0 & 1 & 0 & t_y \\ 0 & 0 & 1 & t_z \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x' \\ y' \\ z' \\ 1 \end{bmatrix}$$ The mirror projection equations become: $$\begin{bmatrix} U_p \\ V_p \\ W_p \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & t_x \\ 0 & 1 & 0 & t_y \\ 0 & 0 & 1/d & t_z/d \end{bmatrix} \begin{bmatrix} x' \\ y' \\ z' \\ 1 \end{bmatrix} \quad x_p = d(x' + t_x)/(z' + t_z) \quad y_p = d(y' + t_y)/(z' + t_z)$$  **Figure 4. An underconstrained problem.** Express xp and yp in terms of x'p and /p thus requires to recover the actual 3-D position of each point from its image projection. This is obviously an underconstrained problem, as an image pixel might potentially be the projection of any world point on a ray passing through the camera center and the pixel, as illustrated in figure 4. Various computer vision techniques could be used to attempt to recover the 3-13 geometry of the world

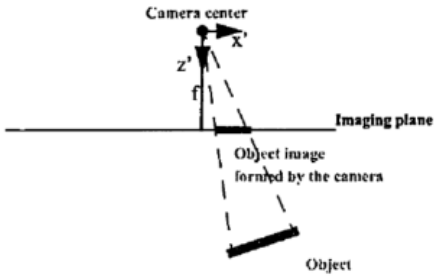
Asserted Claim of the '110 Patent	Exemplary Citations to Francois I
	from images in some cases. Another solution would be to use a 3-D model of the environment, if available. For our first prototype, we followed a simpler approximate approach. Since we are designing our mirror as a first person interaction tool, we assume that the center of interest is the user himself, and that the background is of lesser importance. We thus model the world as a plane parallel to the mirror/imaging plane, at the same distance as the user's viewpoint (see figure 5). The z' component of each world point is thus fixed to $z' = f + d$ in the camera centered coordinate system. We can now inverse the camera projection equations: $$x'_p = fx'/(f+d) \Leftrightarrow x' = (f+d)x'_p/f$$ $$y'_p = fy'/(f+d) \Leftrightarrow y' = (f+d)y'_p/f$$ The transformation equations that relate the user's view to the camera image are thus: $$x_p = d((f+d)x'_p/f + t_x)/((f+d) + t_z)$$ $$y_p = d((f+d)y'_p/f + t_y)/((f+d) + t_z)$$ The only parameters are f, d and [txtytz]. The theoretical focal length of the camera can be obtained by various calibration methods. The positions and orientations of the user's viewpoint and the camera center provided by the tracking devices, allow to compute both the distance d and the change of referential translation parameters. Note that under our assumptions, the transform relating the user's view to the camera view is reduced to a scaling and a translation. This model provides a straightforward and efficient way of synthesizing the viewer's image stream from the camera stream, while remaining a reasonable approximation for a large class of applications. The major field-of-view

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	variations occuring when varying the angle of view and the distance to the mirror, are convincingly simulated.  **Figure 6. Mirror simulation application graph.** *See* 2.3 User view synthesis, pages 746-47. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois I alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

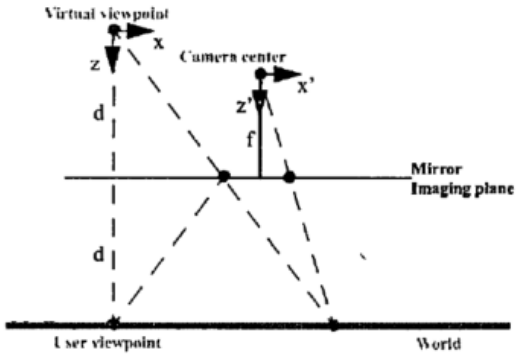
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Claim 2	

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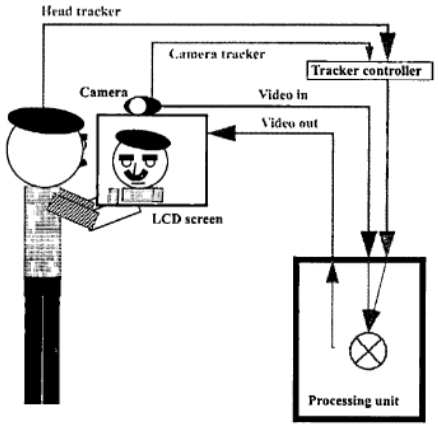
Asserted Claim of the '110 Patent	Exemplary Citations to Francois I
2. The method of claim 1, wherein the mapping transformation comprises a combination of at least two of the following transformations: vertical flips about a vertical axis, a projection transformation, rotation, resize, two-dimensional offset, optic distortion correction, and polynomial mapping on part or entire captured image.	Francois I expressly and/or inherently discloses and/or renders obvious wherein the mapping transformation comprises a combination of at least two of the following transformations: vertical flips about a vertical axis, a projection transformation, rotation, resize, two-dimensional offset, optic distortion correction, and polynomial mapping on part or entire captured image. *See*, *e.g.*, disclosures below. "We present the design and construction of a handheld mirror simulation device. Rather than attempting to solve the difficult vision problem of a general, exact mirror simution, our focus is on the design and construction of a first person Human-Computer Interface (HCI) to be used in new interactive experiments and applications. While remaining simple, our first prototype must provide a better experience to the user than the traditional fixed camera / fixed display / horizontal image flip mirror setting. A major novelty in our approach is the hands-on aspect, which requires a more elaborate model to convincingly reproduce the interaction between the user and the mirror as an object. One important clue is the evolution of the user's field of view in the mirror as her position with respect to the mirror changes. Furthermore, our goal is to produce a working but extensible system, to serve as a platform for future enhancements to the HCI device subsystem itself, as well as to allow easy integration in applications" *See* 1.INTRODUCTION, page 745. "A camera whose position and orientation are fixed with respect to the mirror produces a video stream that corresponds to this particular viewpoint. Assuming the camera can be approximated by a pinhole model (see figure 3), a point of homogenous coordinates." *See* GEOMETRIC ANALYSIS, page 746.

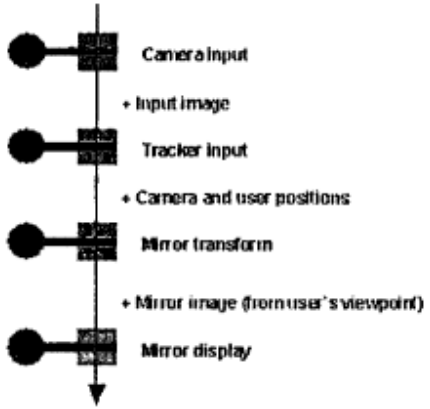
Asserted Claim of the ’110 Patent	Exemplary Citations to Francois I
	 **Figure 3. Pinhole camera geometry.** *See* GEOMETRIC ANALYSIS, page 746.

Asserted Claim of the '110 Patent	Exemplary Citations to Francois I
	2.3 User view synthesis In order to synthesize the images corresponding to the user's viewpoint from the images captured by the camera, we must relate them geometrically, i.e. express x_p and y_p in terms of x'_p and y'_p. We place the camera so that the image plane and (virtual) mirror planes coincide. We chose the viewpoint and camera coordinate systems so that their respective axes directions coincide. Thus the 4x4 matrix relating the two coordinate systems is reduced to a simple translation of the origin: $$\begin{bmatrix} x \\ y \\ z \\ 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & t_x \\ 0 & 1 & 0 & t_y \\ 0 & 0 & 1 & t_z \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x' \\ y' \\ z' \\ 1 \end{bmatrix}$$ The mirror projection equations become: $$\begin{bmatrix} U_p \\ V_p \\ W_p \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & t_x \\ 0 & 1 & 0 & t_y \\ 0 & 0 & 1/d & t_z/d \end{bmatrix} \begin{bmatrix} x' \\ y' \\ z' \\ 1 \end{bmatrix} \qquad \begin{aligned} x_p &= d(x' + t_x)/(z' + t_z) \\ y_p &= d(y' + t_y)/(z' + t_z) \end{aligned}$$ *See* GEOMETRIC ANALYSIS, page 746. "Various computer vision techniques could be used to attempt to recover the 3-13 geometry of the world from images in some cases. Another solution would be to use a 3-D model of the environment, if available. For our first prototype, we followed a simpler approximate approach. Since we are designing our mirror as a first person interaction tool, we assume that the center of interest is the user himself, and that the

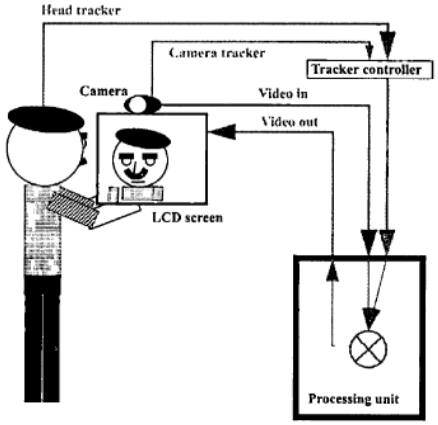
Asserted Claim of the ’110 Patent	Exemplary Citations to Francois I
	background is of lesser importance. We thus model the world as a plane parallel to the mirror/imaging plane, at the same distance as the user's viewpoint (see figure 5).” 747.  **Figure 5. Flat world assumption.** *See* GEOMETRIC ANALYSIS, page 747. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois I alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

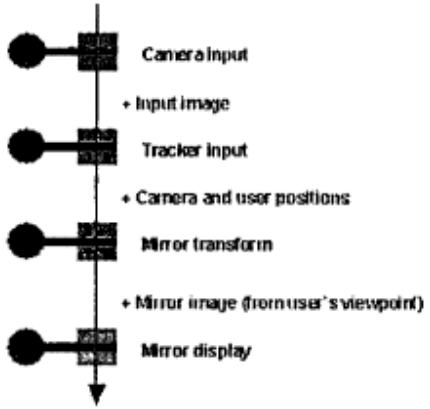
Asserted Claim of the ’110 Patent	Exemplary Citations to Francois I
Claim 3	
3. The method of claim 1, wherein during idle mode the camera continuously sends	Francois I expressly and/or inherently discloses and/or renders obvious wherein during idle mode the camera continuously sends captured images to the processor, and the user

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois I
captured images to the processor, and the user presence is identified by the processor detecting a body part in the images.	presence is identified by the processor detecting a body part in the images. *See*, *e.g.*, disclosures below. “Our system is composed of a handheld LCD screen manipulated by the user, a single camera fixed on the screen, and two 6 degrees of freedom trackers giving in real time the positions and orientations of the camera and the user's head. The major system components and their relations are illustrated in figure 1. The user sees on the screen what they would see on a real mirror.” *See* 1.INTRODUCTION, page 745.  **Figure 1. Handheld mirror simulation system.** “The only parameters are f, d and [txtytz]. The theoretical focal length of the camera can be obtained by various calibration methods. The positions and orientations of the user's viewpoint and the camera center provided by the tracking devices, allow to compute both the distance d and the change of referential translation parameters.” *See* 3.SYSTEM INTEGRATION, page 747.

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois I
	 **Figure 6. Mirror simulation application graph.** This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois I alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois I
Claim 4	
4. The method of claim 3, wherein the body part comprises one of legs, face, eyes, and hands.	Francois I expressly and/or inherently discloses and/or renders obvious wherein the body part comprises one of legs, face, eyes, and hands. *See*, *e.g.*, disclosures below. “Our system is composed of a handheld LCD screen manipulated by the user, a single camera fixed on the screen, and two 6 degrees of freedom trackers giving in real time the positions and orientations of the camera and the user's head. The major system

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois I
	components and their relations are illustrated in figure 1. The user sees on the screen what they would see on a real mirror.” *See* 1.INTRODUCTION, page 745.  **Figure 1. Handheld mirror simulation system.** “The only parameters are f, d and [txtytz]. The theoretical focal length of the camera can be obtained by various calibration methods. The positions and orientations of the user's viewpoint and the camera center provided by the tracking devices, allow to compute both the distance d and the change of referential translation parameters.” *See* 3.SYSTEM INTEGRATION, page 747.

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois I
	 **Figure 6. Mirror simulation application graph.** This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois I alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois I
Claim 5	
5. The method of claim 1, further comprising receiving user input and operating the processor to vary image magnitude or field-of-view of the modified images according to the user input.	Francois I expressly and/or inherently discloses and/or renders obvious receiving user input and operating the processor to vary image magnitude or field-of-view of the modified images according to the user input. *See*, *e.g.*, disclosures below.

Asserted Claim of the '110 Patent	Exemplary Citations to Francois I
	"Our system provides a generic interface for applications involving rich, first-person interaction, such as the Virtual Daguerreotype." *See* Abstract, page 745. "A major novelty in our approach is the hands-on aspect, which requires a more elaborate model to convincingly reproduce the interaction between the user and the mirror as an object. One important clue is the evolution of the user's field of view in the mirror as her position with respect to the mirror changes. Furthermore, our goal is to produce a working but extensible system, to serve as a platform for future enhancements to the HCI device subsystem itself, as well as to allow easy integration in applications Our system is composed of a handheld LCD screen manipulated by the user, a single camera fixed on the screen, and two 6 degrees of freedom trackers giving in real time the positions and orientations of the camera and the user's head. The major system components and their relations are illustrated in figure 1. The user sees on the screen what they would see on a real mirror. The perception of the world reflected through a mirror depends on the viewer's position with respect to the mirror and the 3-D geometry of the world. In order to simulate a real mirror on a computer screen, images of the observed world, consistent with the viewer's position, must be synthesized and displayed in real-time. The continuous input video stream and tracker data is used to synthesize, in real-time, a continuous video stream displayed on the LCD screen. The synthesized video stream is a close approximation of what the user would see on the screen surface if it were a real mirror." *See* 1.INTRODUCTION, page 745. "When a person looks into a planar mirror, they see what they would see from the symmetrical (virtual) point of view (see figure 2). Assimilating image formation by the eye to a perspective projection, the image perceived by the viewer on the mirror surface is a perspective projection on the mirror plane with respect to the virtual viewpoint. A point of homogenous coordinates [xyz1] m an orthonormal coordinate system centered on the virtual viewpoint (symmetrical of the user viewpoint with respect to the mirror plane) with the z direction normal to the mirror, is seen on the mirror surface at its

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois I
	projected location [xpypd] , where d is the orthogonal distance of the viewpoint to the mirror plane, and $\begin{bmatrix} U_p \\ V_p \\ W_p \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1/d & 0 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \\ 1 \end{bmatrix}$ $x_p = U_p / W_p = dx/z$ $y_p = V_p / W_p = dy/z$ The image perceived on the mirror depends only on the position of the user with respect to the mirror, and the field of view covered by the mirror depends only on the position of the user with respect to the mirror edges. In particular, the image perceived on the mirror remains "fixed" when the viewing direction changes while the viewpoint remains fixed.” *See* 2.GEOMETRIC ANALYSIS, pages 745-46. “In order to synthesize the images corresponding to the user's view1point from the images captured by the camera, we must relate them geometrically, i.e. express x_p and y_p in terms of x'_p and y'_p.

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois I

$$\begin{bmatrix} x \\ y \\ z \\ 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & t_x \\ 0 & 1 & 0 & t_y \\ 0 & 0 & 1 & t_z \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x' \\ y' \\ z' \\ 1 \end{bmatrix}$$

The mirror projection equations become:

$$\begin{bmatrix} U_p \\ V_p \\ W_p \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & t_x \\ 0 & 1 & 0 & t_y \\ 0 & 0 & 1/d & t_z/d \end{bmatrix} \begin{bmatrix} x' \\ y' \\ z' \\ 1 \end{bmatrix} \qquad \begin{aligned} x_p &= d(x' + t_x)/(z' + t_z) \\ y_p &= d(y' + t_y)/(z' + t_z) \end{aligned}$$

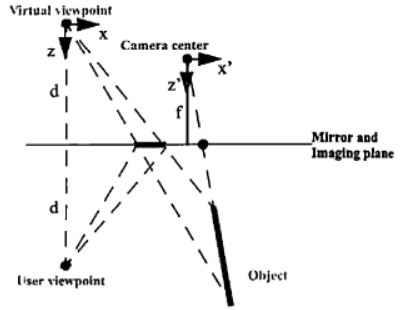
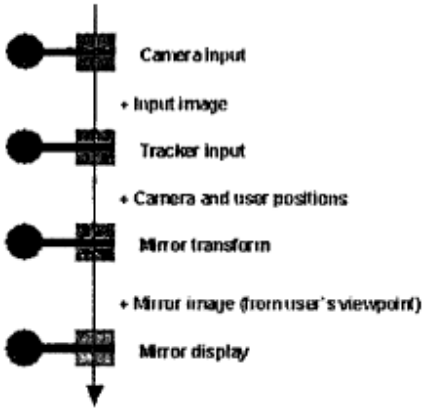


Figure 4. An underconstrained problem.

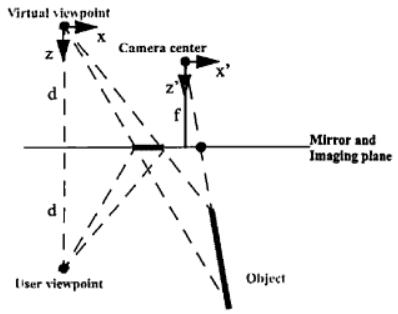
Express xp and yp in terms of x'p and /p thus requires to recover the actual 3-D position of each point from its image projection. This is obviously an underconstrained problem, as an image pixel might potentially be the projection of any world point on a ray passing through the camera center and the pixel, as illustrated in figure 4. Various computer vision techniques could be used to attempt to recover the 3-13 geometry of the world from images in some cases. Another solution would be to use a 3-D model of the environment, if available. For our first prototype, we followed a simpler approximate approach. Since we are designing our mirror as a first person interaction tool, we assume that the center of interest is the user himself, and that the background is of lesser

Asserted Claim of the '110 Patent	Exemplary Citations to Francois I
	importance. We thus model the world as a plane parallel to the mirror/imaging plane, at the same distance as the user's viewpoint (see figure 5). The z' component of each world point is thus fixed to $z' = f + d$ in the camera centered coordinate system. We can now inverse the camera projection equations: $x'_p = fx'/(f+d) \Leftrightarrow x' = (f+d)x'_p/f$ $y'_p = fy'/(f+d) \Leftrightarrow y' = (f+d)y'_p/f$ The transformation equations that relate the user's view to the camera image are thus: $x_p = d((f+d)x'_p/f + t_x)/((f+d) + t_z)$ $y_p = d((f+d)y'_p/f + t_y)/((f+d) + t_z)$ The only parameters are f, d and [txtytz]. The theoretical focal length of the camera can be obtained by various calibration methods. The positions and orientations of the user's viewpoint and the camera center provided by the tracking devices, allow to compute both the distance d and the change of referential translation parameters. Note that under our assumptions, the transform relating the user's view to the camera view is reduced to a scaling and a translation. This model provides a straightforward and efficient way of synthesizing the viewer's image stream from the camera stream, while remaining a reasonable approximation for a large class of applications. The major field-of-view variations occuring when varying the angle of view and the distance to the mirror, are convincingly simulated.

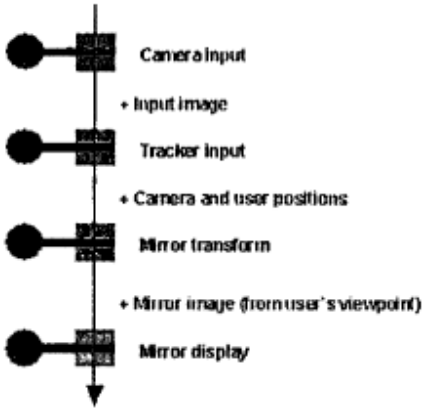
Asserted Claim of the ’110 Patent	Exemplary Citations to Francois I
	 **Figure 6. Mirror simulation application graph.** *See* 2.3 User view synthesis, pages 746-47. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois I alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois I
Claim 6	

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Asserted Claim of the '110 Patent	Exemplary Citations to Francois I
6. The method of claim 5, wherein the processor varies the image magnitude or field-of-view mapping to display a partial or full body of the user in the modified images.	Francois I expressly and/or inherently discloses and/or renders obvious wherein the processor varies the image magnitude or field-of-view mapping to display a partial or full body of the user in the modified images. *See*, *e.g.*, disclosures below. "In order to synthesize the images corresponding to the user's view1point from the images captured by the camera, we must relate them geometrically, i.e. express x_p and y_p in terms of x'_p and y'_p. $$\begin{bmatrix} x \\ y \\ z \\ 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & t_x \\ 0 & 1 & 0 & t_y \\ 0 & 0 & 1 & t_z \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x' \\ y' \\ z' \\ 1 \end{bmatrix}$$ The mirror projection equations become: $$\begin{bmatrix} U_p \\ V_p \\ W_p \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & t_x \\ 0 & 1 & 0 & t_y \\ 0 & 0 & 1/d & t_z/d \end{bmatrix} \begin{bmatrix} x' \\ y' \\ z' \\ 1 \end{bmatrix} \quad x_p = d(x' + t_x)/(z' + t_z) \quad y_p = d(y' + t_y)/(z' + t_z)$$  **Figure 4. An underconstrained problem.** Express xp and yp in terms of x'p and /p thus requires to recover the actual 3-D position of each point from its image projection. This is obviously an underconstrained problem,

Asserted Claim of the '110 Patent	Exemplary Citations to Francois I
	as an image pixel might potentially be the projection of any world point on a ray passing through the camera center and the pixel, as illustrated in figure 4. Various computer vision techniques could be used to attempt to recover the 3-13 geometry of the world from images in some cases. Another solution would be to use a 3-D model of the environment, if available. For our first prototype, we followed a simpler approximate approach. Since we are designing our mirror as a first person interaction tool, we assume that the center of interest is the user himself, and that the background is of lesser importance. We thus model the world as a plane parallel to the mirror/imaging plane, at the same distance as the user's viewpoint (see figure 5). The z' component of each world point is thus fixed to $z' = f + d$ in the camera centered coordinate system. We can now inverse the camera projection equations: $$x'_p = fx'/(f+d) \Leftrightarrow x' = (f+d)x'_p/f$$ $$y'_p = fy'/(f+d) \Leftrightarrow y' = (f+d)y'_p/f$$ The transformation equations that relate the user's view to the camera image are thus: $$x_p = d((f+d)x'_p/f + t_x)/((f+d) + t_z)$$ $$y_p = d((f+d)y'_p/f + t_y)/((f+d) + t_z)$$ The only parameters are f, d and [txtytz]. The theoretical focal length of the camera can be obtained by various calibration methods. The positions and orientations of the user's viewpoint and the camera center provided by the tracking devices, allow to compute both the distance d and the change of referential translation parameters. Note that under our assumptions, the transform relating the user's view to the camera view is reduced to a scaling and a translation. This model provides a straightforward and efficient way of

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois I
	synthesizing the viewer's image stream from the camera stream, while remaining a reasonable approximation for a large class of applications. The major field-of-view variations occuring when varying the angle of view and the distance to the mirror, are convincingly simulated.  **Figure 6. Mirror simulation application graph.** *See* 2.3 User view synthesis, pages 746-47. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois I alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '110 Patent	Exemplary Citations to Francois I
Claim 10	
10. The method of claim 1, further comprising operating the processor to augment the modified images by overlaying virtual objects on a user's image appearing within the modified images.	Francois I inherently discloses and/or renders obvious operating the processor to augment the modified images by overlaying virtual objects on a user's image appearing within the modified images. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois I alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '110 Patent	Exemplary Citations to Francois I
Claim 11	
11. The method of claim 1, further comprising operating the processor to transmit the modified image over a network.	Francois I inherently discloses and/or renders obvious operating the processor to transmit the modified image over a network. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois I alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '110 Patent	Exemplary Citations to Francois I
Claim 12	

Asserted Claim of the '110 Patent	Exemplary Citations to Francois I
12. The method of claim 1, further comprising displaying the modified image on a remote screen for video telepresence.	Francois I inherently discloses and/or renders obvious displaying the modified image on a remote screen for video telepresence. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois I alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '110 Patent	Exemplary Citations to Francois I
Claim 16	
16. The method of claim 1, wherein the processor operates on the images from the camera to generate background segmentation, and replaces segments on the images by replacement segments.	Francois I inherently discloses and/or renders obvious wherein the processor operates on the images from the camera to generate background segmentation, and replaces segments on the images by replacement segments. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois I alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '110 Patent	Exemplary Citations to Francois I
Claim 17	
17. The method of claim 16, wherein the replacement segments comprise virtual	Francois I inherently discloses and/or renders obvious wherein the replacement segments comprise virtual background or background that was captured in a different setting. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois I alone; (2) knowledge of a personal of ordinary skill in the art,

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois I
background or background that was captured in a different setting.	and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

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Exhibit B-03: Invalidity of U.S. Patent No. 8,982,110 in view of *A Handheld Virtual Mirror*, Francois et al.; *A Handheld Mirror Simulation*, Francois et al.; *Mirror symmetry -> 2-view stereo geometry*, Francois et al.; *Software Architecture for Computer Vision: Beyond Pipes and Filters*, Francois; *Software Architecture for Immersipresence*, Francois; *An Architectural Framework for the Design, Analysis and Implementation of Interactive Systems*, Francois (collectively "Francois II")

This chart is subject to all reservations, objections, and disclaimers in Defendant's Invalidity Contentions and any amendment, supplement, or modification thereof, which are incorporated herein by reference in their entirety. The technical publications listed below (collectively "Francois II") are each available as prior art to U.S. Patent No. 8,982,110 (the "'110 Patent") under at least 35 U.S.C. §§ 102(a) and (b) as indicated by the publication dates below.

- *A Handheld Mirror Simulation*, Francois et al., ("Francois I")(2003);
- Integrated Media Systems Center, Alexandre R.J. Francois et al., *A Handheld Virtual Mirror* (2002);
- Image and Vision Computing 21, 137–143, Alexandre R.J. Francois et al., *Mirror symmetry -> 2-view stereo geometry* (2003);
- Institute for Robotics and Intelligent Systems, Alexandre R.J. Francois, *Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003);
- Integrated Media Systems Center, Alexandre R.J. Francois, *Software Architecture for Immersipresence* (2003);
- The Computer Journal, Vol. 54 No. 7, Alexandre R.J. Francois, *An Architectural Framework for the Design, Analysis and Implementation of Interactive Systems* (2010).

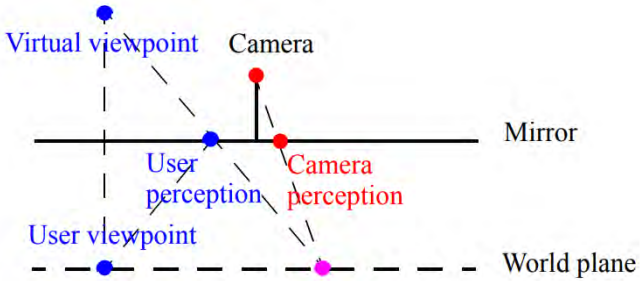
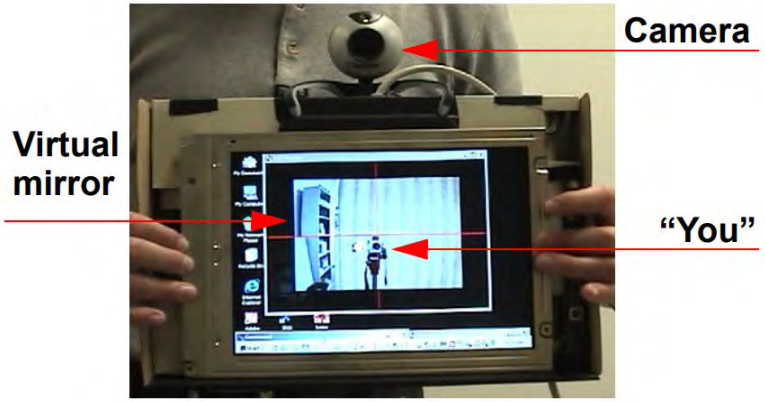
Francois II, alone or with other references, renders the Asserted Claims of the '110 Patent obvious. To the extent it is found Francois II does not expressly disclose certain limitations in the Asserted Claims, such limitations are at least implicitly or inherently disclosed. Moreover, to the extent it is found that Francois II does not disclose a limitation in the Asserted Claims, Francois II renders obvious the limitation, either alone or in combination with other prior art identified in the cover pleading or herein, and/or in combination with the general knowledge of a person having ordinary skill in the art. Further, this chart herein incorporates by reference and in its entirety the chart for *A Handheld Mirror Simulation*, Francois et al., ("Francois I") (Exhibit B-02) for the '110 Patent.

In these contentions, Defendants have relied in part on Plaintiff's Infringement Contentions. In those contentions, Plaintiff appears to pursue overly broad claim constructions in an effort to assert infringement where none exists, and to accuse products that do not infringe the claims. Defendants' assertion that a particular limitation is disclosed by a prior art reference and/or is disclosed in a particular manner may be based in part on Plaintiff's apparent claim interpretations. In relying on Plaintiff's apparent claim interpretations, Defendants do not admit that Plaintiff's apparent claim interpretations are supportable or proper or that the claim limitations in question are definite or otherwise amenable to construction.

Defendants have endeavored to provide as much detail as possible in these contentions and, in doing so, have exceeded the level of detail required. The inclusion of specific details in some areas is not a concession that such details are required or that the omission of similar details in other areas is a defect. These citations to portions of any reference in this chart are exemplary only. Defendants will rely on the entirety of the references cited in this chart to show that the Asserted Claims are invalid.

Asserted Claim of the '110 Patent	**Exemplary Citations to Francois II**
Claim 1	
1[pre]. A computerized method for operating a display system, the display system having a camera, a monitor, and a processor, the method comprising:	To the extent the preamble is limiting, Francois II expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. "This sketch presents the design and construction of a handheld virtual mirror device. The perception of the world reflected through a mirror depends on the viewer's position with respect to the mirror and the 3-D geometry of the world. In order to simulate a real mirror on a computer screen, images of the observed world, consistent with the viewer's position, must be synthesized and displayed in real-time. Our system is build around a flat LCD screen manipulated by the user, a single camera fixed on the screen, and a tracking device. The continuous input video stream and tracker data is used to synthesize, in real-time, a continuous video stream displayed on the LCD screen. The synthesized video stream is a close approximation of what the user would see on the screen surface if it were a real mirror." *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at the introductory paragraph. "When a person looks into a mirror, they see what they would see from the symmetrical (virtual) point of view (figure 1). A camera whose position and orientation are fixed with respect to the mirror produces a video stream that corresponds to this particular viewpoint. In

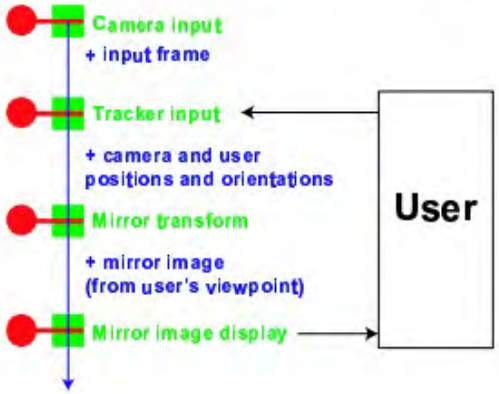
Asserted Claim of the ’110 Patent	Exemplary Citations to Francois II
	order to synthesize the images corresponding to the user's viewpoint from the images captured by the camera, we must relate them geometrically. Such a transform cannot be formulated without assumptions or knowledge about the world geometry. In our case, the focus of attention is the user's own reflection in the mirror. We thus model the world as a plane parallel to the mirror, at the user's distance from the mirror. We have shown that under these assumptions, the transform relating the camera view and the user view depends only on the relative positions of the user viewpoint and the camera center, and is reduced to a scaling and a translation. The transform is exact when the user viewpoint lies on the camera axis. This model provides a straightforward and efficient way of synthesizing the viewer's image stream from the camera stream, and provides a good approximation when the viewer's position remains close to the camera axis.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 1.Problem formulation and geometric analysis. “We have implemented the mirror image transform as a module in the Modular Flow Scheduling Middleware [François 2001], the open source implementation of IMSC's software architecture for Integrated Media Systems. It is specifically designed for parallel processing of concurrent data streams in real-time, and its modularity dramatically reduces development and integration time. The actual handheld virtual mirror system is composed of a handheld 10" LCD flat screen fitted with a camera and a magnetic tracker sensor (figure 2), a fixed processing unit, a fixed magnetic tracker transmitter, and a second magnetic tracker sensor placed on the user. Real-time camera and tracker inputs are used to synthesize the virtual mirror stream and display it in real-time on the LCD screen. The result is a very convincing handheld mirror simulation.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 2.2.System integration. “The design and construction of realistic virtual mirrors represents an original experiment in Human-Computer Interface, that opens the door to various interactive experiments in entertainment, arts and communication. Use of video analysis and graphics techniques will allow to explore and interfere with what has always been a private, solitary act of a person looking in a mirror.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 3.Perspectives.

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois II
	See A Handheld Virtual Mirror (2002), at Figure 1:  Figure 1. Basic mirror geometry. *See A Handheld Virtual Mirror* (2002), at Figure 2:  Figure 2. Handheld virtual mirror device.

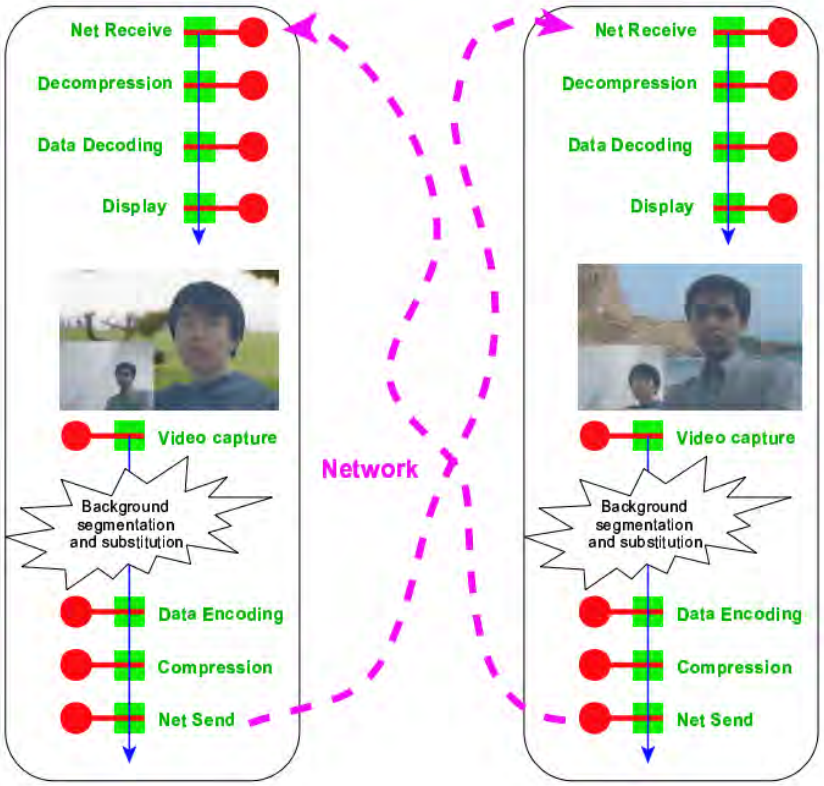
Asserted Claim of the ’110 Patent	Exemplary Citations to Francois II
	“This document highlights and addresses architecture level software development issues facing researchers and practitioners in the field of Computer Vision. A new framework, or architectural style, called SAI, is introduced. It provides a formalism for the design, implementation and analysis of software systems that perform distributed parallel processing of generic data streams. Architectural patterns are illustrated with a number of demonstration projects ranging from single stream automatic real-time video processing to fully integrated distributed interactive systems mixing live video, graphics and sound. SAI is supported by an open source architectural middleware called MFSM.” *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 1 (Abstract). “4.3 Handheld mirror simulation The Virtual Mirror project [16, 15] started as a feasibility study for the development and construction of a handheld mirror simulation device. The perception of the world reflected through a mirror depends on the viewer’s position with respect to the mirror and the 3-D geometry of the world. In order to simulate a real mirror on a computer screen, images of the observed world, consistent with the viewer’s position, must be synthesized and displayed in real-time. This is of course geometrically impossible, but with a few simplifying assumptions (e.g. planar world), the image transform required was made simple yet convincing enough to consider building an actual device. The current prototype system (see Figure 12) is comprised of an LCD screen manipulated by the user, a single camera fixed on the screen, and a tracking device. The continuous input video stream and tracker data is used to synthesize, in real-time, a continuous video stream displayed on the LCD screen. The synthesized video stream is a close approximation of what the user would see on the screen surface if it were a real mirror. Figure 13 shows the corresponding conceptual application graph. The single stream application does not involve any complicated structure. The stream originates in a live video input cell. A tracker input cell adds position and orientation data to the stream. A mirror transform cell uses the synchronous image and tracking data to synthesize the mirror simulation image, which is then presented to the user by an image display cell. The two major difficulties in this application are (1) synchronizing the various input streams (video and tracking data) to compute a consistent result; and (2) displaying the result with a low enough latency and a high enough throughput to produce a convincing simulation. The use of pulses in the SAI model

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois II
	makes synchronization a natural operation, involving no superfluous delays or computations. The asynchronous parallel processing model allow high frame rates and low latency. The essential purpose of this system is interaction. Interaction can be seen as a particular data stream loop feeding the user with a perceptual representation of the internal model (experience), collecting the users reaction through various sensory devices and modifying the state of the internal model accordingly (influence). From the systems point of view, these data streams are volatile, and the processes involved in producing and processing them are of the same nature as those carrying procedural internal evolution tasks. Here, the internal model is the mirror, implicit in the computations carried by the mirror transform cell. The user experiences the system through the image displayed on the handheld screen, and influences it by moving her head or the screen. Note that the way live video (frames) and corresponding tracker data are synchronized in the application as described in the conceptual graph is based on the assumption that the delay between the frame capture in the live input cell (push mechanism acting as pulse trigger), and the capture of tracker data in the tracker input cell (pull mechanism), is small enough that no inconsistency can be perceived. This approach happens to work in this case, even when the system is running on a modest platform, but certainly does not generalize to synchronization in more sophisticated settings. This illustrates the flexibility of the SAI style, that allows to devise general structures, as well as simplified or ad hoc design when allowed by the application. This project also illustrates the power of SAI for system integration. The modularity of the model ensures that components developed independently (but consistently with style rules) will function together seamlessly. This allows code re-use (e.g. the image node, and the live video capture and image display cells already existed), and distributed development and testing of new node and cell types. The whole project was completed in only a few months with very limited resources. The mirror simulation system can be used as a research platform. For example, it is a testbed for developing and testing video analysis techniques that could be used to replace the magnetic trackers, including face detection and tracking, and gaze tracking. The device itself constitutes a new generic interface for applications involving rich, first-person interaction. A straightforward application is the Daguerr´eotype simulation described in [22]. Beyond technical and commercial applications of such a device, the use of video analysis and graphics techniques will allow artists to explore

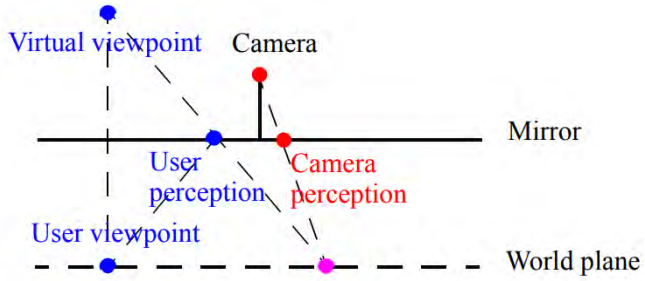
Asserted Claim of the ’110 Patent	Exemplary Citations to Francois II
	and interfere with what has always been a private, solitary act, a person looking into a mirror.” *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 13-15. *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at Figs. 12 and 13:

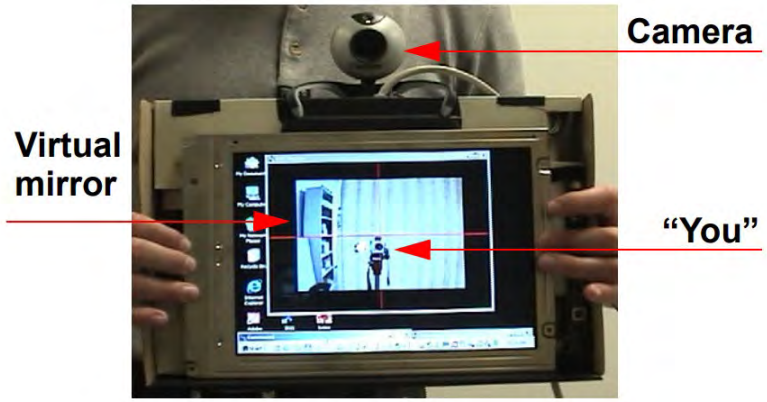
Asserted Claim of the ’110 Patent	Exemplary Citations to Francois II
	 Figure 12: The handheld mirror simulation system (“Virtual Mirror”).  Figure 13: The Virtual Mirror application graph.

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois II
	“4.5 Live video in animated 3-D graphics The example presented in this section is a real-time, interactive application requiring manipulation of het1erogenous data streams [14]. A video stream (captured live or read from a file) is used as surface texture on an animated 3-D model, rendered in real-time. The (virtual) camera used for rendering can be manipulated n real-time (e.g. with a gamepad or through a head tracking device), making the system interactive. This system was developed to illustrate the design of a scene graph-based graphics toolkit, and the advantages provided by the SAI style for manipulating independently and synchronizing different data streams in a complex interactive (possibly immersive) setting. From a Computer Vision point of view, this example illustrates how the SAI style allows to manipulate video streams and geometric models in a consistent framework. The same architectural patterns generalize to manipulating generic data streams and persistent models. Figure 16 shows the system’s conceptual graph. The graph is composed of four functional subgraphs, corresponding to four independent streams, organized around a central source that holds the 3-D model representation in the form of a scene graph, and various process parameters for the different connected cells. The rendering stream generates images of the model. The control stream updates the (virtual) camera position based on user input. Together, the rendering and control units (including the shared source) form an interaction loop with the user. The animation stream drives the dynamic evolution of the 3-D model. The texturing stream places images captured from a video source (camera or file) in the texture node in the scene graph. Interaction and modeling are now analyzed in more detail.” *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 16-17. *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at Fig. 15:

Asserted Claim of the '110 Patent	Exemplary Citations to Francois II
	 Figure 15: Conceptual graph for an early version of the IMSC Communicator, with support for video (synchronized image and sound). This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois II alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants'

Asserted Claim of the '110 Patent	Exemplary Citations to Francois II
	Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[a]. operating the camera to generate a stream of images of the user;	To the extent the preamble is limiting, Francois II expressly and/or inherently discloses and/or renders obvious operating the camera to generate a stream of images of the user. *See*, *e.g.*, disclosures below. "In order to simulate a real mirror on a computer screen, images of the observed world, consistent with the viewer's position, must be synthesized and displayed in real-time. Our system is build around a flat LCD screen manipulated by the user, a single camera fixed on the screen, and a tracking device." *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at the introductory paragraph. "A camera whose position and orientation are fixed with respect to the mirror produces a video stream that corresponds to this particular viewpoint. In order to synthesize the images corresponding to the user's viewpoint from the images captured by the camera, we must relate them geometrically." *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 1.Problem formulation and geometric analysis. "The actual handheld virtual mirror system is composed of a handheld 10" LCD flat screen fitted with a camera and a magnetic tracker sensor (figure 2), a fixed processing unit, a fixed magnetic tracker transmitter, and a second magnetic tracker sensor placed on the user. Real-time camera and tracker inputs are used to synthesize the virtual mirror stream and display it in real-time on the LCD screen. The result is a very convincing handheld mirror simulation." *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 2.2.System integration. "The design and construction of realistic virtual mirrors represents an original experiment in Human-Computer Interface, that opens the door to various interactive experiments in entertainment, arts and communication. Use of video analysis and graphics techniques will allow to explore and interfere with what has always been a private, solitary act of a person

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois II
	looking in a mirror.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 3.Perspectives. *See A Handheld Virtual Mirror* (2002), at Figure 1:  Figure 1. Basic mirror geometry. *See A Handheld Virtual Mirror* (2002), at Figure 2:

Asserted Claim of the '110 Patent	Exemplary Citations to Francois II
	 Figure 2. Handheld virtual mirror device. "We address the problem of 3D reconstruction from a single perspective view of a mirror symmetric scene. We establish the fundamental result that it is geometrically equivalent to observing the scene with two cameras, the cameras being symmetrical with respect to the unknown 3D symmetry plane. All traditional tools of classical 2-view stereo can then be applied, and the concepts of fundamental/essential matrix, epipolar geometry, rectification and disparity hold. However, the problems are greatly simplified here, as the rectification process and the computation of epipolar geometry can be easily performed from the original view only. If the camera is calibrated, we show how to synthesize the symmetric image generated by the same physical camera. A Euclidean reconstruction of the scene can then be computed from the resulting stereo pair. To validate this novel formulation, we have processed many real images, and show examples of 3D reconstruction. q 2003 Elsevier Science B.V. All rights reserved." *See Mirror symmetry -> 2-view stereo geometry* (2003) at 137 (Abstract). "Theorem. One perspective view of a mirror symmetric scene, taken with an arbitrary projective camera, is geometrically equivalent to two perspective views of the scene from two projective cameras symmetrical with respect to the unknown 3D symmetry plane.

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois II
	We show how to extract the epipolar geometry relating the two views from the single input image. Classical 2-view stereo results can then be applied (see e.g. Refs. [1,4]), and the concepts of fundamental/essential matrix, epipolar geometry, rectification and disparity hold. If the camera is calibrated, we show how to synthesize the image generated by the original camera placed symmetrically, in order to be able to use traditional 2-view stereo tools to obtain an Euclidean reconstruction of the scene. This paper is organized as follows. In Section 2, we establish a lemma introducing a virtual camera, symmetric to the camera that produced the input image with respect to the object’s symmetry plane. In Section 3, we establish a lemma linking the symmetry lines and epipolar lines in images of a symmetric scene taken by cameras in symmetrical locations. The proof for the mirror-stereo theorem is given in Section 4. In Section 5, we show, in the case of a calibrated pinhole camera, how to build a virtual view taken by the same camera placed symmetrically in location and orientation. Examples of Euclidean 3D reconstructions obtained from such pairs with an off-the-shelf stereo package are presented. A summary of the contribution concludes the paper in Section 6. Throughout the paper, the approach and notation used are consistent with that of Ref. [4].” *See Mirror symmetry -> 2-view stereo geometry* (2003) at 138. “We developed our novel formulation to use existing 2- view stereo tools to perform 3D reconstruction of mirror symmetric objects from a single, real perspective image. Such systems take as input two images, taken by the same physical camera from different positions, and sometimes require the images to be rectified. If the rectification poses no theoretical problem given the availability of epipolar pencils, the synthesis of a virtual symmetric view taken by a physical camera requires more work. We show how to build such an image in the case of a calibrated pinhole camera, in order to allow Euclidean reconstruction of the scene. We then present the reconstruction results obtained by processing image pairs made of one real perspective image of a mirror symmetric object, and one synthetic symmetric view, in an off-the-shelf commercial package, Eos System’s PhotoModeler Pro 4.0.” *See Mirror symmetry -> 2-view stereo geometry* (2003) at 139.

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois II
	“4.3 Handheld mirror simulation The Virtual Mirror project [16, 15] started as a feasibility study for the development and construction of a handheld mirror simulation device. The perception of the world reflected through a mirror depends on the viewer’s position with respect to the mirror and the 3-D geometry of the world. In order to simulate a real mirror on a computer screen, images of the observed world, consistent with the viewer’s position, must be synthesized and displayed in real-time. This is of course geometrically impossible, but with a few simplifying assumptions (e.g. planar world), the image transform required was made simple yet convincing enough to consider building an actual device. The current prototype system (see Figure 12) is comprised of an LCD screen manipulated by the user, a single camera fixed on the screen, and a tracking device. The continuous input video stream and tracker data is used to synthesize, in real-time, a continuous video stream displayed on the LCD screen. The synthesized video stream is a close approximation of what the user would see on the screen surface if it were a real mirror. Figure 13 shows the corresponding conceptual application graph. The single stream application does not involve any complicated structure. The stream originates in a live video input cell. A tracker input cell adds position and orientation data to the stream. A mirror transform cell uses the synchronous image and tracking data to synthesize the mirror simulation image, which is then presented to the user by an image display cell. The two major difficulties in this application are (1) synchronizing the various input streams (video and tracking data) to compute a consistent result; and (2) displaying the result with a low enough latency and a high enough throughput to produce a convincing simulation. The use of pulses in the SAI model makes synchronization a natural operation, involving no superfluous delays or computations. The asynchronous parallel processing model allow high frame rates and low latency. The essential purpose of this system is interaction. Interaction can be seen as a particular data stream loop feeding the user with a perceptual representation of the internal model (experience), collecting the users reaction through various sensory devices and modifying the state of the internal model accordingly (influence). From the systems point of view, these data streams are volatile, and the processes involved in producing and processing them are of the same nature as those carrying procedural internal evolution tasks. Here, the internal model is the mirror, implicit in the computations carried by the mirror transform cell. The user experiences the system through the image displayed on the handheld screen, and influences it by moving her

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois II
	head or the screen. Note that the way live video (frames) and corresponding tracker data are synchronized in the application as described in the conceptual graph is based on the assumption that the delay between the frame capture in the live input cell (push mechanism acting as pulse trigger), and the capture of tracker data in the tracker input cell (pull mechanism), is small enough that no inconsistency can be perceived. This approach happens to work in this case, even when the system is running on a modest platform, but certainly does not generalize to synchronization in more sophisticated settings. This illustrates the flexibility of the SAI style, that allows to devise general structures, as well as simplified or ad hoc design when allowed by the application. This project also illustrates the power of SAI for system integration. The modularity of the model ensures that components developed independently (but consistently with style rules) will function together seamlessly. This allows code re-use (e.g. the image node, and the live video capture and image display cells already existed), and distributed development and testing of new node and cell types. The whole project was completed in only a few months with very limited resources. The mirror simulation system can be used as a research platform. For example, it is a testbed for developing and testing video analysis techniques that could be used to replace the magnetic trackers, including face detection and tracking, and gaze tracking. The device itself constitutes a new generic interface for applications involving rich, first-person interaction. A straightforward application is the Daguerr´eotype simulation described in [22]. Beyond technical and commercial applications of such a device, the use of video analysis and graphics techniques will allow artists to explore and interfere with what has always been a private, solitary act, a person looking into a mirror.” *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 13-15. *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at Figs. 12 and 13:

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Figure 12: The handheld mirror simulation system ("Virtual Mirror").

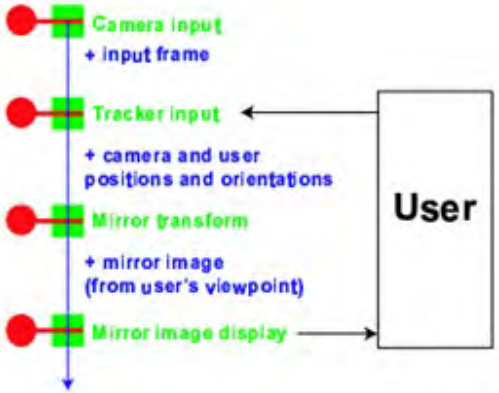
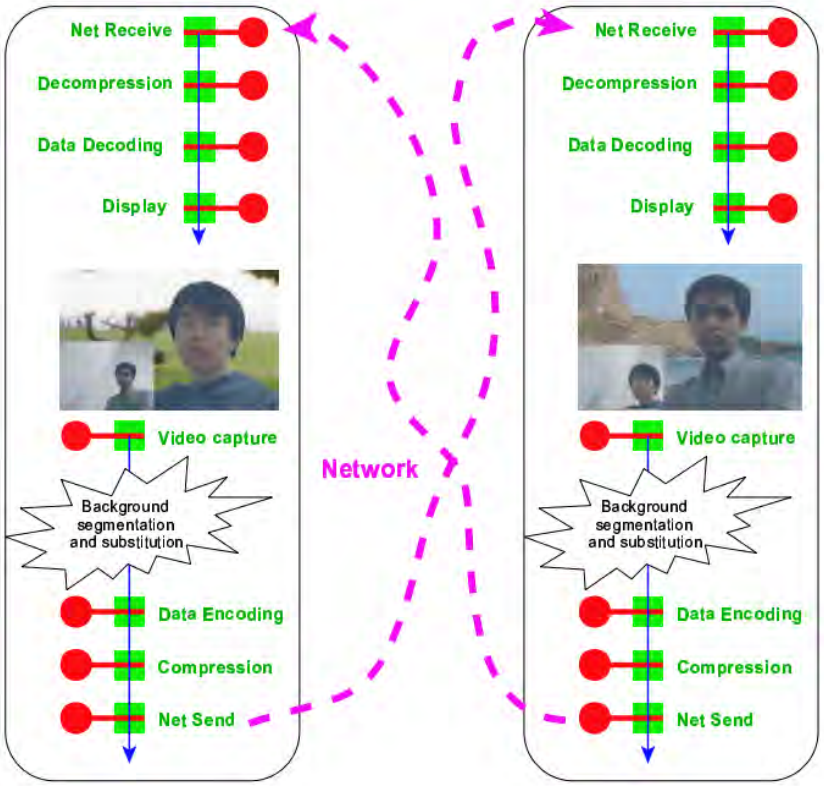
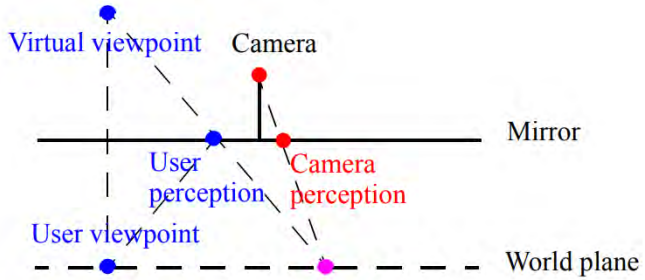
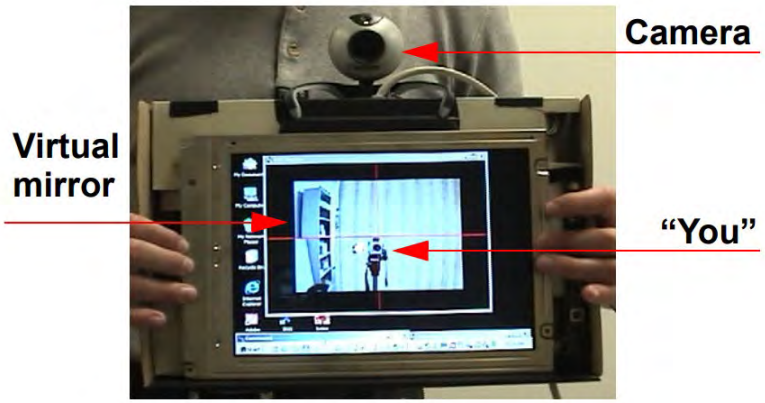


Figure 13: The Virtual Mirror application graph.

Asserted Claim of the '110 Patent	Exemplary Citations to Francois II
	"4.5 Live video in animated 3-D graphics The example presented in this section is a real-time, interactive application requiring manipulation of het1erogenous data streams [14]. A video stream (captured live or read from a file) is used as surface texture on an animated 3-D model, rendered in real-time. The (virtual) camera used for rendering can be manipulated n real-time (e.g. with a gamepad or through a head tracking device), making the system interactive. This system was developed to illustrate the design of a scene graph-based graphics toolkit, and the advantages provided by the SAI style for manipulating independently and synchronizing different data streams in a complex interactive (possibly immersive) setting. From a Computer Vision point of view, this example illustrates how the SAI style allows to manipulate video streams and geometric models in a consistent framework. The same architectural patterns generalize to manipulating generic data streams and persistent models. Figure 16 shows the system's conceptual graph. The graph is composed of four functional subgraphs, corresponding to four independent streams, organized around a central source that holds the 3-D model representation in the form of a scene graph, and various process parameters for the different connected cells. The rendering stream generates images of the model. The control stream updates the (virtual) camera position based on user input. Together, the rendering and control units (including the shared source) form an interaction loop with the user. The animation stream drives the dynamic evolution of the 3-D model. The texturing stream places images captured from a video source (camera or file) in the texture node in the scene graph. Interaction and modeling are now analyzed in more detail." *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 16-17. *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at Fig. 15:

Asserted Claim of the '110 Patent	Exemplary Citations to Francois II
	 Figure 15: Conceptual graph for an early version of the IMSC Communicator, with support for video (synchronized image and sound). This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois II alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants'

Asserted Claim of the '110 Patent	Exemplary Citations to Francois II
	Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[b]. operating the processor to detect the presence of the user in the stream of image;	To the extent the preamble is limiting, Francois II expressly and/or inherently discloses and/or renders obvious operating the processor to detect the presence of the user in the stream of image. *See*, *e.g.*, disclosures below. "This sketch presents the design and construction of a handheld virtual mirror device. The perception of the world reflected through a mirror depends on the viewer's position with respect to the mirror and the 3-D geometry of the world. In order to simulate a real mirror on a computer screen, images of the observed world, consistent with the viewer's position, must be synthesized and displayed in real-time. Our system is build around a flat LCD screen manipulated by the user, a single camera fixed on the screen, and a tracking device. The continuous input video stream and tracker data is used to synthesize, in real-time, a continuous video stream displayed on the LCD screen. The synthesized video stream is a close approximation of what the user would see on the screen surface if it were a real mirror." *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at the introductory paragraph. "We have implemented the mirror image transform as a module in the Modular Flow Scheduling Middleware [François 2001], the open source implementation of IMSC's software architecture for Integrated Media Systems. It is specifically designed for parallel processing of concurrent data streams in real-time, and its modularity dramatically reduces development and integration time. The actual handheld virtual mirror system is composed of a handheld 10" LCD flat screen fitted with a camera and a magnetic tracker sensor (figure 2), a fixed processing unit, a fixed magnetic tracker transmitter, and a second magnetic tracker sensor placed on the user. Real-time camera and tracker inputs are used to synthesize the virtual mirror stream and display it in real-time on the LCD screen. The result is a very convincing handheld mirror simulation." *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 2.2.System integration.

Asserted Claim of the '110 Patent	Exemplary Citations to Francois II
	See A Handheld Virtual Mirror (2002), at Figure 1:  Figure 1. Basic mirror geometry. *See A Handheld Virtual Mirror* (2002), at Figure 2:  Figure 2. Handheld virtual mirror device.

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois II
	“4.1 Real-time video segmentation and tracking The development of real-time video analysis applications was actually a steering concern during the development of the SAI style. The system presented here was used as a testbed for the implementation, testing and refinement of some SAI concepts [18]. The video analysis tasks performed are low level segmentation and blob tracking. The segmentation is performed by change detection using an adaptive statistical color background model (the camera is assumed stationary). A review of background maintenance algorithms can be found in [28]. Blob tracking is performed using a new multiresolution algorithm whose description is out of the scope of this document. Figure 7 shows the conceptual level architecture of the software system. It is build around a single stream going through a number of cells. The graph can be decomposed into four functional subgraphs: capture, segmentation, tracking, visualization. The stream originates in the video input cell, which produces, at a given rate, pulses containing an image coming either from a live capture device or a video file. This cell and its source constitute the capture unit of the application. The stream then goes through the segmentation unit, which is analyzed below. Coming out of the segmentation, the stream goes through a tracking cell. The result visualization unit is composed of a rendering and a display subunits. Rendering of a persistent structure (here, the tracking graph) will be illustrated in a more general context in another example below (“Live Video in Animated 3-D Graphics”). The display cell simply puts on the screen its input images, in this case the composite frames produced by the renderer. A very interesting aspect of this system, and certainly the most innovative when it was introduced, is the asynchronous parallel implementation of the segmentation algorithm, which contains a feed-back loop. The corresponding conceptual graph is also a flow graph of the algorithm. Each input frame is compared with a statistical background model. For each pixel, a decision is made whether it is an observation of the background or of an occluding element. The output is a foreground binary mask. This comparison is performed by the background comparison cell. Each pulse, after going through this cell, contains the input image and a binary foreground image, which is used by the connected components cell to produce a labeled components image, added to the pulse. The input image and the labeled components image are used by the background update cell to update the distributions in the background model. Since the comparison and the update cells both use the persistent background model, they are both connected to a common source that holds the background model structure. This path forms a

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	feed back loop in which the result of the processing of each frame is used to update the adaptive background model. Because of the asynchrony of the processing, by the time the background model is updated with the result of the processing of a given frame, many other frames might have been compared to the model. In this particular context, the quality of the result is not affected–in fact, it is common practice in background model maintenance to perform only partial updates at each frame, in order to reduce computational load–and the overall system throughput permitted by this design is always significantly larger than that achievable in a sequential design." *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 10-11. *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at Figs 8 and 9:

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Figure 8: Object segmentation and tracking results in a PETS02 test sequence. The examples shown are two sample output composite frames taken at different times in the original video.



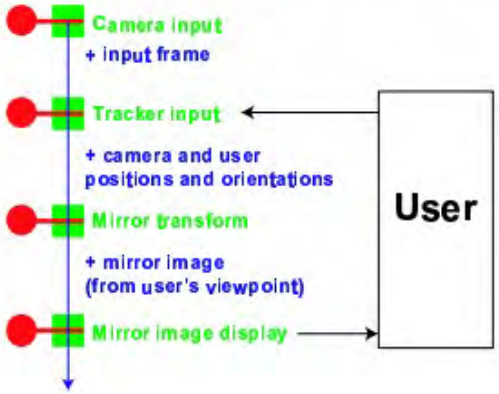
Figure 9: Segmentation and tracking of the players and the ball in professional racquetball video. The examples shown are three consecutive output composite frames.

"4.3 Handheld mirror simulation

The Virtual Mirror project [16, 15] started as a feasibility study for the development and construction of a handheld mirror simulation device. The perception of the world reflected through a mirror depends on the viewer's position with respect to the mirror and the 3-D geometry of the world. In order to simulate a real mirror on a computer screen, images of the observed world, consistent with the viewer's position, must be synthesized and displayed in real-time. This is of course geometrically impossible, but with a few simplifying assumptions

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	(e.g. planar world), the image transform required was made simple yet convincing enough to consider building an actual device. The current prototype system (see Figure 12) is comprised of an LCD screen manipulated by the user, a single camera fixed on the screen, and a tracking device. The continuous input video stream and tracker data is used to synthesize, in real-time, a continuous video stream displayed on the LCD screen. The synthesized video stream is a close approximation of what the user would see on the screen surface if it were a real mirror. Figure 13 shows the corresponding conceptual application graph. The single stream application does not involve any complicated structure. The stream originates in a live video input cell. A tracker input cell adds position and orientation data to the stream. A mirror transform cell uses the synchronous image and tracking data to synthesize the mirror simulation image, which is then presented to the user by an image display cell. The two major difficulties in this application are (1) synchronizing the various input streams (video and tracking data) to compute a consistent result; and (2) displaying the result with a low enough latency and a high enough throughput to produce a convincing simulation. The use of pulses in the SAI model makes synchronization a natural operation, involving no superfluous delays or computations. The asynchronous parallel processing model allow high frame rates and low latency. The essential purpose of this system is interaction. Interaction can be seen as a particular data stream loop feeding the user with a perceptual representation of the internal model (experience), collecting the users reaction through various sensory devices and modifying the state of the internal model accordingly (influence). From the systems point of view, these data streams are volatile, and the processes involved in producing and processing them are of the same nature as those carrying procedural internal evolution tasks. Here, the internal model is the mirror, implicit in the computations carried by the mirror transform cell. The user experiences the system through the image displayed on the handheld screen, and influences it by moving her head or the screen. Note that the way live video (frames) and corresponding tracker data are synchronized in the application as described in the conceptual graph is based on the assumption that the delay between the frame capture in the live input cell (push mechanism acting as pulse trigger), and the capture of tracker data in the tracker input cell (pull mechanism), is small enough that no inconsistency can be perceived. This approach happens to work in this case, even when the system is running on a modest platform, but certainly does not generalize to synchronization in more sophisticated settings. This illustrates the flexibility of the SAI style,

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	that allows to devise general structures, as well as simplified or ad hoc design when allowed by the application. This project also illustrates the power of SAI for system integration. The modularity of the model ensures that components developed independently (but consistently with style rules) will function together seamlessly. This allows code re-use (e.g. the image node, and the live video capture and image display cells already existed), and distributed development and testing of new node and cell types. The whole project was completed in only a few months with very limited resources. The mirror simulation system can be used as a research platform. For example, it is a testbed for developing and testing video analysis techniques that could be used to replace the magnetic trackers, including face detection and tracking, and gaze tracking. The device itself constitutes a new generic interface for applications involving rich, first-person interaction. A straightforward application is the Daguerr´eotype simulation described in [22]. Beyond technical and commercial applications of such a device, the use of video analysis and graphics techniques will allow artists to explore and interfere with what has always been a private, solitary act, a person looking into a mirror.” *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 13-15. *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at Figs. 12 and 13:

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	 Figure 12: The handheld mirror simulation system ("Virtual Mirror").  Figure 13: The Virtual Mirror application graph.

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	"This document describes SAI, a new software architecture model for designing, analyzing and implementing applications performing distributed, asynchronous parallel processing of generic data streams. SAI provides a universal framework for the distributed implementation of algorithms and their easy integration into complex systems that exhibit desirable software engineering qualities such as efficiency, scalability, extensibility, reusability and interoperability. The SAI architectural style and its properties are described." *See Software Architecture for Immersipresence* (2003) at 1 (Abstract). "The SAI style defines two types of components: cells and sources. Cells are processing centers. They do not store any state data related to their computations. The cells constitute an extensible set of specialized components that implement specific algorithms. Each specialized cell type is identified by a type name (string), and is logically defined by its input data, its parameters and its output. Cell instances are repre1sented graphically as green squares. A cell can be active or inactive, in which case it is transparent to the system. Sources are shared repository of persistent data. Source instances are represented as red disks or circles. Two types of connectors link cells to cells and cells to sources. Cell to source connectors give the cell access to the source data. Cell to cell connectors define data conduits for the streams. The semantics of these connectors are relaxed compared to that of pipes (which are FIFO queues): they do not convey any constraint on the time ordering of the data flowing through them. Cell and source instances interact according to the following rules. A cell must be connected to exactly one source, which holds its persistent state data. A source can be connected to an arbitrary number of cell, all of which have concurrent shared memory access to the data held by the source. A source may hold data relevant to one or more of its connected cells, and should hold all the relevant data for each of its connected cells (possibly with some overlap). Cell-source connectors are drawn as either double or fat red lines. They may be drawn across cells (as if cells were connected together by these links) for layout convenience. Volatile data flows in streams, which are defined by cell-to-cell connections. A cell can be connected to exactly one upstream cell, and to an arbitrary number of downstream cells. Streams (and thus cell-cell connections) are drawn as thin blue arrows crossing over the cells." *See Software Architecture for Immersipresence* (2003) at 8.

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	“Data, whether persistent or volatile, is held in pulses. A pulse is a carrier for all the synchronous data corresponding to a given time stamp in a stream. Information in a pulse is organized as a mono-rooted composition hierarchy of node objects…. Each source contains a passive pulse, which encodes the instantaneous state of the data structures held by the source. Volatile data flows in streams, that are temporally quantized into active pulses.” *See Software Architecture for Immersipresence* (2003) at 9. “Finally, a critical architectural property that must be considered is performance overhead. Some aspects of the SAI data and processing models, such as filtering, involve non trivial computations, and could make the theory impractical. The existence of fairly complex systems designed in the SAI style and implemented with MFSM show that, at least for these examples, it is not the case. Experimental scalability tests performed on applications designed in the SAI style, reported in [20] and [16], suggest that: (1) as long as computing resources are available, the overhead introduced by the SAI processing model remains constant, and (2) the contribution of the different processes are combined linearly.” *See Software Architecture for Immersipresence* (2003) at 10. “5.1. Visual tracking with CAMSHIFT The CAMSHIFT algorithm [9] detects and tracks a pattern, for example, a person’s face, in a video stream. Figure 6 shows sample graphical outputs of a CAMSHIFT-based system: the position, size and orientation of the target overlaid on the input frame (right), and on the probability distribution computed from the input frame and the target model (left)…. OpenCV implements individual features useful in developing a CAMSHIFT-based tracking system. The code adopts an object-oriented organization structure. Low-level features include general purpose data structures and functions; intermediate-level features include more specialized functions that package calls to general purpose functions in the context of specific algorithms; at the highest level, a black-box class encapsulates all necessary data structures and hides all intermediate library calls internally.” *An Architectural Framework for the Design, Analysis and Implementation of Interactive Systems* (2010) at 1194. “Figure 8 shows the SAI graph of a simple CAMSHIFT-based color-tracking system. The SAI formulation makes explicit, at the architectural level, the various elements that come into play in the implementation of such a system, and their interactions. In particular, the SAI diagram

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	prominently features the feedback loop that constitutes the core of the CAMSHIFT algorithm…. In mean shift-based tracking of a single target, for each new input probability image, the iterative gradient descent starts at the last known position of the target and optimally converges toward the location of the model instance in the current input frame. The new position of the taget is added to each pulse exiting the Mean shift cell. CAMSHIFT extends mean shift-based color tracking by continuously computing the size and orientation of the tracked area (Moments cell). The position and size of the target are updated (Last known bounding box) to serve as input parameters for processing of the next input frame reaching the Mean shift cell. The capture of input video frames, color model conversion of the input frames (here from RGB to HSV) and rendering and display of composite images for demonstration purposes are all generic operation that have no specificity to the tracking task. Isolating such process facilitates code reuse and simplifies debugging." *An Architectural Framework for the Design, Analysis and Implementation of Interactive Systems* (2010) at 1195. "Intuitively, the target (a person's face in a close-up shot) is large and slow, and therefore almost always found very close to where it was previously seen. Occasionally, the target suddenly moves too fast, or disappears, or, for any other reason, cannot be found in the particular frame, and the algorithm keeps working pointlessly until the maximum number of iterations allowed is reached, wasting precious time and processing cycles on a hopeless task. Processing resources would be better spent on the next frame, in which the target might be easier to find. Consequently, the Mean shift cell implements a small, fixed number of iterations of the mean shift gradient descent. The iterative nature of the original algorithm is expressed through the feedback structure. As a result, the system reacts more efficiently to changes in the input (target motion)." *An Architectural Framework for the Design, Analysis and Implementation of Interactive Systems* (2010) at 1196. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois II alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

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1[c]. operating the processor to apply adaptive transformation mapping to the stream of images captured by the camera to generate modified images that appear to be captured from a different point of view of the camera's actual point of view; and	To the extent the preamble is limiting, Francois II expressly and/or inherently discloses and/or renders obvious operating the processor to apply adaptive transformation mapping to the stream of images captured by the camera to generate modified images that appear to be captured from a different point of view of the camera's actual point of view. *See*, *e.g.*, disclosures below. "This sketch presents the design and construction of a handheld virtual mirror device. The perception of the world reflected through a mirror depends on the viewer's position with respect to the mirror and the 3-D geometry of the world. In order to simulate a real mirror on a computer screen, images of the observed world, consistent with the viewer's position, must be synthesized and displayed in real-time. Our system is build around a flat LCD screen manipulated by the user, a single camera fixed on the screen, and a tracking device. The continuous input video stream and tracker data is used to synthesize, in real-time, a continuous video stream displayed on the LCD screen. The synthesized video stream is a close approximation of what the user would see on the screen surface if it were a real mirror." *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at the introductory paragraph. "When a person looks into a mirror, they see what they would see from the symmetrical (virtual) point of view (figure 1). A camera whose position and orientation are fixed with respect to the mirror produces a video stream that corresponds to this particular viewpoint. In order to synthesize the images corresponding to the user's viewpoint from the images captured by the camera, we must relate them geometrically. Such a transform cannot be formulated without assumptions or knowledge about the world geometry. In our case, the focus of attention is the user's own reflection in the mirror. We thus model the world as a plane parallel to the mirror, at the user's distance from the mirror. We have shown that under these assumptions, the transform relating the camera view and the user view depends only on the relative positions of the user viewpoint and the camera center, and is reduced to a scaling and a translation. The transform is exact when the user viewpoint lies on the camera axis. This model provides a straightforward and efficient way of synthesizing the viewer's image stream from the camera stream, and provides a good approximation when the viewer's position remains close to the

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	camera axis.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 1.Problem formulation and geometric analysis. “We have implemented the mirror image transform as a module in the Modular Flow Scheduling Middleware [François 2001], the open source implementation of IMSC's software architecture for Integrated Media Systems. It is specifically designed for parallel processing of concurrent data streams in real-time, and its modularity dramatically reduces development and integration time. The actual handheld virtual mirror system is composed of a handheld 10" LCD flat screen fitted with a camera and a magnetic tracker sensor (figure 2), a fixed processing unit, a fixed magnetic tracker transmitter, and a second magnetic tracker sensor placed on the user. Real-time camera and tracker inputs are used to synthesize the virtual mirror stream and display it in real-time on the LCD screen. The result is a very convincing handheld mirror simulation.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 2.2.System integration. “The design and construction of realistic virtual mirrors represents an original experiment in Human-Computer Interface, that opens the door to various interactive experiments in entertainment, arts and communication. Use of video analysis and graphics techniques will allow to explore and interfere with what has always been a private, solitary act of a person looking in a mirror.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 3.Perspectives. *See A Handheld Virtual Mirror* (2002), at Figure 1:

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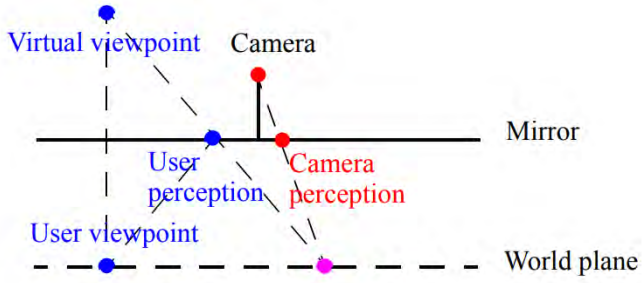


Figure 1. Basic mirror geometry.

See A Handheld Virtual Mirror (2002), at Figure 2:

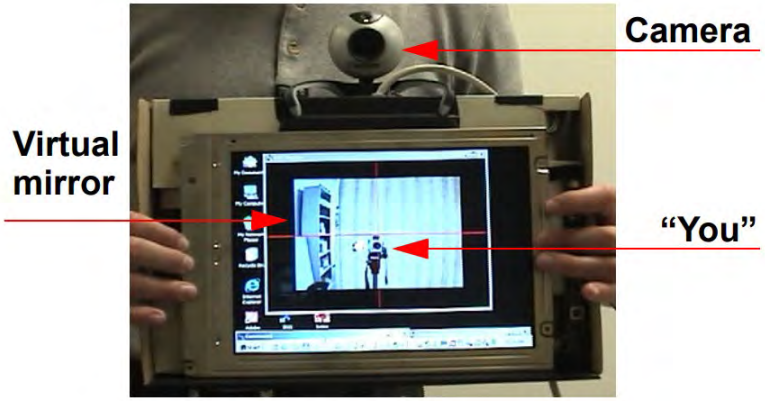


Figure 2. Handheld virtual mirror device.

"We address the problem of 3D reconstruction from a single perspective view of a mirror symmetric scene. We establish the fundamental result that it is geometrically equivalent to observing the scene with two cameras, the cameras being symmetrical with respect to the

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	unknown 3D symmetry plane. All traditional tools of classical 2-view stereo can then be applied, and the concepts of fundamental/essential matrix, epipolar geometry, rectification and disparity hold. However, the problems are greatly simplified here, as the rectification process and the computation of epipolar geometry can be easily performed from the original view only. If the camera is calibrated, we show how to synthesize the symmetric image generated by the same physical camera. A Euclidean reconstruction of the scene can then be computed from the resulting stereo pair. To validate this novel formulation, we have processed many real images, and show examples of 3D reconstruction. q 2003 Elsevier Science B.V. All rights reserved." *See Mirror symmetry -> 2-view stereo geometry* (2003) at 137 (Abstract). "We establish more general epipolar projective properties of single views of mirror symmetric scenes, and apply them in a different context: we perform Euclidean 3D reconstruction of mirror symmetric objects from a single perspective view using traditional 2-view stereo geometry." *See Mirror symmetry -> 2-view stereo geometry* (2003) at 137-138. "We developed our novel formulation to use existing 2- view stereo tools to perform 3D reconstruction of mirror symmetric objects from a single, real perspective image. Such systems take as input two images, taken by the same physical camera from different positions, and sometimes require the images to be rectified. If the rectification poses no theoretical problem given the availability of epipolar pencils, the synthesis of a virtual symmetric view taken by a physical camera requires more work. We show how to build such an image in the case of a calibrated pinhole camera, in order to allow Euclidean reconstruction of the scene. We then present the reconstruction results obtained by processing image pairs made of one real perspective image of a mirror symmetric object, and one synthetic symmetric view, in an off-the-shelf commercial package, Eos System's PhotoModeler Pro 4.0. 5.1. Calibrated pinhole camera case Suppose the camera used to take the available picture is a pinhole camera. It projects the world point X into the image point x according to the formula:

$x = KR[I|(-\tilde{C})]X$

The 3×3 matrix K is the camera calibration matrix. If C is a pinhole camera, its calibration matrix is of the form:

$$k = \begin{bmatrix} \alpha_x & 0 & x_0 \\ & \alpha_y & y_0 \\ & & 1 \end{bmatrix}$$

where α_x α_y and represent the focal length of the camera in the x and y directions, respectively, and (x_0, y_0) is the principal point, all expressed in terms of pixel dimensions.

R is the 3×3 transform matrix from the world coordinate system to the camera coordinate system, in this case a rotation, defined by:

$$R = [\, e_1^{\mathrm{T}} \quad e_2^{\mathrm{T}} \quad e_3^{\mathrm{T}} \,]^{\mathrm{T}}$$

where (e_1, e_2, e_3) is the orthonormal basis of the Euclidean coordinate system associated with the camera.

Let (e'_1, e'_2, e'_3) be the orthonormal basis of the Euclidean coordinate system associated with the virtual symmetrical camera. By construction, $e'_j = \overline{e_j} = \bar{Z}e_j$. Because of the symmetry, this coordinate system's orientation is reversed compared to that of (e_1, e_2, e_3) (if one is right-handed, the other is left-handed).

The virtual camera projects the world point X into the image point x' according to:

$$x' = KR\bar{Z}[I| - \tilde{\tilde{C}}]X = K\bar{R}[I| - \tilde{\tilde{C}}]X$$

where:

$$\bar{R} = R\bar{Z} = [\, \overline{e_1}^{\mathrm{T}} \quad \overline{e_2}^{\mathrm{T}} \quad \overline{e_3}^{\mathrm{T}} \,]^{\mathrm{T}}$$

The image point of the same world point seen by the physical camera placed in $\tilde{C}$ and with principal axis direction $\overline{e_3}^{\mathrm{T}}$ is:

$$x'' = KR''[I| - \tilde{\tilde{C}}]X$$

where

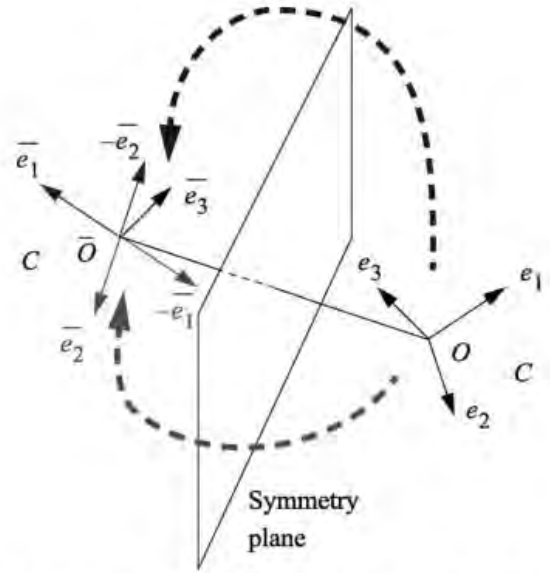
$$R'' = [\, e''_1\mathrm{T} \quad e''_2\mathrm{T} \quad \overline{e_3}^{\mathrm{T}} \,]^{\mathrm{T}}$$

and (e''_1, e''_2) is an orthonormal basis of the principal plane such that $(e''_1, e''_2, \overline{e_3})$ has the same orientation as (e_1, e_2, e_3) (both are either right or left-handed). Such a basis is obtained by applying a rotation of an arbitrary angle θ to the basis $(\overline{e_1}, \overline{e_2})$ in the plane it defines, and inverting the direction of one of the axes. The rotation of the coordinate system corresponds to a rotation of the physical camera around its optical axis.

Using the notation

$$\begin{bmatrix} a \\ b \\ c \end{bmatrix} = \bar{R}[I| - \tilde{\tilde{C}}]X$$

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	x'' can be written: $x'' = \begin{bmatrix} \alpha_x & 0 & x_0 \\ & \alpha_y & y_0 \\ & & 1 \end{bmatrix} \begin{bmatrix} -1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} a \\ b \\ c \end{bmatrix}$ Since we are looking to relate x'' and $x' = \begin{bmatrix} \alpha_x & 0 & x_0 \\ & \alpha_y & y_0 \\ & & 1 \end{bmatrix} \begin{bmatrix} a \\ b \\ c \end{bmatrix}$ the simplest analytic form naturally corresponds to no rotation, i.e. to the cases where the real camera coordinate system axes are aligned with that of the virtual (symmetric) ones, the direction of one of the axes being reversed to preserve the coordinate system's orientation. The two corresponding cases are shown in Fig. 2. For sake of clarity and simplicity, without loss of generality, we only consider an inversion of the x-axis. Under these conditions, x' and x'' differ only by their first component U' and U'', respectively, and thus only the image points abscissas differ: $u' = \frac{a}{c}\alpha_x + x_0, \qquad u'' = -\frac{a}{c}\alpha_x + x_0$ It follows that if the camera is calibrated, then the symmetric view of the virtual stereo pair can be obtained by simply performing a horizontal mirror of the original image with respect to a vertical axis going through the principal point.

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	 Fig. 2. How to relate the virtual view and the real camera's view from the virtual viewpoint. " *See Mirror symmetry -> 2-view stereo geometry* (2003) at 139-140. "5.2. Stealth fighter model Our first example is a toy F-117 Stealth fighter. The input image and synthesized symmetric view are presented in Fig. 3a with their epipolar pencils. The internal parameters of the digital camera used were determined using Photo-modeler's calibration tool. After specifying a minimum number of point correspondences between the two images, the software was able to perform a full calibration of both camera positions and to infer the 3D position of the object points. Adding more point and line correspondences allowed to obtain a 3D wireframe model of the object presented in Fig. 3b. Note that the recovered object is mirror symmetric, and that the recovered cameras are actually symmetrical in location and orientation with respect to the object's symmetry plane, properties that are not used at any point in Photomodeler's reconstruction algorithms (the symmetry property is only used to

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	synthesize the symmetric view). Once the 3D inference is performed, the 3D surface model shown in Fig. 3c is built and the texture can be extracted from the images. The final 3D model with texture map is shown in Fig. 3d. The construction of this 3D textured model took only a few minutes to a novice Photomodeler user. Incorporating symmetry derived constraints in the workflow and in the interface would greatly facilitate the process and reduce the time needed to build a model, while also helping in improving the accuracy of the manual input and helping deal with self occlusions across the symmetry plane.” *See Mirror symmetry -> 2-view stereo geometry* (2003) at 142-143. “5.3. Face model The technique clearly applies beautifully to perfectly symmetric objects. We also wanted to try the more challenging problem posed by (quasi-)human faces. We used a bust of Darth Maul, which is fairly symmetric. The input and synthetic symmetric views are presented in Fig. 4a. The wireframe model and camera positions and orientations as recovered by Photomodeler are presented in Fig. 4b. Finally, the resulting textured model is shown in Fig. 4c. The polygonal model, although coarse, captures the geometry of the face fairly well, so that the resulting textured model is easily recognized as a face under various viewpoints.” *See Mirror symmetry -> 2-view stereo geometry* (2003) at 143. *See Mirror symmetry -> 2-view stereo geometry* (2003) at Fig. 4(a):  (a) Input image (left) of a Darth Maul bust and inverted image (right), used as a stereo pair

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	“This document highlights and addresses architecture level software development issues facing researchers and practitioners in the field of Computer Vision. A new framework, or architectural style, called SAI, is introduced. It provides a formalism for the design, implementation and analysis of software systems that perform distributed parallel processing of generic data streams. Architectural patterns are illustrated with a number of demonstration projects ranging from single stream automatic real-time video processing to fully integrated distributed interactive systems mixing live video, graphics and sound. SAI is supported by an open source architectural middleware called MFSM.” See Software Architecture for Computer Vision: Beyond Pipes and Filters (2003) at 1 (Abstract). “4.3 Handheld mirror simulation The Virtual Mirror project [16, 15] started as a feasibility study for the development and construction of a handheld mirror simulation device. The perception of the world reflected through a mirror depends on the viewer’s position with respect to the mirror and the 3-D geometry of the world. In order to simulate a real mirror on a computer screen, images of the observed world, consistent with the viewer’s position, must be synthesized and displayed in real-time. This is of course geometrically impossible, but with a few simplifying assumptions (e.g. planar world), the image transform required was made simple yet convincing enough to consider building an actual device. The current prototype system (see Figure 12) is comprised of an LCD screen manipulated by the user, a single camera fixed on the screen, and a tracking device. The continuous input video stream and tracker data is used to synthesize, in real-time, a continuous video stream displayed on the LCD screen. The synthesized video stream is a close approximation of what the user would see on the screen surface if it were a real mirror. Figure 13 shows the corresponding conceptual application graph. The single stream application does not involve any complicated structure. The stream originates in a live video input cell. A tracker input cell adds position and orientation data to the stream. A mirror transform cell uses the synchronous image and tracking data to synthesize the mirror simulation image, which is then presented to the user by an image display cell. The two major difficulties in this application are (1) synchronizing the various input streams (video and tracking data) to

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	compute a consistent result; and (2) displaying the result with a low enough latency and a high enough throughput to produce a convincing simulation. The use of pulses in the SAI model makes synchronization a natural operation, involving no superfluous delays or computations. The asynchronous parallel processing model allow high frame rates and low latency. The essential purpose of this system is interaction. Interaction can be seen as a particular data stream loop feeding the user with a perceptual representation of the internal model (experience), collecting the users reaction through various sensory devices and modifying the state of the internal model accordingly (influence). From the systems point of view, these data streams are volatile, and the processes involved in producing and processing them are of the same nature as those carrying procedural internal evolution tasks. Here, the internal model is the mirror, implicit in the computations carried by the mirror transform cell. The user experiences the system through the image displayed on the handheld screen, and influences it by moving her head or the screen. Note that the way live video (frames) and corresponding tracker data are synchronized in the application as described in the conceptual graph is based on the assumption that the delay between the frame capture in the live input cell (push mechanism acting as pulse trigger), and the capture of tracker data in the tracker input cell (pull mechanism), is small enough that no inconsistency can be perceived. This approach happens to work in this case, even when the system is running on a modest platform, but certainly does not generalize to synchronization in more sophisticated settings. This illustrates the flexibility of the SAI style, that allows to devise general structures, as well as simplified or ad hoc design when allowed by the application. This project also illustrates the power of SAI for system integration. The modularity of the model ensures that components developed independently (but consistently with style rules) will function together seamlessly. This allows code re-use (e.g. the image node, and the live video capture and image display cells already existed), and distributed development and testing of new node and cell types. The whole project was completed in only a few months with very limited resources. The mirror simulation system can be used as a research platform. For example, it is a testbed for developing and testing video analysis techniques that could be used to replace the magnetic trackers, including face detection and tracking, and gaze tracking. The device itself constitutes a new generic interface for applications involving rich, first-person interaction. A straightforward application is the Daguerr´eotype simulation described in [22]. Beyond technical and commercial applications

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	of such a device, the use of video analysis and graphics techniques will allow artists to explore and interfere with what has always been a private, solitary act, a person looking into a mirror.” See Software Architecture for Computer Vision: Beyond Pipes and Filters (2003) at 13-15. See Software Architecture for Computer Vision: Beyond Pipes and Filters (2003) at Figs. 12 and 13:

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Figure 12: The handheld mirror simulation system (“Virtual Mirror”).

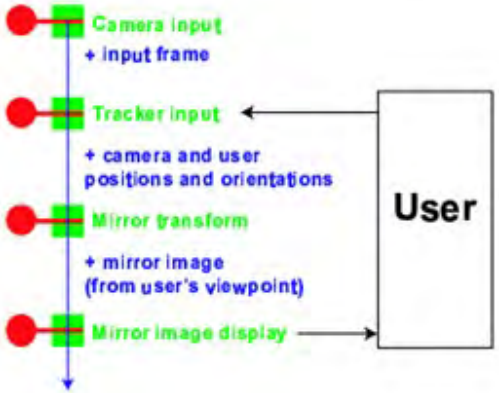
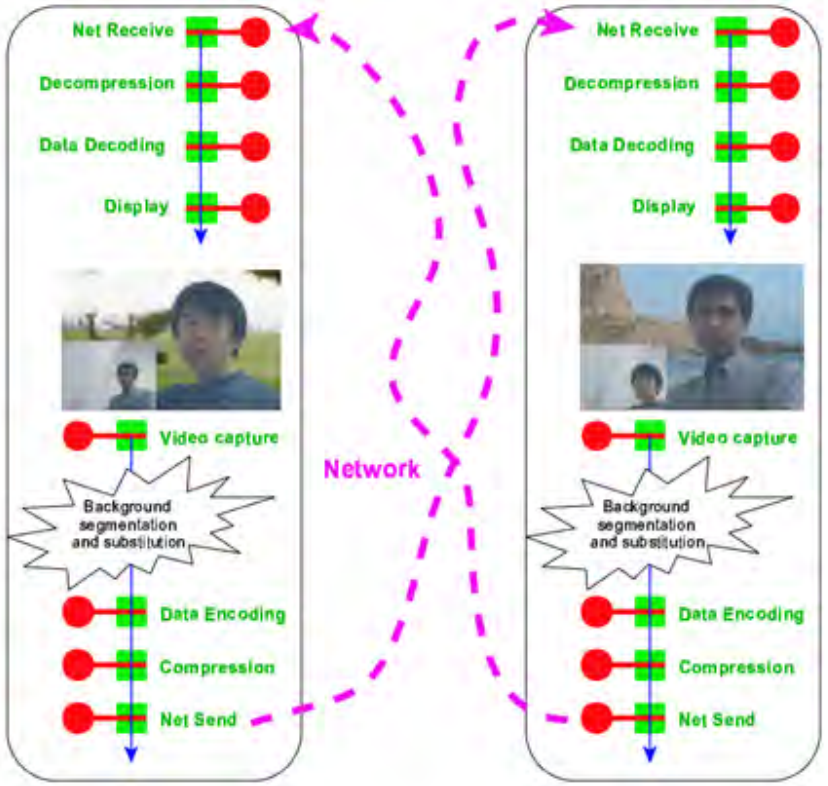


Figure 13: The Virtual Mirror application graph.

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	"4.5 Live video in animated 3-D graphics The example presented in this section is a real-time, interactive application requiring manipulation of het1erogenous data streams [14]. A video stream (captured live or read from a file) is used as surface texture on an animated 3-D model, rendered in real-time. The (virtual) camera used for rendering can be manipulated n real-time (e.g. with a gamepad or through a head tracking device), making the system interactive. This system was developed to illustrate the design of a scene graph-based graphics toolkit, and the advantages provided by the SAI style for manipulating independently and synchronizing different data streams in a complex interactive (possibly immersive) setting. From a Computer Vision point of view, this example illustrates how the SAI style allows to manipulate video streams and geometric models in a consistent framework. The same architectural patterns generalize to manipulating generic data streams and persistent models. Figure 16 shows the system's conceptual graph. The graph is composed of four functional subgraphs, corresponding to four independent streams, organized around a central source that holds the 3-D model representation in the form of a scene graph, and various process parameters for the different connected cells. The rendering stream generates images of the model. The control stream updates the (virtual) camera position based on user input. Together, the rendering and control units (including the shared source) form an interaction loop with the user. The animation stream drives the dynamic evolution of the 3-D model. The texturing stream places images captured from a video source (camera or file) in the texture node in the scene graph. Interaction and modeling are now analyzed in more detail." *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 16-17. *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at Fig. 15:

Asserted Claim of the '110 Patent	Exemplary Citations to Francois II
	 Figure 15: Conceptual graph for an early version of the IMSC Communicator, with support for video (synchronized image and sound). This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois II alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants'

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	Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[d]. displaying the modified images on the monitor;	To the extent the preamble is limiting, Francois II expressly and/or inherently discloses and/or renders obvious displaying the modified images on the monitor. *See*, *e.g.*, disclosures below. "This sketch presents the design and construction of a handheld virtual mirror device. The perception of the world reflected through a mirror depends on the viewer's position with respect to the mirror and the 3-D geometry of the world. In order to simulate a real mirror on a computer screen, images of the observed world, consistent with the viewer's position, must be synthesized and displayed in real-time. Our system is build around a flat LCD screen manipulated by the user, a single camera fixed on the screen, and a tracking device. The continuous input video stream and tracker data is used to synthesize, in real-time, a continuous video stream displayed on the LCD screen. The synthesized video stream is a close approximation of what the user would see on the screen surface if it were a real mirror." *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at the introductory paragraph. "When a person looks into a mirror, they see what they would see from the symmetrical (virtual) point of view (figure 1). A camera whose position and orientation are fixed with respect to the mirror produces a video stream that corresponds to this particular viewpoint. In order to synthesize the images corresponding to the user's viewpoint from the images captured by the camera, we must relate them geometrically. Such a transform cannot be formulated without assumptions or knowledge about the world geometry. In our case, the focus of attention is the user's own reflection in the mirror. We thus model the world as a plane parallel to the mirror, at the user's distance from the mirror. We have shown that under these assumptions, the transform relating the camera view and the user view depends only on the relative positions of the user viewpoint and the camera center, and is reduced to a scaling and a translation. The transform is exact when the user viewpoint lies on the camera axis. This model provides a straightforward and efficient way of synthesizing the viewer's image stream from the camera stream, and provides a good approximation when the viewer's position remains close to the

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	camera axis.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 1.Problem formulation and geometric analysis. “We have implemented the mirror image transform as a module in the Modular Flow Scheduling Middleware [François 2001], the open source implementation of IMSC's software architecture for Integrated Media Systems. It is specifically designed for parallel processing of concurrent data streams in real-time, and its modularity dramatically reduces development and integration time. The actual handheld virtual mirror system is composed of a handheld 10" LCD flat screen fitted with a camera and a magnetic tracker sensor (figure 2), a fixed processing unit, a fixed magnetic tracker transmitter, and a second magnetic tracker sensor placed on the user. Real-time camera and tracker inputs are used to synthesize the virtual mirror stream and display it in real-time on the LCD screen. The result is a very convincing handheld mirror simulation.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 2.2.System integration. “The design and construction of realistic virtual mirrors represents an original experiment in Human-Computer Interface, that opens the door to various interactive experiments in entertainment, arts and communication. Use of video analysis and graphics techniques will allow to explore and interfere with what has always been a private, solitary act of a person looking in a mirror.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 3.Perspectives. *See A Handheld Virtual Mirror* (2002), at Figure 1:

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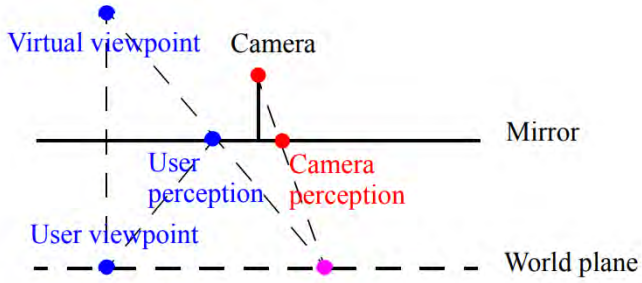


Figure 1. Basic mirror geometry.

See A Handheld Virtual Mirror (2002), at Figure 2:

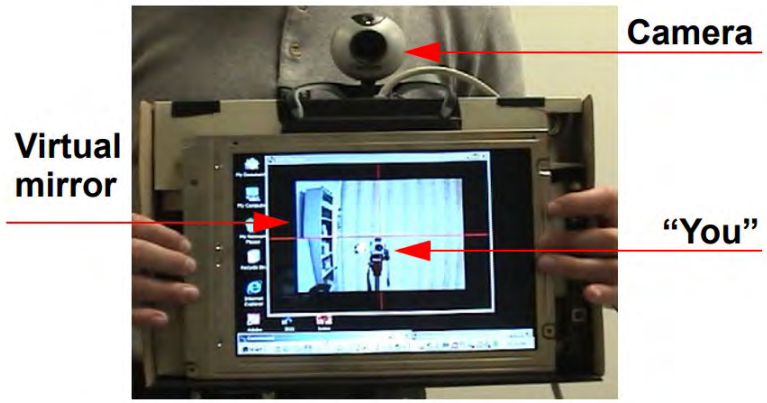


Figure 2. Handheld virtual mirror device.

"This document highlights and addresses architecture level software development issues facing researchers and practitioners in the field of Computer Vision. A new framework, or

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	architectural style, called SAI, is introduced. It provides a formalism for the design, implementation and analysis of software systems that perform distributed parallel processing of generic data streams. Architectural patterns are illustrated with a number of demonstration projects ranging from single stream automatic real-time video processing to fully integrated distributed interactive systems mixing live video, graphics and sound. SAI is supported by an open source architectural middleware called MFSM." See Software Architecture for Computer Vision: Beyond Pipes and Filters (2003) at 1 (Abstract). "4.3 Handheld mirror simulation The Virtual Mirror project [16, 15] started as a feasibility study for the development and construction of a handheld mirror simulation device. The perception of the world reflected through a mirror depends on the viewer's position with respect to the mirror and the 3-D geometry of the world. In order to simulate a real mirror on a computer screen, images of the observed world, consistent with the viewer's position, must be synthesized and displayed in real-time. This is of course geometrically impossible, but with a few simplifying assumptions (e.g. planar world), the image transform required was made simple yet convincing enough to consider building an actual device. The current prototype system (see Figure 12) is comprised of an LCD screen manipulated by the user, a single camera fixed on the screen, and a tracking device. The continuous input video stream and tracker data is used to synthesize, in real-time, a continuous video stream displayed on the LCD screen. The synthesized video stream is a close approximation of what the user would see on the screen surface if it were a real mirror. Figure 13 shows the corresponding conceptual application graph. The single stream application does not involve any complicated structure. The stream originates in a live video input cell. A tracker input cell adds position and orientation data to the stream. A mirror transform cell uses the synchronous image and tracking data to synthesize the mirror simulation image, which is then presented to the user by an image display cell. The two major difficulties in this application are (1) synchronizing the various input streams (video and tracking data) to compute a consistent result; and (2) displaying the result with a low enough latency and a high enough throughput to produce a convincing simulation. The use of pulses in the SAI model makes synchronization a natural operation, involving no superfluous delays or computations. The asynchronous parallel processing model allow high frame rates and low latency. The

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	essential purpose of this system is interaction. Interaction can be seen as a particular data stream loop feeding the user with a perceptual representation of the internal model (experience), collecting the users reaction through various sensory devices and modifying the state of the internal model accordingly (influence). From the systems point of view, these data streams are volatile, and the processes involved in producing and processing them are of the same nature as those carrying procedural internal evolution tasks. Here, the internal model is the mirror, implicit in the computations carried by the mirror transform cell. The user experiences the system through the image displayed on the handheld screen, and influences it by moving her head or the screen. Note that the way live video (frames) and corresponding tracker data are synchronized in the application as described in the conceptual graph is based on the assumption that the delay between the frame capture in the live input cell (push mechanism acting as pulse trigger), and the capture of tracker data in the tracker input cell (pull mechanism), is small enough that no inconsistency can be perceived. This approach happens to work in this case, even when the system is running on a modest platform, but certainly does not generalize to synchronization in more sophisticated settings. This illustrates the flexibility of the SAI style, that allows to devise general structures, as well as simplified or ad hoc design when allowed by the application. This project also illustrates the power of SAI for system integration. The modularity of the model ensures that components developed independently (but consistently with style rules) will function together seamlessly. This allows code re-use (e.g. the image node, and the live video capture and image display cells already existed), and distributed development and testing of new node and cell types. The whole project was completed in only a few months with very limited resources. The mirror simulation system can be used as a research platform. For example, it is a testbed for developing and testing video analysis techniques that could be used to replace the magnetic trackers, including face detection and tracking, and gaze tracking. The device itself constitutes a new generic interface for applications involving rich, first-person interaction. A straightforward application is the Daguerr´eotype simulation described in [22]. Beyond technical and commercial applications of such a device, the use of video analysis and graphics techniques will allow artists to explore and interfere with what has always been a private, solitary act, a person looking into a mirror.” See Software Architecture for Computer Vision: Beyond Pipes and Filters (2003) at 13-15.

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	See Software Architecture for Computer Vision: Beyond Pipes and Filters (2003) at Figs. 12 and 13:

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Figure 12: The handheld mirror simulation system ("Virtual Mirror").

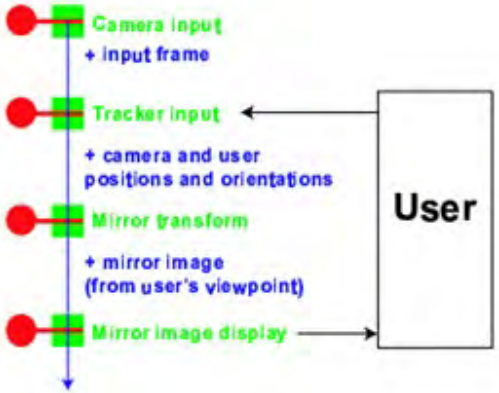
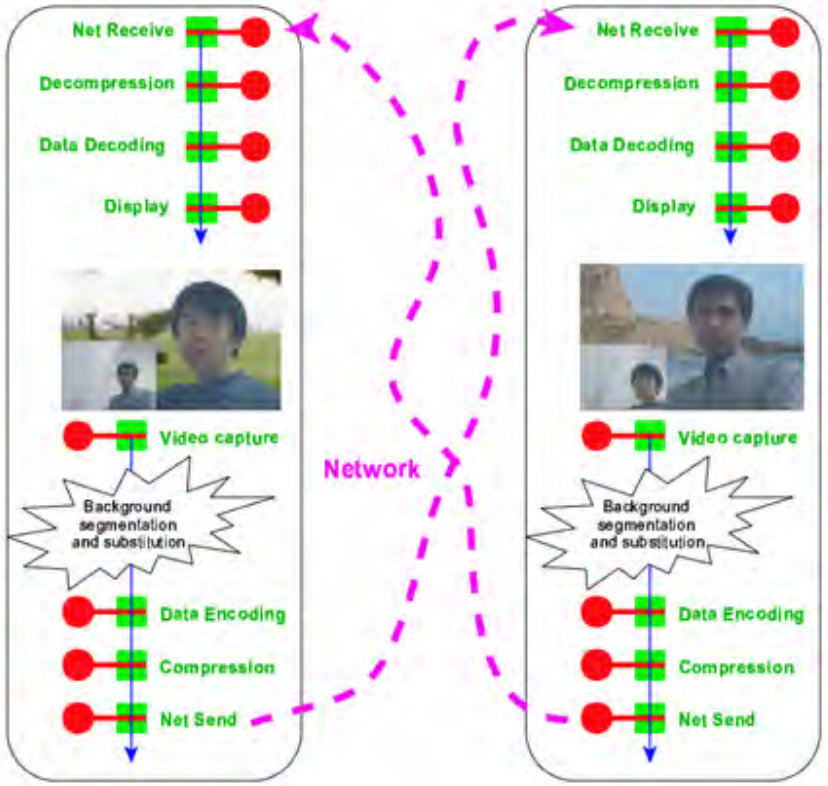


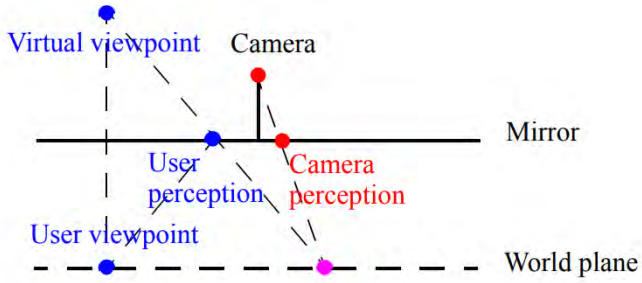
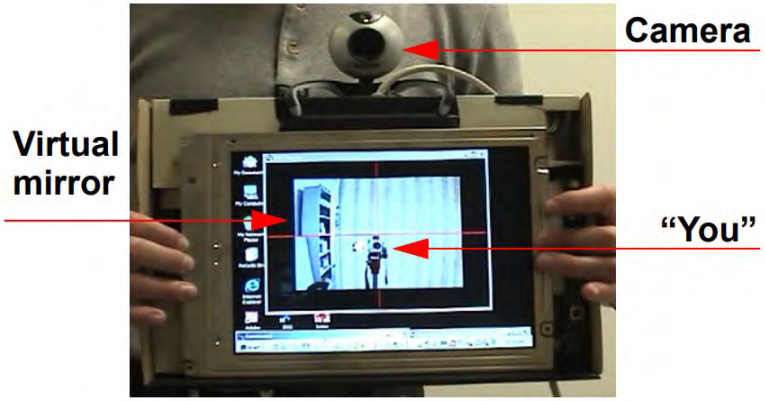
Figure 13: The Virtual Mirror application graph.

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	"4.5 Live video in animated 3-D graphics The example presented in this section is a real-time, interactive application requiring manipulation of het1erogenous data streams [14]. A video stream (captured live or read from a file) is used as surface texture on an animated 3-D model, rendered in real-time. The (virtual) camera used for rendering can be manipulated n real-time (e.g. with a gamepad or through a head tracking device), making the system interactive. This system was developed to illustrate the design of a scene graph-based graphics toolkit, and the advantages provided by the SAI style for manipulating independently and synchronizing different data streams in a complex interactive (possibly immersive) setting. From a Computer Vision point of view, this example illustrates how the SAI style allows to manipulate video streams and geometric models in a consistent framework. The same architectural patterns generalize to manipulating generic data streams and persistent models. Figure 16 shows the system's conceptual graph. The graph is composed of four functional subgraphs, corresponding to four independent streams, organized around a central source that holds the 3-D model representation in the form of a scene graph, and various process parameters for the different connected cells. The rendering stream generates images of the model. The control stream updates the (virtual) camera position based on user input. Together, the rendering and control units (including the shared source) form an interaction loop with the user. The animation stream drives the dynamic evolution of the 3-D model. The texturing stream places images captured from a video source (camera or file) in the texture node in the scene graph. Interaction and modeling are now analyzed in more detail." *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 16-17. *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at Fig. 15:

Asserted Claim of the '110 Patent	Exemplary Citations to Francois II
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	Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[e]. wherein the different point of view corresponds to an image taken from a different angle and a different distance than the actual images captured by the camera; and	To the extent the preamble is limiting, Francois II expressly and/or inherently discloses and/or renders obvious wherein the different point of view corresponds to an image taken from a different angle and a different distance than the actual images captured by the camera. *See*, *e.g.*, disclosures below. "This sketch presents the design and construction of a handheld virtual mirror device. The perception of the world reflected through a mirror depends on the viewer's position with respect to the mirror and the 3-D geometry of the world. In order to simulate a real mirror on a computer screen, images of the observed world, consistent with the viewer's position, must be synthesized and displayed in real-time. Our system is build around a flat LCD screen manipulated by the user, a single camera fixed on the screen, and a tracking device. The continuous input video stream and tracker data is used to synthesize, in real-time, a continuous video stream displayed on the LCD screen. The synthesized video stream is a close approximation of what the user would see on the screen surface if it were a real mirror." *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at the introductory paragraph. "When a person looks into a mirror, they see what they would see from the symmetrical (virtual) point of view (figure 1). A camera whose position and orientation are fixed with respect to the mirror produces a video stream that corresponds to this particular viewpoint. In order to synthesize the images corresponding to the user's viewpoint from the images captured by the camera, we must relate them geometrically. Such a transform cannot be formulated without assumptions or knowledge about the world geometry. In our case, the focus of attention is the user's own reflection in the mirror. We thus model the world as a plane parallel to the mirror, at the user's distance from the mirror. We have shown that under these assumptions, the transform relating the camera view and the user view depends only on the relative positions of the user viewpoint and the camera center, and is reduced to a scaling and a translation. The transform is exact when the user viewpoint lies on the camera axis. This model provides a straightforward and efficient way of synthesizing the viewer's image stream from the camera

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	stream, and provides a good approximation when the viewer's position remains close to the camera axis.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 1.Problem formulation and geometric analysis. “We have implemented the mirror image transform as a module in the Modular Flow Scheduling Middleware [François 2001], the open source implementation of IMSC's software architecture for Integrated Media Systems. It is specifically designed for parallel processing of concurrent data streams in real-time, and its modularity dramatically reduces development and integration time. The actual handheld virtual mirror system is composed of a handheld 10" LCD flat screen fitted with a camera and a magnetic tracker sensor (figure 2), a fixed processing unit, a fixed magnetic tracker transmitter, and a second magnetic tracker sensor placed on the user. Real-time camera and tracker inputs are used to synthesize the virtual mirror stream and display it in real-time on the LCD screen. The result is a very convincing handheld mirror simulation.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 2.2.System integration. “The design and construction of realistic virtual mirrors represents an original experiment in Human-Computer Interface, that opens the door to various interactive experiments in entertainment, arts and communication. Use of video analysis and graphics techniques will allow to explore and interfere with what has always been a private, solitary act of a person looking in a mirror.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 3.Perspectives. *See A Handheld Virtual Mirror* (2002), at Figure 1:

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	 Figure 1. Basic mirror geometry. *See A Handheld Virtual Mirror* (2002), at Figure 2:  Figure 2. Handheld virtual mirror device. "We address the problem of 3D reconstruction from a single perspective view of a mirror symmetric scene. We establish the fundamental result that it is geometrically equivalent to observing the scene with two cameras, the cameras being symmetrical with respect to the

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	unknown 3D symmetry plane. All traditional tools of classical 2-view stereo can then be applied, and the concepts of fundamental/essential matrix, epipolar geometry, rectification and disparity hold. However, the problems are greatly simplified here, as the rectification process and the computation of epipolar geometry can be easily performed from the original view only. If the camera is calibrated, we show how to synthesize the symmetric image generated by the same physical camera. A Euclidean reconstruction of the scene can then be computed from the resulting stereo pair. To validate this novel formulation, we have processed many real images, and show examples of 3D reconstruction. q 2003 Elsevier Science B.V. All rights reserved." *See Mirror symmetry -> 2-view stereo geometry* (2003) at 137 (Abstract). "We establish more general epipolar projective properties of single views of mirror symmetric scenes, and apply them in a different context: we perform Euclidean 3D reconstruction of mirror symmetric objects from a single perspective view using traditional 2-view stereo geometry." *See Mirror symmetry -> 2-view stereo geometry* (2003) at 137-138. "We developed our novel formulation to use existing 2- view stereo tools to perform 3D reconstruction of mirror symmetric objects from a single, real perspective image. Such systems take as input two images, taken by the same physical camera from different positions, and sometimes require the images to be rectified. If the rectification poses no theoretical problem given the availability of epipolar pencils, the synthesis of a virtual symmetric view taken by a physical camera requires more work. We show how to build such an image in the case of a calibrated pinhole camera, in order to allow Euclidean reconstruction of the scene. We then present the reconstruction results obtained by processing image pairs made of one real perspective image of a mirror symmetric object, and one synthetic symmetric view, in an off-the-shelf commercial package, Eos System's PhotoModeler Pro 4.0. 5.1. Calibrated pinhole camera case Suppose the camera used to take the available picture is a pinhole camera. It projects the world point X into the image point x according to the formula:

$x = KR[I|(-\tilde{C})]X$

The 3×3 matrix K is the camera calibration matrix. If C is a pinhole camera, its calibration matrix is of the form:

$$k = \begin{bmatrix} \alpha_x & 0 & x_0 \\ & \alpha_y & y_0 \\ & & 1 \end{bmatrix}$$

where α_x α_y and represent the focal length of the camera in the x and y directions, respectively, and (x_0, y_0) is the principal point, all expressed in terms of pixel dimensions.

R is the 3×3 transform matrix from the world coordinate system to the camera coordinate system, in this case a rotation, defined by:

$$R = [\, e_1^{\mathrm{T}} \quad e_2^{\mathrm{T}} \quad e_3^{\mathrm{T}} \,]^{\mathrm{T}}$$

where (e_1, e_2, e_3) is the orthonormal basis of the Euclidean coordinate system associated with the camera.

Let (e'_1, e'_2, e'_3) be the orthonormal basis of the Euclidean coordinate system associated with the virtual symmetrical camera. By construction, $e'_j = \overline{e_j} = \bar{Z}e_j$. Because of the symmetry, this coordinate system's orientation is reversed compared to that of (e_1, e_2, e_3) (if one is right-handed, the other is left-handed).

The virtual camera projects the world point X into the image point x' according to:

$$x' = KR\bar{Z}[I| - \tilde{C}]X = K\bar{R}[I| - \tilde{C}]X$$

where:

$$\bar{R} = R\bar{Z} = [\, \overline{e_1}^{\mathrm{T}} \quad \overline{e_2}^{\mathrm{T}} \quad \overline{e_3}^{\mathrm{T}} \,]^{\mathrm{T}}$$

The image point of the same world point seen by the physical camera placed in $\tilde{C}$ and with principal axis direction $\overline{e_3}^{\mathrm{T}}$ is:

$$x'' = KR''[I| - \tilde{C}]X$$

where

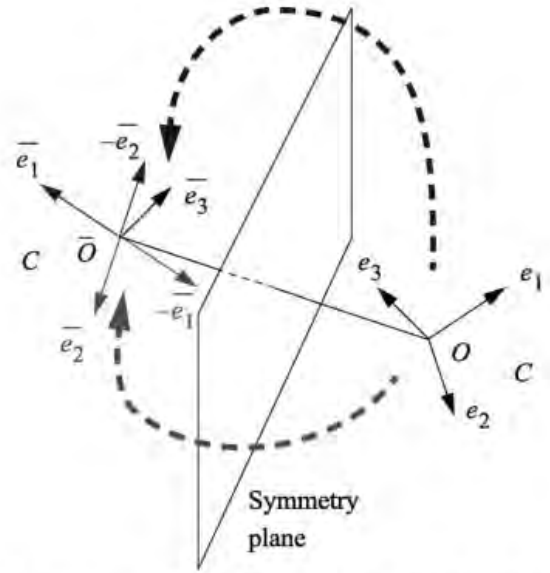
$$R'' = [\, e_1''^{\mathrm{T}} \quad e_2''^{\mathrm{T}} \quad \overline{e_3}^{\mathrm{T}} \,]^{\mathrm{T}}$$

and (e''_1, e''_2) is an orthonormal basis of the principal plane such that $(e''_1, e''_2, \overline{e_3})$ has the same orientation as (e_1, e_2, e_3) (both are either right or left-handed). Such a basis is obtained by applying a rotation of an arbitrary angle θ to the basis $(\overline{e_1}, \overline{e_2})$ in the plane it defines, and inverting the direction of one of the axes. The rotation of the coordinate system corresponds to a rotation of the physical camera around its optical axis.

Using the notation

$$\begin{bmatrix} a \\ b \\ c \end{bmatrix} = \bar{R}[I| - \tilde{C}]X$$

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	x'' can be written: $x'' = \begin{bmatrix} \alpha_x & 0 & x_0 \\ & \alpha_y & y_0 \\ & & 1 \end{bmatrix} \begin{bmatrix} -1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} a \\ b \\ c \end{bmatrix}$ Since we are looking to relate x'' and $x' = \begin{bmatrix} \alpha_x & 0 & x_0 \\ & \alpha_y & y_0 \\ & & 1 \end{bmatrix} \begin{bmatrix} a \\ b \\ c \end{bmatrix}$ the simplest analytic form naturally corresponds to no rotation, i.e. to the cases where the real camera coordinate system axes are aligned with that of the virtual (symmetric) ones, the direction of one of the axes being reversed to preserve the coordinate system's orientation. The two corresponding cases are shown in Fig. 2. For sake of clarity and simplicity, without loss of generality, we only consider an inversion of the x-axis. Under these conditions, x' and x'' differ only by their first component U' and U'', respectively, and thus only the image points abscissas differ: $u' = \frac{a}{c}\alpha_x + x_0, \qquad u'' = -\frac{a}{c}\alpha_x + x_0$ It follows that if the camera is calibrated, then the symmetric view of the virtual stereo pair can be obtained by simply performing a horizontal mirror of the original image with respect to a vertical axis going through the principal point.

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	 Fig. 2. How to relate the virtual view and the real camera's view from the virtual viewpoint. " *See Mirror symmetry -> 2-view stereo geometry* (2003) at 139-140. "5.2. Stealth fighter model Our first example is a toy F-117 Stealth fighter. The input image and synthesized symmetric view are presented in Fig. 3a with their epipolar pencils. The internal parameters of the digital camera used were determined using Photo-modeler's calibration tool. After specifying a minimum number of point correspondences between the two images, the software was able to perform a full calibration of both camera positions and to infer the 3D position of the object points. Adding more point and line correspondences allowed to obtain a 3D wireframe model of the object presented in Fig. 3b. Note that the recovered object is mirror symmetric, and that the recovered cameras are actually symmetrical in location and orientation with respect to the object's symmetry plane, properties that are not used at any point in Photomodeler's reconstruction algorithms (the symmetry property is only used to

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	synthesize the symmetric view). Once the 3D inference is performed, the 3D surface model shown in Fig. 3c is built and the texture can be extracted from the images. The final 3D model with texture map is shown in Fig. 3d. The construction of this 3D textured model took only a few minutes to a novice Photomodeler user. Incorporating symmetry derived constraints in the workflow and in the interface would greatly facilitate the process and reduce the time needed to build a model, while also helping in improving the accuracy of the manual input and helping deal with self occlusions across the symmetry plane.” *See Mirror symmetry -> 2-view stereo geometry* (2003) at 142-143. “5.3. Face model The technique clearly applies beautifully to perfectly symmetric objects. We also wanted to try the more challenging problem posed by (quasi-)human faces. We used a bust of Darth Maul, which is fairly symmetric. The input and synthetic symmetric views are presented in Fig. 4a. The wireframe model and camera positions and orientations as recovered by Photomodeler are presented in Fig. 4b. Finally, the resulting textured model is shown in Fig. 4c. The polygonal model, although coarse, captures the geometry of the face fairly well, so that the resulting textured model is easily recognized as a face under various viewpoints.” *See Mirror symmetry -> 2-view stereo geometry* (2003) at 143. *See Mirror symmetry -> 2-view stereo geometry* (2003) at Fig. 4(a):  (a) Input image (left) of a Darth Maul bust and inverted image (right), used as a stereo pair

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	This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois II alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[f]. wherein during mirror tracking mode the processor utilizes the angle of the images captured by the camera and applies parametric input for a mapping transformation that changes imaging perspective of the images captured by the camera.	To the extent the preamble is limiting, Francois II expressly and/or inherently discloses and/or renders obvious wherein during mirror tracking mode the processor utilizes the angle of the images captured by the camera and applies parametric input for a mapping transformation that changes imaging perspective of the images captured by the camera. *See*, *e.g.*, disclosures below. "This sketch presents the design and construction of a handheld virtual mirror device. The perception of the world reflected through a mirror depends on the viewer's position with respect to the mirror and the 3-D geometry of the world. In order to simulate a real mirror on a computer screen, images of the observed world, consistent with the viewer's position, must be synthesized and displayed in real-time. Our system is build around a flat LCD screen manipulated by the user, a single camera fixed on the screen, and a tracking device. The continuous input video stream and tracker data is used to synthesize, in real-time, a continuous video stream displayed on the LCD screen. The synthesized video stream is a close approximation of what the user would see on the screen surface if it were a real mirror." *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at the introductory paragraph. "When a person looks into a mirror, they see what they would see from the symmetrical (virtual) point of view (figure 1). A camera whose position and orientation are fixed with respect to the mirror produces a video stream that corresponds to this particular viewpoint. In order to synthesize the images corresponding to the user's viewpoint from the images captured by the camera, we must relate them geometrically. Such a transform cannot be formulated without assumptions or knowledge about the world geometry. In our case, the focus of attention is the user's own reflection in the mirror. We thus model the world as a plane parallel to the mirror, at the user's distance from the mirror. We have shown that under these assumptions,

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	the transform relating the camera view and the user view depends only on the relative positions of the user viewpoint and the camera center, and is reduced to a scaling and a translation. The transform is exact when the user viewpoint lies on the camera axis. This model provides a straightforward and efficient way of synthesizing the viewer's image stream from the camera stream, and provides a good approximation when the viewer's position remains close to the camera axis.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 1.Problem formulation and geometric analysis. “We have implemented the mirror image transform as a module in the Modular Flow Scheduling Middleware [François 2001], the open source implementation of IMSC's software architecture for Integrated Media Systems. It is specifically designed for parallel processing of concurrent data streams in real-time, and its modularity dramatically reduces development and integration time. The actual handheld virtual mirror system is composed of a handheld 10" LCD flat screen fitted with a camera and a magnetic tracker sensor (figure 2), a fixed processing unit, a fixed magnetic tracker transmitter, and a second magnetic tracker sensor placed on the user. Real-time camera and tracker inputs are used to synthesize the virtual mirror stream and display it in real-time on the LCD screen. The result is a very convincing handheld mirror simulation.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 2.2.System integration. “The design and construction of realistic virtual mirrors represents an original experiment in Human-Computer Interface, that opens the door to various interactive experiments in entertainment, arts and communication. Use of video analysis and graphics techniques will allow to explore and interfere with what has always been a private, solitary act of a person looking in a mirror.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 3.Perspectives. *See A Handheld Virtual Mirror* (2002), at Figure 1:

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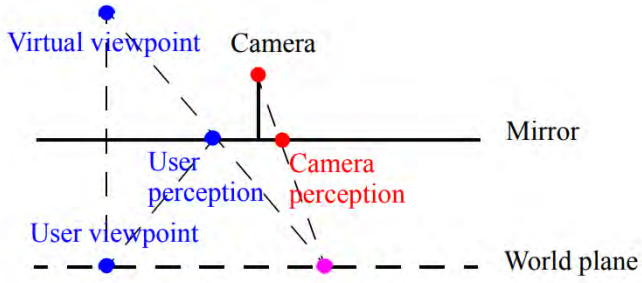


Figure 1. Basic mirror geometry.

See A Handheld Virtual Mirror (2002), at Figure 2:

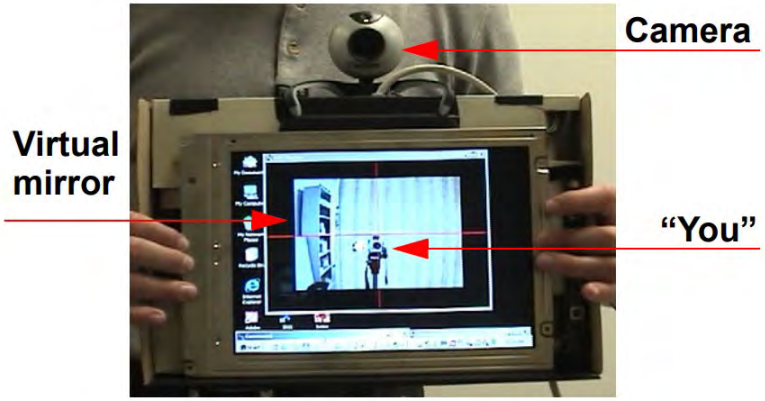


Figure 2. Handheld virtual mirror device.

"We address the problem of 3D reconstruction from a single perspective view of a mirror symmetric scene. We establish the fundamental result that it is geometrically equivalent to observing the scene with two cameras, the cameras being symmetrical with respect to the

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	unknown 3D symmetry plane. All traditional tools of classical 2-view stereo can then be applied, and the concepts of fundamental/essential matrix, epipolar geometry, rectification and disparity hold. However, the problems are greatly simplified here, as the rectification process and the computation of epipolar geometry can be easily performed from the original view only. If the camera is calibrated, we show how to synthesize the symmetric image generated by the same physical camera. A Euclidean reconstruction of the scene can then be computed from the resulting stereo pair. To validate this novel formulation, we have processed many real images, and show examples of 3D reconstruction. q 2003 Elsevier Science B.V. All rights reserved." *See Mirror symmetry -> 2-view stereo geometry* (2003) at 137 (Abstract). "We establish more general epipolar projective properties of single views of mirror symmetric scenes, and apply them in a different context: we perform Euclidean 3D reconstruction of mirror symmetric objects from a single perspective view using traditional 2-view stereo geometry." *See Mirror symmetry -> 2-view stereo geometry* (2003) at 137-138. "We developed our novel formulation to use existing 2- view stereo tools to perform 3D reconstruction of mirror symmetric objects from a single, real perspective image. Such systems take as input two images, taken by the same physical camera from different positions, and sometimes require the images to be rectified. If the rectification poses no theoretical problem given the availability of epipolar pencils, the synthesis of a virtual symmetric view taken by a physical camera requires more work. We show how to build such an image in the case of a calibrated pinhole camera, in order to allow Euclidean reconstruction of the scene. We then present the reconstruction results obtained by processing image pairs made of one real perspective image of a mirror symmetric object, and one synthetic symmetric view, in an off-the-shelf commercial package, Eos System's PhotoModeler Pro 4.0. 5.1. Calibrated pinhole camera case Suppose the camera used to take the available picture is a pinhole camera. It projects the world point X into the image point x according to the formula:

$x = KR[I|(-\tilde{C})]X$

The 3×3 matrix K is the camera calibration matrix. If C is a pinhole camera, its calibration matrix is of the form:

$$k = \begin{bmatrix} \alpha_x & 0 & x_0 \\ & \alpha_y & y_0 \\ & & 1 \end{bmatrix}$$

where α_x α_y and represent the focal length of the camera in the x and y directions, respectively, and (x_0, y_0) is the principal point, all expressed in terms of pixel dimensions.

R is the 3×3 transform matrix from the world coordinate system to the camera coordinate system, in this case a rotation, defined by:

$$R = [\, e_1^{\mathrm{T}} \quad e_2^{\mathrm{T}} \quad e_3^{\mathrm{T}} \,]^{\mathrm{T}}$$

where (e_1, e_2, e_3) is the orthonormal basis of the Euclidean coordinate system associated with the camera.

Let (e'_1, e'_2, e'_3) be the orthonormal basis of the Euclidean coordinate system associated with the virtual symmetrical camera. By construction, $e'_j = \overline{e_j} = \tilde{Z}e_j$. Because of the symmetry, this coordinate system's orientation is reversed compared to that of (e_1, e_2, e_3) (if one is right-handed, the other is left-handed).

The virtual camera projects the world point X into the image point x' according to:

$$x' = KR\tilde{Z}[I| - \tilde{C}]X = K\tilde{R}[I| - \tilde{C}]X$$

where:

$$\tilde{R} = R\tilde{Z} = [\, \overline{e_1}^{\mathrm{T}} \quad \overline{e_2}^{\mathrm{T}} \quad \overline{e_3}^{\mathrm{T}} \,]^{\mathrm{T}}$$

The image point of the same world point seen by the physical camera placed in $\tilde{C}$ and with principal axis direction $\overline{e_3}^{\mathrm{T}}$ is:

$$x'' = KR''[I| - \tilde{C}]X$$

where

$$R'' = [\, e''_1\mathrm{T} \quad e''_2\mathrm{T} \quad \overline{e_3}^{\mathrm{T}} \,]^{\mathrm{T}}$$

and (e''_1, e''_2) is an orthonormal basis of the principal plane such that $(e''_1, e''_2, \overline{e_3})$ has the same orientation as (e_1, e_2, e_3) (both are either right or left-handed). Such a basis is obtained by applying a rotation of an arbitrary angle θ to the basis $(\overline{e_1}, \overline{e_2})$ in the plane it defines, and inverting the direction of one of the axes. The rotation of the coordinate system corresponds to a rotation of the physical camera around its optical axis.

Using the notation

$$\begin{bmatrix} a \\ b \\ c \end{bmatrix} = \tilde{R}[I| - \tilde{C}]X$$

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	x'' can be written: $x'' = \begin{bmatrix} \alpha_x & 0 & x_0 \\ & \alpha_y & y_0 \\ & & 1 \end{bmatrix} \begin{bmatrix} -1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} a \\ b \\ c \end{bmatrix}$ Since we are looking to relate x'' and $x' = \begin{bmatrix} \alpha_x & 0 & x_0 \\ & \alpha_y & y_0 \\ & & 1 \end{bmatrix} \begin{bmatrix} a \\ b \\ c \end{bmatrix}$ the simplest analytic form naturally corresponds to no rotation, i.e. to the cases where the real camera coordinate system axes are aligned with that of the virtual (symmetric) ones, the direction of one of the axes being reversed to preserve the coordinate system's orientation. The two corresponding cases are shown in Fig. 2. For sake of clarity and simplicity, without loss of generality, we only consider an inversion of the x-axis. Under these conditions, x' and x'' differ only by their first component U' and U'', respectively, and thus only the image points abscissas differ: $u' = \frac{a}{c}\alpha_x + x_0, \qquad u'' = -\frac{a}{c}\alpha_x + x_0$ It follows that if the camera is calibrated, then the symmetric view of the virtual stereo pair can be obtained by simply performing a horizontal mirror of the original image with respect to a vertical axis going through the principal point.

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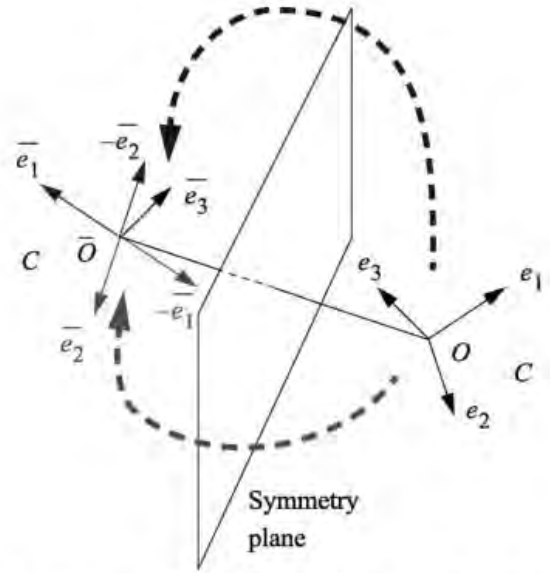


Fig. 2. How to relate the virtual view and the real camera's view from the virtual viewpoint.

" *See Mirror symmetry -> 2-view stereo geometry* (2003) at 139-140.

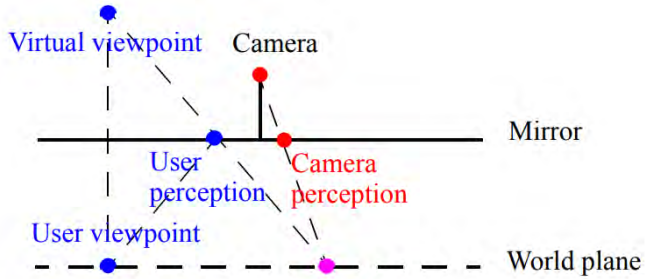
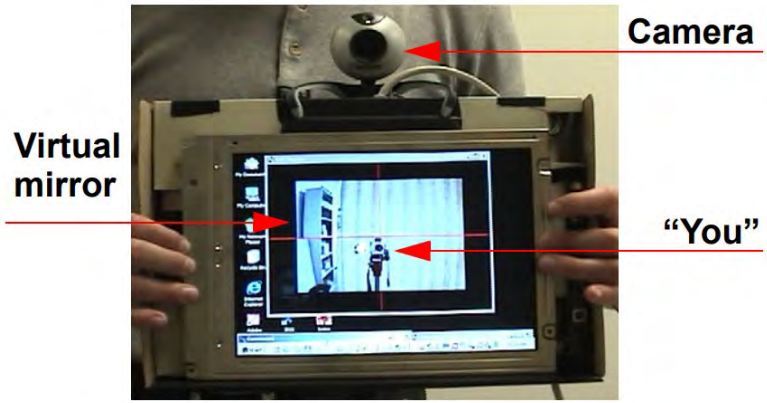
"5.2. Stealth fighter model Our first example is a toy F-117 Stealth fighter. The input image and synthesized symmetric view are presented in Fig. 3a with their epipolar pencils. The internal parameters of the digital camera used were determined using Photo-modeler's calibration tool. After specifying a minimum number of point correspondences between the two images, the software was able to perform a full calibration of both camera positions and to infer the 3D position of the object points. Adding more point and line correspondences allowed to obtain a 3D wireframe model of the object presented in Fig. 3b. Note that the recovered object is mirror symmetric, and that the recovered cameras are actually symmetrical in location and orientation with respect to the object's symmetry plane, properties that are not used at any point in Photomodeler's reconstruction algorithms (the symmetry property is only used to

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	synthesize the symmetric view). Once the 3D inference is performed, the 3D surface model shown in Fig. 3c is built and the texture can be extracted from the images. The final 3D model with texture map is shown in Fig. 3d. The construction of this 3D textured model took only a few minutes to a novice Photomodeler user. Incorporating symmetry derived constraints in the workflow and in the interface would greatly facilitate the process and reduce the time needed to build a model, while also helping in improving the accuracy of the manual input and helping deal with self occlusions across the symmetry plane.” *See Mirror symmetry -> 2-view stereo geometry* (2003) at 142-143. “5.3. Face model The technique clearly applies beautifully to perfectly symmetric objects. We also wanted to try the more challenging problem posed by (quasi-)human faces. We used a bust of Darth Maul, which is fairly symmetric. The input and synthetic symmetric views are presented in Fig. 4a. The wireframe model and camera positions and orientations as recovered by Photomodeler are presented in Fig. 4b. Finally, the resulting textured model is shown in Fig. 4c. The polygonal model, although coarse, captures the geometry of the face fairly well, so that the resulting textured model is easily recognized as a face under various viewpoints.” *See Mirror symmetry -> 2-view stereo geometry* (2003) at 143. *See Mirror symmetry -> 2-view stereo geometry* (2003) at Fig. 4(a):  (a) Input image (left) of a Darth Maul bust and inverted image (right), used as a stereo pair

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	This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois II alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

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Claim 2	
2. The method of claim 1, wherein the mapping transformation comprises a combination of at least two of the following transformations: vertical flips about a vertical axis, a projection transformation, rotation, resize, two-dimensional offset, optic distortion correction, and polynomial mapping on part or entire captured image.	To the extent the preamble is limiting, Francois II expressly and/or inherently discloses and/or renders obvious wherein the mapping transformation comprises a combination of at least two of the following transformations: vertical flips about a vertical axis, a projection transformation, rotation, resize, two-dimensional offset, optic distortion correction, and polynomial mapping on part or entire captured image. *See*, *e.g.*, disclosures below. “This sketch presents the design and construction of a handheld virtual mirror device. The perception of the world reflected through a mirror depends on the viewer's position with respect to the mirror and the 3-D geometry of the world. In order to simulate a real mirror on a computer screen, images of the observed world, consistent with the viewer's position, must be synthesized and displayed in real-time. Our system is build around a flat LCD screen manipulated by the user, a single camera fixed on the screen, and a tracking device. The continuous input video stream and tracker data is used to synthesize, in real-time, a continuous video stream displayed on the LCD screen. The synthesized video stream is a close approximation of what the user would see on the screen surface if it were a real mirror.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at the introductory paragraph. “When a person looks into a mirror, they see what they would see from the symmetrical (virtual) point of view (figure 1). A camera whose position and orientation are fixed with respect to the mirror produces a video stream that corresponds to this particular viewpoint. In

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	order to synthesize the images corresponding to the user's viewpoint from the images captured by the camera, we must relate them geometrically. Such a transform cannot be formulated without assumptions or knowledge about the world geometry. In our case, the focus of attention is the user's own reflection in the mirror. We thus model the world as a plane parallel to the mirror, at the user's distance from the mirror. We have shown that under these assumptions, the transform relating the camera view and the user view depends only on the relative positions of the user viewpoint and the camera center, and is reduced to a scaling and a translation. The transform is exact when the user viewpoint lies on the camera axis. This model provides a straightforward and efficient way of synthesizing the viewer's image stream from the camera stream, and provides a good approximation when the viewer's position remains close to the camera axis.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 1.Problem formulation and geometric analysis. “We have implemented the mirror image transform as a module in the Modular Flow Scheduling Middleware [François 2001], the open source implementation of IMSC's software architecture for Integrated Media Systems. It is specifically designed for parallel processing of concurrent data streams in real-time, and its modularity dramatically reduces development and integration time. The actual handheld virtual mirror system is composed of a handheld 10" LCD flat screen fitted with a camera and a magnetic tracker sensor (figure 2), a fixed processing unit, a fixed magnetic tracker transmitter, and a second magnetic tracker sensor placed on the user. Real-time camera and tracker inputs are used to synthesize the virtual mirror stream and display it in real-time on the LCD screen. The result is a very convincing handheld mirror simulation.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 2.2.System integration. “The design and construction of realistic virtual mirrors represents an original experiment in Human-Computer Interface, that opens the door to various interactive experiments in entertainment, arts and communication. Use of video analysis and graphics techniques will allow to explore and interfere with what has always been a private, solitary act of a person looking in a mirror.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 3.Perspectives.

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	See A Handheld Virtual Mirror (2002), at Figure 1:  Figure 1. Basic mirror geometry. *See A Handheld Virtual Mirror* (2002), at Figure 2:  Figure 2. Handheld virtual mirror device. "We address the problem of 3D reconstruction from a single perspective view of a mirror symmetric scene. We establish the fundamental result that it is geometrically equivalent to

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois II
	observing the scene with two cameras, the cameras being symmetrical with respect to the unknown 3D symmetry plane. All traditional tools of classical 2-view stereo can then be applied, and the concepts of fundamental/essential matrix, epipolar geometry, rectification and disparity hold. However, the problems are greatly simplified here, as the rectification process and the computation of epipolar geometry can be easily performed from the original view only. If the camera is calibrated, we show how to synthesize the symmetric image generated by the same physical camera. A Euclidean reconstruction of the scene can then be computed from the resulting stereo pair. To validate this novel formulation, we have processed many real images, and show examples of 3D reconstruction. q 2003 Elsevier Science B.V. All rights reserved.” *See Mirror symmetry -> 2-view stereo geometry* (2003) at 137 (Abstract). “We establish more general epipolar projective properties of single views of mirror symmetric scenes, and apply them in a different context: we perform Euclidean 3D reconstruction of mirror symmetric objects from a single perspective view using traditional 2-view stereo geometry.” *See Mirror symmetry -> 2-view stereo geometry* (2003) at 137-138. “We developed our novel formulation to use existing 2- view stereo tools to perform 3D reconstruction of mirror symmetric objects from a single, real perspective image. Such systems take as input two images, taken by the same physical camera from different positions, and sometimes require the images to be rectified. If the rectification poses no theoretical problem given the availability of epipolar pencils, the synthesis of a virtual symmetric view taken by a physical camera requires more work. We show how to build such an image in the case of a calibrated pinhole camera, in order to allow Euclidean reconstruction of the scene. We then present the reconstruction results obtained by processing image pairs made of one real perspective image of a mirror symmetric object, and one synthetic symmetric view, in an off-the-shelf commercial package, Eos System’s PhotoModeler Pro 4.0. 5.1. Calibrated pinhole camera case Suppose the camera used to take the available picture is a pinhole camera. It projects the world point X into the image point x according to the formula:

$x = KR[I|(-\tilde{C})]X$

The 3×3 matrix K is the camera calibration matrix. If C is a pinhole camera, its calibration matrix is of the form:

$$k = \begin{bmatrix} \alpha_x & 0 & x_0 \\ & \alpha_y & y_0 \\ & & 1 \end{bmatrix}$$

where α_x α_y and represent the focal length of the camera in the x and y directions, respectively, and (x_0, y_0) is the principal point, all expressed in terms of pixel dimensions.

R is the 3×3 transform matrix from the world coordinate system to the camera coordinate system, in this case a rotation, defined by:

$$R = [\, e_1^{\mathrm{T}} \quad e_2^{\mathrm{T}} \quad e_3^{\mathrm{T}} \,]^{\mathrm{T}}$$

where (e_1, e_2, e_3) is the orthonormal basis of the Euclidean coordinate system associated with the camera.

Let (e'_1, e'_2, e'_3) be the orthonormal basis of the Euclidean coordinate system associated with the virtual symmetrical camera. By construction, $e'_j = \overline{e_j} = \bar{Z}e_j$. Because of the symmetry, this coordinate system's orientation is reversed compared to that of (e_1, e_2, e_3) (if one is right-handed, the other is left-handed).

The virtual camera projects the world point X into the image point x' according to:

$$x' = KR\bar{Z}[I| - \tilde{C}]X = K\bar{R}[I| - \tilde{C}]X$$

where:

$$\bar{R} = R\bar{Z} = [\, \overline{e_1}^{\mathrm{T}} \quad \overline{e_2}^{\mathrm{T}} \quad \overline{e_3}^{\mathrm{T}} \,]^{\mathrm{T}}$$

The image point of the same world point seen by the physical camera placed in $\tilde{C}$ and with principal axis direction $\overline{e_3}^{\mathrm{T}}$ is:

$$x'' = KR''[I| - \tilde{C}]X$$

where

$$R'' = [\, e''_1\mathrm{T} \quad e''_2\mathrm{T} \quad \overline{e_3}^{\mathrm{T}} \,]^{\mathrm{T}}$$

and (e''_1, e''_2) is an orthonormal basis of the principal plane such that $(e''_1, e''_2, \overline{e_3})$ has the same orientation as (e_1, e_2, e_3) (both are either right or left-handed). Such a basis is obtained by applying a rotation of an arbitrary angle θ to the basis $(\overline{e_1}, \overline{e_2})$ in the plane it defines, and inverting the direction of one of the axes. The rotation of the coordinate system corresponds to a rotation of the physical camera around its optical axis.

Using the notation

$$\begin{bmatrix} a \\ b \\ c \end{bmatrix} = \bar{R}[I| - \tilde{C}]X$$

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	x'' can be written: $x'' = \begin{bmatrix} \alpha_x & 0 & x_0 \\ & \alpha_y & y_0 \\ & & 1 \end{bmatrix} \begin{bmatrix} -1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} a \\ b \\ c \end{bmatrix}$ Since we are looking to relate x'' and $x' = \begin{bmatrix} \alpha_x & 0 & x_0 \\ & \alpha_y & y_0 \\ & & 1 \end{bmatrix} \begin{bmatrix} a \\ b \\ c \end{bmatrix}$ the simplest analytic form naturally corresponds to no rotation, i.e. to the cases where the real camera coordinate system axes are aligned with that of the virtual (symmetric) ones, the direction of one of the axes being reversed to preserve the coordinate system's orientation. The two corresponding cases are shown in Fig. 2. For sake of clarity and simplicity, without loss of generality, we only consider an inversion of the x-axis. Under these conditions, x' and x'' differ only by their first component U' and U'', respectively, and thus only the image points abscissas differ: $u' = \frac{a}{c}\alpha_x + x_0, \qquad u'' = -\frac{a}{c}\alpha_x + x_0$ It follows that if the camera is calibrated, then the symmetric view of the virtual stereo pair can be obtained by simply performing a horizontal mirror of the original image with respect to a vertical axis going through the principal point.

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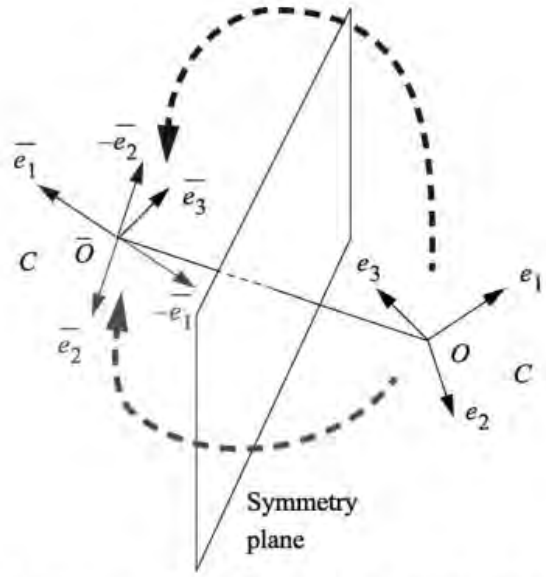


Fig. 2. How to relate the virtual view and the real camera's view from the virtual viewpoint.

" *See Mirror symmetry -> 2-view stereo geometry* (2003) at 139-140.

"5.2. Stealth fighter model Our first example is a toy F-117 Stealth fighter. The input image and synthesized symmetric view are presented in Fig. 3a with their epipolar pencils. The internal parameters of the digital camera used were determined using Photo-modeler's calibration tool. After specifying a minimum number of point correspondences between the two images, the software was able to perform a full calibration of both camera positions and to infer the 3D position of the object points. Adding more point and line correspondences allowed to obtain a 3D wireframe model of the object presented in Fig. 3b. Note that the recovered object is mirror symmetric, and that the recovered cameras are actually symmetrical in location and orientation with respect to the object's symmetry plane, properties that are not used at any point in Photomodeler's reconstruction algorithms (the symmetry property is only used to

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	synthesize the symmetric view). Once the 3D inference is performed, the 3D surface model shown in Fig. 3c is built and the texture can be extracted from the images. The final 3D model with texture map is shown in Fig. 3d. The construction of this 3D textured model took only a few minutes to a novice Photomodeler user. Incorporating symmetry derived constraints in the workflow and in the interface would greatly facilitate the process and reduce the time needed to build a model, while also helping in improving the accuracy of the manual input and helping deal with self occlusions across the symmetry plane.” *See Mirror symmetry -> 2-view stereo geometry* (2003) at 142-143. “5.3. Face model The technique clearly applies beautifully to perfectly symmetric objects. We also wanted to try the more challenging problem posed by (quasi-)human faces. We used a bust of Darth Maul, which is fairly symmetric. The input and synthetic symmetric views are presented in Fig. 4a. The wireframe model and camera positions and orientations as recovered by Photomodeler are presented in Fig. 4b. Finally, the resulting textured model is shown in Fig. 4c. The polygonal model, although coarse, captures the geometry of the face fairly well, so that the resulting textured model is easily recognized as a face under various viewpoints.” *See Mirror symmetry -> 2-view stereo geometry* (2003) at 143. *See Mirror symmetry -> 2-view stereo geometry* (2003) at Fig. 4(a):  (a) Input image (left) of a Darth Maul bust and inverted image (right), used as a stereo pair

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	"This document highlights and addresses architecture level software development issues facing researchers and practitioners in the field of Computer Vision. A new framework, or architectural style, called SAI, is introduced. It provides a formalism for the design, implementation and analysis of software systems that perform distributed parallel processing of generic data streams. Architectural patterns are illustrated with a number of demonstration projects ranging from single stream automatic real-time video processing to fully integrated distributed interactive systems mixing live video, graphics and sound. SAI is supported by an open source architectural middleware called MFSM." *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 1 (Abstract). "4.3 Handheld mirror simulation The Virtual Mirror project [16, 15] started as a feasibility study for the development and construction of a handheld mirror simulation device. The perception of the world reflected through a mirror depends on the viewer's position with respect to the mirror and the 3-D geometry of the world. In order to simulate a real mirror on a computer screen, images of the observed world, consistent with the viewer's position, must be synthesized and displayed in real-time. This is of course geometrically impossible, but with a few simplifying assumptions (e.g. planar world), the image transform required was made simple yet convincing enough to consider building an actual device. The current prototype system (see Figure 12) is comprised of an LCD screen manipulated by the user, a single camera fixed on the screen, and a tracking device. The continuous input video stream and tracker data is used to synthesize, in real-time, a continuous video stream displayed on the LCD screen. The synthesized video stream is a close approximation of what the user would see on the screen surface if it were a real mirror. Figure 13 shows the corresponding conceptual application graph. The single stream application does not involve any complicated structure. The stream originates in a live video input cell. A tracker input cell adds position and orientation data to the stream. A mirror transform cell uses the synchronous image and tracking data to synthesize the mirror simulation image, which is then presented to the user by an image display cell. The two major difficulties in this application are (1) synchronizing the various input streams (video and tracking data) to compute a

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	consistent result; and (2) displaying the result with a low enough latency and a high enough throughput to produce a convincing simulation. The use of pulses in the SAI model makes synchronization a natural operation, involving no superfluous delays or computations. The asynchronous parallel processing model allow high frame rates and low latency. The essential purpose of this system is interaction. Interaction can be seen as a particular data stream loop feeding the user with a perceptual representation of the internal model (experience), collecting the users reaction through various sensory devices and modifying the state of the internal model accordingly (influence). From the systems point of view, these data streams are volatile, and the processes involved in producing and processing them are of the same nature as those carrying procedural internal evolution tasks. Here, the internal model is the mirror, implicit in the computations carried by the mirror transform cell. The user experiences the system through the image displayed on the handheld screen, and influences it by moving her head or the screen. Note that the way live video (frames) and corresponding tracker data are synchronized in the application as described in the conceptual graph is based on the assumption that the delay between the frame capture in the live input cell (push mechanism acting as pulse trigger), and the capture of tracker data in the tracker input cell (pull mechanism), is small enough that no inconsistency can be perceived. This approach happens to work in this case, even when the system is running on a modest platform, but certainly does not generalize to synchronization in more sophisticated settings. This illustrates the flexibility of the SAI style, that allows to devise general structures, as well as simplified or ad hoc design when allowed by the application. This project also illustrates the power of SAI for system integration. The modularity of the model ensures that components developed independently (but consistently with style rules) will function together seamlessly. This allows code re-use (e.g. the image node, and the live video capture and image display cells already existed), and distributed development and testing of new node and cell types. The whole project was completed in only a few months with very limited resources. The mirror simulation system can be used as a research platform. For example, it is a testbed for developing and testing video analysis techniques that could be used to replace the magnetic trackers, including face detection and tracking, and gaze tracking. The device itself constitutes a new generic interface for applications involving rich, first-person interaction. A straightforward application is the Daguerr´eotype simulation described in [22]. Beyond technical and commercial applications

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois II
	of such a device, the use of video analysis and graphics techniques will allow artists to explore and interfere with what has always been a private, solitary act, a person looking into a mirror.” *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 13-15. *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at Figs. 12 and 13:

Asserted Claim of the '110 Patent	Exemplary Citations to Francois II



Figure 12: The handheld mirror simulation system ("Virtual Mirror").

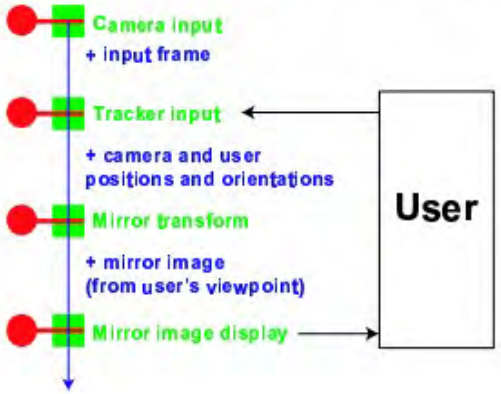
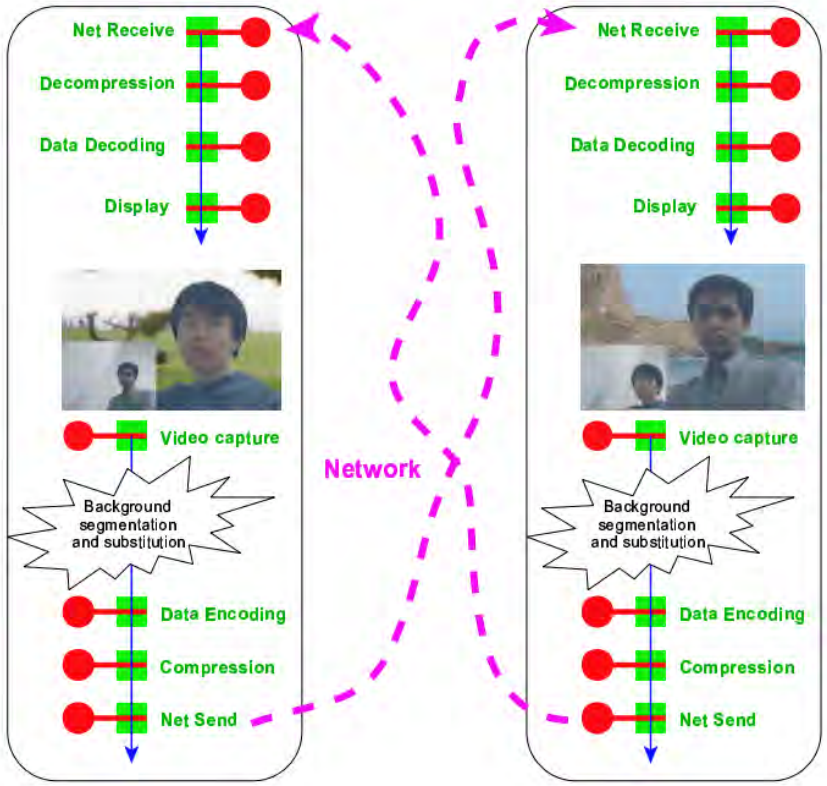


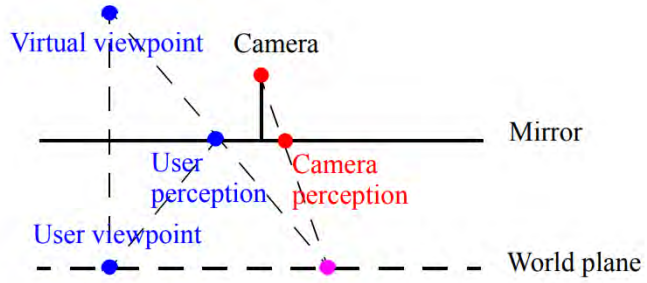
Figure 13: The Virtual Mirror application graph.

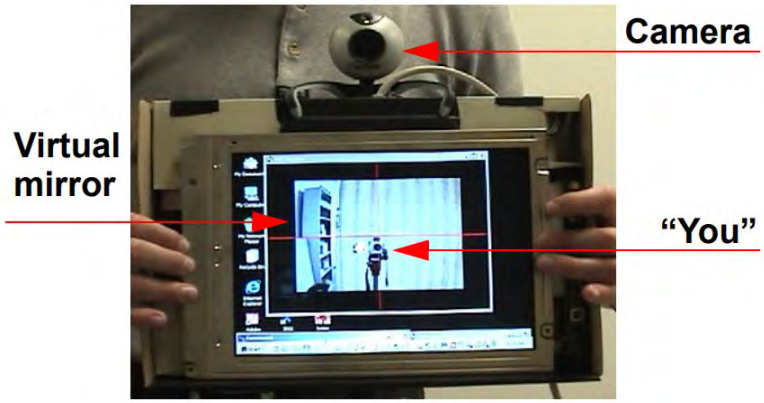
Asserted Claim of the ’110 Patent	Exemplary Citations to Francois II
	“4.5 Live video in animated 3-D graphics The example presented in this section is a real-time, interactive application requiring manipulation of het1erogenous data streams [14]. A video stream (captured live or read from a file) is used as surface texture on an animated 3-D model, rendered in real-time. The (virtual) camera used for rendering can be manipulated n real-time (e.g. with a gamepad or through a head tracking device), making the system interactive. This system was developed to illustrate the design of a scene graph-based graphics toolkit, and the advantages provided by the SAI style for manipulating independently and synchronizing different data streams in a complex interactive (possibly immersive) setting. From a Computer Vision point of view, this example illustrates how the SAI style allows to manipulate video streams and geometric models in a consistent framework. The same architectural patterns generalize to manipulating generic data streams and persistent models. Figure 16 shows the system’s conceptual graph. The graph is composed of four functional subgraphs, corresponding to four independent streams, organized around a central source that holds the 3-D model representation in the form of a scene graph, and various process parameters for the different connected cells. The rendering stream generates images of the model. The control stream updates the (virtual) camera position based on user input. Together, the rendering and control units (including the shared source) form an interaction loop with the user. The animation stream drives the dynamic evolution of the 3-D model. The texturing stream places images captured from a video source (camera or file) in the texture node in the scene graph. Interaction and modeling are now analyzed in more detail.” *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 16-17. *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at Fig. 15:

Asserted Claim of the '110 Patent	Exemplary Citations to Francois II
	 Figure 15: Conceptual graph for an early version of the IMSC Communicator, with support for video (synchronized image and sound). This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois II alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants'

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois II
	Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois II
Claim 3	
3. The method of claim 1, wherein during idle mode the camera continuously sends captured images to the processor, and the user presence is identified by the processor detecting a body part in the images.	To the extent the preamble is limiting, Francois II expressly and/or inherently discloses and/or renders obvious wherein during idle mode the camera continuously sends captured images to the processor, and the user presence is identified by the processor detecting a body part in the images. *See*, *e.g.*, disclosures below. “This sketch presents the design and construction of a handheld virtual mirror device. The perception of the world reflected through a mirror depends on the viewer's position with respect to the mirror and the 3-D geometry of the world. In order to simulate a real mirror on a computer screen, images of the observed world, consistent with the viewer's position, must be synthesized and displayed in real-time. Our system is build around a flat LCD screen manipulated by the user, a single camera fixed on the screen, and a tracking device. The continuous input video stream and tracker data is used to synthesize, in real-time, a continuous video stream displayed on the LCD screen. The synthesized video stream is a close approximation of what the user would see on the screen surface if it were a real mirror.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at the introductory paragraph. “We have implemented the mirror image transform as a module in the Modular Flow Scheduling Middleware [François 2001], the open source implementation of IMSC's software architecture for Integrated Media Systems. It is specifically designed for parallel processing of concurrent data streams in real-time, and its modularity dramatically reduces development and integration time. The actual handheld virtual mirror system is composed of a handheld 10" LCD flat screen fitted with a camera and a magnetic tracker sensor (figure 2), a fixed processing unit, a fixed magnetic tracker

Asserted Claim of the '110 Patent	Exemplary Citations to Francois II
	transmitter, and a second magnetic tracker sensor placed on the user. Real-time camera and tracker inputs are used to synthesize the virtual mirror stream and display it in real-time on the LCD screen. The result is a very convincing handheld mirror simulation." *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 2.2.System integration. *See A Handheld Virtual Mirror* (2002), at Figure 1:  Figure 1. Basic mirror geometry. *See A Handheld Virtual Mirror* (2002), at Figure 2:

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois II
	 Figure 2. Handheld virtual mirror device. “4.1 Real-time video segmentation and tracking The development of real-time video analysis applications was actually a steering concern during the development of the SAI style. The system presented here was used as a testbed for the implementation, testing and refinement of some SAI concepts [18]. The video analysis tasks performed are low level segmentation and blob tracking. The segmentation is performed by change detection using an adaptive statistical color background model (the camera is assumed stationary). A review of background maintenance algorithms can be found in [28]. Blob tracking is performed using a new multiresolution algorithm whose description is out of the scope of this document. Figure 7 shows the conceptual level architecture of the software system. It is build around a single stream going through a number of cells. The graph can be decomposed into four functional subgraphs: capture, segmentation, tracking, visualization. The stream originates in the video input cell, which produces, at a given rate, pulses containing an image coming either from a live capture device or a video file. This cell and its source constitute the capture unit of the application. The stream then goes through the

Asserted Claim of the '110 Patent	Exemplary Citations to Francois II
	segmentation unit, which is analyzed below. Coming out of the segmentation, the stream goes through a tracking cell. The result visualization unit is composed of a rendering and a display subunits. Rendering of a persistent structure (here, the tracking graph) will be illustrated in a more general context in another example below ("Live Video in Animated 3-D Graphics"). The display cell simply puts on the screen its input images, in this case the composite frames produced by the renderer. A very interesting aspect of this system, and certainly the most innovative when it was introduced, is the asynchronous parallel implementation of the segmentation algorithm, which contains a feed-back loop. The corresponding conceptual graph is also a flow graph of the algorithm. Each input frame is compared with a statistical background model. For each pixel, a decision is made whether it is an observation of the background or of an occluding element. The output is a foreground binary mask. This comparison is performed by the background comparison cell. Each pulse, after going through this cell, contains the input image and a binary foreground image, which is used by the connected components cell to produce a labeled components image, added to the pulse. The input image and the labeled components image are used by the background update cell to update the distributions in the background model. Since the comparison and the update cells both use the persistent background model, they are both connected to a common source that holds the background model structure. This path forms a feed back loop in which the result of the processing of each frame is used to update the adaptive background model. Because of the asynchrony of the processing, by the time the background model is updated with the result of the processing of a given frame, many other frames might have been compared to the model. In this particular context, the quality of the result is not affected–in fact, it is common practice in background model maintenance to perform only partial updates at each frame, in order to reduce computational load–and the overall system throughput permitted by this design is always significantly larger than that achievable in a sequential design." *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 10-11. *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at Figs 8 and 9:

Asserted Claim of the '110 Patent	Exemplary Citations to Francois II



Figure 8: Object segmentation and tracking results in a PETS02 test sequence. The examples shown are two sample output composite frames taken at different times in the original video.



Figure 9: Segmentation and tracking of the players and the ball in professional racquetball video. The examples shown are three consecutive output composite frames.

"4.3 Handheld mirror simulation

The Virtual Mirror project [16, 15] started as a feasibility study for the development and construction of a handheld mirror simulation device. The perception of the world reflected through a mirror depends on the viewer's position with respect to the mirror and the 3-D geometry of the world. In order to simulate a real mirror on a computer screen, images of the observed world, consistent with the viewer's position, must be synthesized and displayed in real-time. This is of course geometrically impossible, but

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois II
	with a few simplifying assumptions (e.g. planar world), the image transform required was made simple yet convincing enough to consider building an actual device. The current prototype system (see Figure 12) is comprised of an LCD screen manipulated by the user, a single camera fixed on the screen, and a tracking device. The continuous input video stream and tracker data is used to synthesize, in real-time, a continuous video stream displayed on the LCD screen. The synthesized video stream is a close approximation of what the user would see on the screen surface if it were a real mirror. Figure 13 shows the corresponding conceptual application graph. The single stream application does not involve any complicated structure. The stream originates in a live video input cell. A tracker input cell adds position and orientation data to the stream. A mirror transform cell uses the synchronous image and tracking data to synthesize the mirror simulation image, which is then presented to the user by an image display cell. The two major difficulties in this application are (1) synchronizing the various input streams (video and tracking data) to compute a consistent result; and (2) displaying the result with a low enough latency and a high enough throughput to produce a convincing simulation. The use of pulses in the SAI model makes synchronization a natural operation, involving no superfluous delays or computations. The asynchronous parallel processing model allow high frame rates and low latency. The essential purpose of this system is interaction. Interaction can be seen as a particular data stream loop feeding the user with a perceptual representation of the internal model (experience), collecting the users reaction through various sensory devices and modifying the state of the internal model accordingly (influence). From the systems point of view, these data streams are volatile, and the processes involved in producing and processing them are of the same nature as those carrying procedural internal evolution tasks. Here, the internal model is the mirror, implicit in the computations carried by the mirror transform cell. The user experiences the system through the image displayed on the handheld screen, and influences it by moving her head or the screen. Note that the way live video (frames) and corresponding tracker data are synchronized in the application as described in the conceptual graph is based on the assumption that the delay between the frame capture in the live input cell (push mechanism acting as pulse trigger), and the capture of tracker data in the tracker input cell (pull mechanism), is small enough that no inconsistency can

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois II
	be perceived. This approach happens to work in this case, even when the system is running on a modest platform, but certainly does not generalize to synchronization in more sophisticated settings. This illustrates the flexibility of the SAI style, that allows to devise general structures, as well as simplified or ad hoc design when allowed by the application. This project also illustrates the power of SAI for system integration. The modularity of the model ensures that components developed independently (but consistently with style rules) will function together seamlessly. This allows code re-use (e.g. the image node, and the live video capture and image display cells already existed), and distributed development and testing of new node and cell types. The whole project was completed in only a few months with very limited resources. The mirror simulation system can be used as a research platform. For example, it is a testbed for developing and testing video analysis techniques that could be used to replace the magnetic trackers, including face detection and tracking, and gaze tracking. The device itself constitutes a new generic interface for applications involving rich, first-person interaction. A straightforward application is the Daguerr´eotype simulation described in [22]. Beyond technical and commercial applications of such a device, the use of video analysis and graphics techniques will allow artists to explore and interfere with what has always been a private, solitary act, a person looking into a mirror.” *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 13-15. *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at Figs. 12 and 13:

Asserted Claim of the '110 Patent	Exemplary Citations to Francois II



Figure 12: The handheld mirror simulation system ("Virtual Mirror").

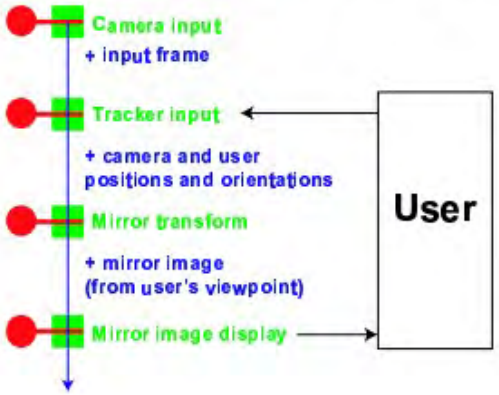
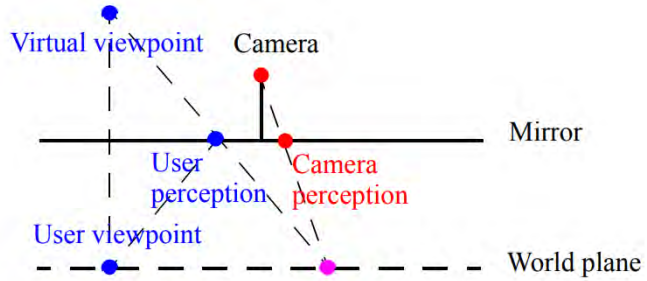
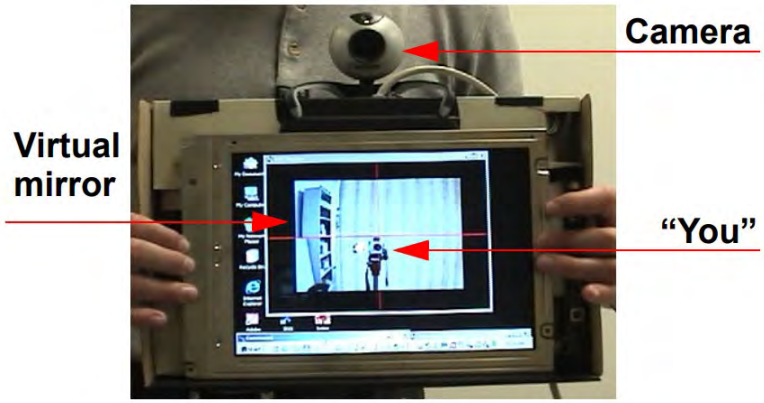


Figure 13: The Virtual Mirror application graph.

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois II
	This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois II alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois II
Claim 4	
4. The method of claim 3, wherein the body part comprises one of legs, face, eyes, and hands.	To the extent the preamble is limiting, Francois II expressly and/or inherently discloses and/or renders obvious wherein the body part comprises one of legs, face, eyes, and hands. *See*, *e.g.*, disclosures below. “This sketch presents the design and construction of a handheld virtual mirror device. The perception of the world reflected through a mirror depends on the viewer's position with respect to the mirror and the 3-D geometry of the world. In order to simulate a real mirror on a computer screen, images of the observed world, consistent with the viewer's position, must be synthesized and displayed in real-time. Our system is build around a flat LCD screen manipulated by the user, a single camera fixed on the screen, and a tracking device. The continuous input video stream and tracker data is used to synthesize, in real-time, a continuous video stream displayed on the LCD screen. The synthesized video stream is a close approximation of what the user would see on the screen surface if it were a real mirror.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at the introductory paragraph. “We have implemented the mirror image transform as a module in the Modular Flow Scheduling Middleware [François 2001], the open source implementation of IMSC's software architecture for Integrated Media Systems. It is specifically designed for parallel processing of concurrent data streams in real-time, and its modularity dramatically reduces development and integration time. The actual handheld virtual

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois II
	mirror system is composed of a handheld 10" LCD flat screen fitted with a camera and a magnetic tracker sensor (figure 2), a fixed processing unit, a fixed magnetic tracker transmitter, and a second magnetic tracker sensor placed on the user. Real-time camera and tracker inputs are used to synthesize the virtual mirror stream and display it in real-time on the LCD screen. The result is a very convincing handheld mirror simulation.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 2.2.System integration. *See A Handheld Virtual Mirror* (2002), at Figure 1:  Figure 1. Basic mirror geometry. *See A Handheld Virtual Mirror* (2002), at Figure 2:

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Asserted Claim of the '110 Patent	Exemplary Citations to Francois II
	segmentation unit, which is analyzed below. Coming out of the segmentation, the stream goes through a tracking cell. The result visualization unit is composed of a rendering and a display subunits. Rendering of a persistent structure (here, the tracking graph) will be illustrated in a more general context in another example below ("Live Video in Animated 3-D Graphics"). The display cell simply puts on the screen its input images, in this case the composite frames produced by the renderer. A very interesting aspect of this system, and certainly the most innovative when it was introduced, is the asynchronous parallel implementation of the segmentation algorithm, which contains a feed-back loop. The corresponding conceptual graph is also a flow graph of the algorithm. Each input frame is compared with a statistical background model. For each pixel, a decision is made whether it is an observation of the background or of an occluding element. The output is a foreground binary mask. This comparison is performed by the background comparison cell. Each pulse, after going through this cell, contains the input image and a binary foreground image, which is used by the connected components cell to produce a labeled components image, added to the pulse. The input image and the labeled components image are used by the background update cell to update the distributions in the background model. Since the comparison and the update cells both use the persistent background model, they are both connected to a common source that holds the background model structure. This path forms a feed back loop in which the result of the processing of each frame is used to update the adaptive background model. Because of the asynchrony of the processing, by the time the background model is updated with the result of the processing of a given frame, many other frames might have been compared to the model. In this particular context, the quality of the result is not affected–in fact, it is common practice in background model maintenance to perform only partial updates at each frame, in order to reduce computational load–and the overall system throughput permitted by this design is always significantly larger than that achievable in a sequential design." *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 10-11. *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at Figs 8 and 9:

Asserted Claim of the '110 Patent	Exemplary Citations to Francois II



Figure 8: Object segmentation and tracking results in a PETS02 test sequence. The examples shown are two sample output composite frames taken at different times in the original video.



Figure 9: Segmentation and tracking of the players and the ball in professional racquetball video. The examples shown are three consecutive output composite frames.

"4.3 Handheld mirror simulation

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	with a few simplifying assumptions (e.g. planar world), the image transform required was made simple yet convincing enough to consider building an actual device. The current prototype system (see Figure 12) is comprised of an LCD screen manipulated by the user, a single camera fixed on the screen, and a tracking device. The continuous input video stream and tracker data is used to synthesize, in real-time, a continuous video stream displayed on the LCD screen. The synthesized video stream is a close approximation of what the user would see on the screen surface if it were a real mirror. Figure 13 shows the corresponding conceptual application graph. The single stream application does not involve any complicated structure. The stream originates in a live video input cell. A tracker input cell adds position and orientation data to the stream. A mirror transform cell uses the synchronous image and tracking data to synthesize the mirror simulation image, which is then presented to the user by an image display cell. The two major difficulties in this application are (1) synchronizing the various input streams (video and tracking data) to compute a consistent result; and (2) displaying the result with a low enough latency and a high enough throughput to produce a convincing simulation. The use of pulses in the SAI model makes synchronization a natural operation, involving no superfluous delays or computations. The asynchronous parallel processing model allow high frame rates and low latency. The essential purpose of this system is interaction. Interaction can be seen as a particular data stream loop feeding the user with a perceptual representation of the internal model (experience), collecting the users reaction through various sensory devices and modifying the state of the internal model accordingly (influence). From the systems point of view, these data streams are volatile, and the processes involved in producing and processing them are of the same nature as those carrying procedural internal evolution tasks. Here, the internal model is the mirror, implicit in the computations carried by the mirror transform cell. The user experiences the system through the image displayed on the handheld screen, and influences it by moving her head or the screen. Note that the way live video (frames) and corresponding tracker data are synchronized in the application as described in the conceptual graph is based on the assumption that the delay between the frame capture in the live input cell (push mechanism acting as pulse trigger), and the capture of tracker data in the tracker input cell (pull mechanism), is small enough that no inconsistency can

Asserted Claim of the '110 Patent	Exemplary Citations to Francois II
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Asserted Claim of the '110 Patent	Exemplary Citations to Francois II



Figure 12: The handheld mirror simulation system ("Virtual Mirror").

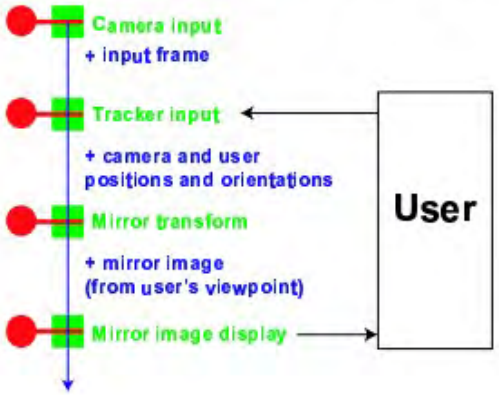


Figure 13: The Virtual Mirror application graph.

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois II
	This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois II alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois II
Claim 5	
5. The method of claim 1, further comprising receiving user input and operating the processor to vary image magnitude or field-of-view of the modified images according to the user input.	To the extent the preamble is limiting, Francois II expressly and/or inherently discloses and/or renders obvious receiving user input and operating the processor to vary image magnitude or field-of-view of the modified images according to the user input. *See*, *e.g.*, disclosures below. “This sketch presents the design and construction of a handheld virtual mirror device. The perception of the world reflected through a mirror depends on the viewer's position with respect to the mirror and the 3-D geometry of the world. In order to simulate a real mirror on a computer screen, images of the observed world, consistent with the viewer's position, must be synthesized and displayed in real-time. Our system is build around a flat LCD screen manipulated by the user, a single camera fixed on the screen, and a tracking device. The continuous input video stream and tracker data is used to synthesize, in real-time, a continuous video stream displayed on the LCD screen. The synthesized video stream is a close approximation of what the user would see on the screen surface if it were a real mirror.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at the introductory paragraph. “When a person looks into a mirror, they see what they would see from the symmetrical (virtual) point of view (figure 1). A camera whose position and orientation are fixed with respect to the mirror produces a video stream that corresponds to this particular viewpoint. In order to synthesize the images corresponding to the user's viewpoint from the images captured by the camera, we must relate them geometrically. Such a transform cannot be formulated

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	without assumptions or knowledge about the world geometry. In our case, the focus of attention is the user's own reflection in the mirror. We thus model the world as a plane parallel to the mirror, at the user's distance from the mirror. We have shown that under these assumptions, the transform relating the camera view and the user view depends only on the relative positions of the user viewpoint and the camera center, and is reduced to a scaling and a translation. The transform is exact when the user viewpoint lies on the camera axis. This model provides a straightforward and efficient way of synthesizing the viewer's image stream from the camera stream, and provides a good approximation when the viewer's position remains close to the camera axis.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 1.Problem formulation and geometric analysis. “We have implemented the mirror image transform as a module in the Modular Flow Scheduling Middleware [François 2001], the open source implementation of IMSC's software architecture for Integrated Media Systems. It is specifically designed for parallel processing of concurrent data streams in real-time, and its modularity dramatically reduces development and integration time. The actual handheld virtual mirror system is composed of a handheld 10" LCD flat screen fitted with a camera and a magnetic tracker sensor (figure 2), a fixed processing unit, a fixed magnetic tracker transmitter, and a second magnetic tracker sensor placed on the user. Real-time camera and tracker inputs are used to synthesize the virtual mirror stream and display it in real-time on the LCD screen. The result is a very convincing handheld mirror simulation.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 2.2.System integration. “The design and construction of realistic virtual mirrors represents an original experiment in Human-Computer Interface, that opens the door to various interactive experiments in entertainment, arts and communication. Use of video analysis and graphics techniques will allow to explore and interfere with what has always been a private, solitary act of a person looking in a mirror.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 3.Perspectives. *See A Handheld Virtual Mirror* (2002), at Figure 1:

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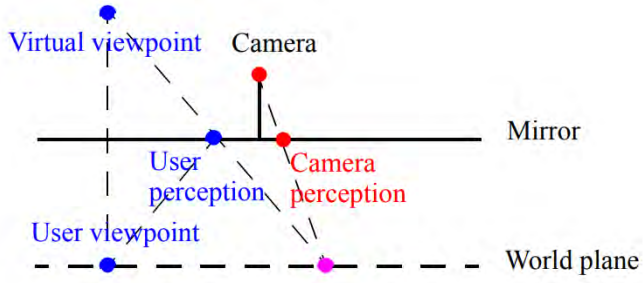


Figure 1. Basic mirror geometry.

See A Handheld Virtual Mirror (2002), at Figure 2:

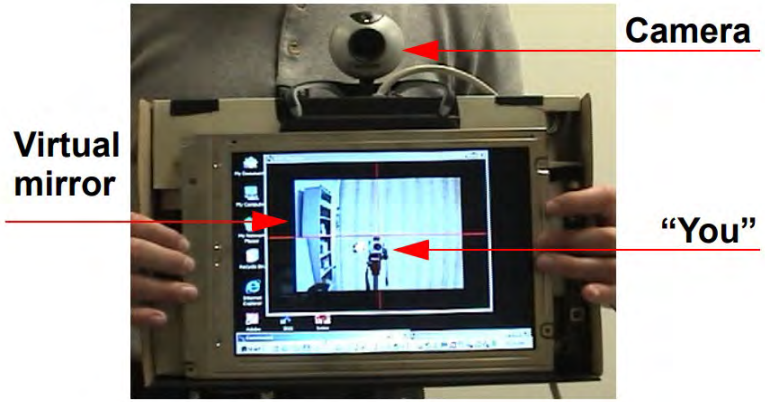


Figure 2. Handheld virtual mirror device.

"We address the problem of 3D reconstruction from a single perspective view of a mirror symmetric scene. We establish the fundamental result that it is geometrically equivalent to observing the scene with two cameras, the cameras being symmetrical with respect to the

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	unknown 3D symmetry plane. All traditional tools of classical 2-view stereo can then be applied, and the concepts of fundamental/essential matrix, epipolar geometry, rectification and disparity hold. However, the problems are greatly simplified here, as the rectification process and the computation of epipolar geometry can be easily performed from the original view only. If the camera is calibrated, we show how to synthesize the symmetric image generated by the same physical camera. A Euclidean reconstruction of the scene can then be computed from the resulting stereo pair. To validate this novel formulation, we have processed many real images, and show examples of 3D reconstruction. q 2003 Elsevier Science B.V. All rights reserved.” *See Mirror symmetry -> 2-view stereo geometry* (2003) at 137 (Abstract). “We establish more general epipolar projective properties of single views of mirror symmetric scenes, and apply them in a different context: we perform Euclidean 3D reconstruction of mirror symmetric objects from a single perspective view using traditional 2-view stereo geometry.” *See Mirror symmetry -> 2-view stereo geometry* (2003) at 137-138. “We developed our novel formulation to use existing 2- view stereo tools to perform 3D reconstruction of mirror symmetric objects from a single, real perspective image. Such systems take as input two images, taken by the same physical camera from different positions, and sometimes require the images to be rectified. If the rectification poses no theoretical problem given the availability of epipolar pencils, the synthesis of a virtual symmetric view taken by a physical camera requires more work. We show how to build such an image in the case of a calibrated pinhole camera, in order to allow Euclidean reconstruction of the scene. We then present the reconstruction results obtained by processing image pairs made of one real perspective image of a mirror symmetric object, and one synthetic symmetric view, in an off-the-shelf commercial package, Eos System’s PhotoModeler Pro 4.0. 5.1. Calibrated pinhole camera case Suppose the camera used to take the available picture is a pinhole camera. It projects the world point X into the image point x according to the formula:

$x = KR[I|(-\tilde{C})]X$

The 3×3 matrix K is the camera calibration matrix. If C is a pinhole camera, its calibration matrix is of the form:

$$k = \begin{bmatrix} \alpha_x & 0 & x_0 \\ & \alpha_y & y_0 \\ & & 1 \end{bmatrix}$$

where α_x α_y and represent the focal length of the camera in the x and y directions, respectively, and (x_0, y_0) is the principal point, all expressed in terms of pixel dimensions.

R is the 3×3 transform matrix from the world coordinate system to the camera coordinate system, in this case a rotation, defined by:

$$R = [\, e_1^{\mathrm{T}} \quad e_2^{\mathrm{T}} \quad e_3^{\mathrm{T}} \,]^{\mathrm{T}}$$

where (e_1, e_2, e_3) is the orthonormal basis of the Euclidean coordinate system associated with the camera.

Let (e'_1, e'_2, e'_3) be the orthonormal basis of the Euclidean coordinate system associated with the virtual symmetrical camera. By construction, $e'_j = \overline{e_j} = \bar{Z}e_j$. Because of the symmetry, this coordinate system's orientation is reversed compared to that of (e_1, e_2, e_3) (if one is right-handed, the other is left-handed).

The virtual camera projects the world point X into the image point x' according to:

$$x' = KR\bar{Z}[I| - \tilde{C}]X = K\bar{R}[I| - \tilde{C}]X$$

where:

$$\bar{R} = R\bar{Z} = [\, \overline{e_1}^{\mathrm{T}} \quad \overline{e_2}^{\mathrm{T}} \quad \overline{e_3}^{\mathrm{T}} \,]^{\mathrm{T}}$$

The image point of the same world point seen by the physical camera placed in $\tilde{C}$ and with principal axis direction $\overline{e_3}^{\mathrm{T}}$ is:

$$x'' = KR''[I| - \tilde{C}]X$$

where

$$R'' = [\, e_1''\mathrm{T} \quad e_2''\mathrm{T} \quad \overline{e_3}^{\mathrm{T}} \,]^{\mathrm{T}}$$

and (e''_1, e''_2) is an orthonormal basis of the principal plane such that $(e''_1, e''_2, \overline{e_3})$ has the same orientation as (e_1, e_2, e_3) (both are either right or left-handed). Such a basis is obtained by applying a rotation of an arbitrary angle θ to the basis $(\overline{e_1}, \overline{e_2})$ in the plane it defines, and inverting the direction of one of the axes. The rotation of the coordinate system corresponds to a rotation of the physical camera around its optical axis.

Using the notation

$$\begin{bmatrix} a \\ b \\ c \end{bmatrix} = \bar{R}[I| - \tilde{C}]X$$

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	x'' can be written: $x'' = \begin{bmatrix} \alpha_x & 0 & x_0 \\ & \alpha_y & y_0 \\ & & 1 \end{bmatrix} \begin{bmatrix} -1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} a \\ b \\ c \end{bmatrix}$ Since we are looking to relate x'' and $x' = \begin{bmatrix} \alpha_x & 0 & x_0 \\ & \alpha_y & y_0 \\ & & 1 \end{bmatrix} \begin{bmatrix} a \\ b \\ c \end{bmatrix}$ the simplest analytic form naturally corresponds to no rotation, i.e. to the cases where the real camera coordinate system axes are aligned with that of the virtual (symmetric) ones, the direction of one of the axes being reversed to preserve the coordinate system's orientation. The two corresponding cases are shown in Fig. 2. For sake of clarity and simplicity, without loss of generality, we only consider an inversion of the x-axis. Under these conditions, x' and x'' differ only by their first component U' and U'', respectively, and thus only the image points abscissas differ: $u' = \frac{a}{c}\alpha_x + x_0, \qquad u'' = -\frac{a}{c}\alpha_x + x_0$ It follows that if the camera is calibrated, then the symmetric view of the virtual stereo pair can be obtained by simply performing a horizontal mirror of the original image with respect to a vertical axis going through the principal point.

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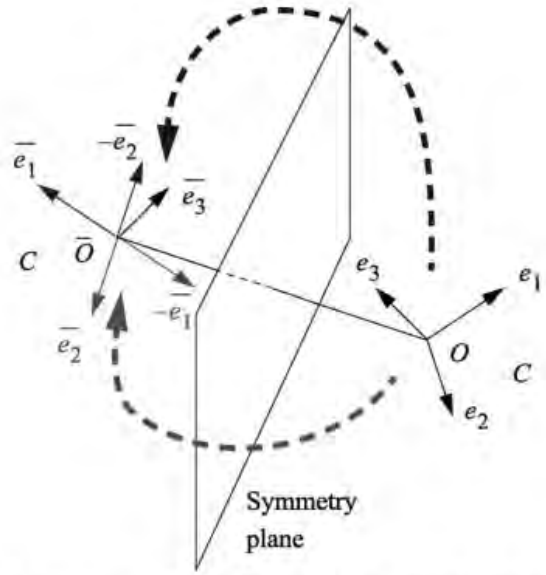


Fig. 2. How to relate the virtual view and the real camera's view from the virtual viewpoint.

" *See Mirror symmetry -> 2-view stereo geometry* (2003) at 139-140.

"5.2. Stealth fighter model Our first example is a toy F-117 Stealth fighter. The input image and synthesized symmetric view are presented in Fig. 3a with their epipolar pencils. The internal parameters of the digital camera used were determined using Photo-modeler's calibration tool. After specifying a minimum number of point correspondences between the two images, the software was able to perform a full calibration of both camera positions and to infer the 3D position of the object points. Adding more point and line correspondences allowed to obtain a 3D wireframe model of the object presented in Fig. 3b. Note that the recovered object is mirror symmetric, and that the recovered cameras are actually symmetrical in location and orientation with respect to the object's symmetry plane, properties that are not used at any point in Photomodeler's reconstruction algorithms (the symmetry property is only used to

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	synthesize the symmetric view). Once the 3D inference is performed, the 3D surface model shown in Fig. 3c is built and the texture can be extracted from the images. The final 3D model with texture map is shown in Fig. 3d. The construction of this 3D textured model took only a few minutes to a novice Photomodeler user. Incorporating symmetry derived constraints in the workflow and in the interface would greatly facilitate the process and reduce the time needed to build a model, while also helping in improving the accuracy of the manual input and helping deal with self occlusions across the symmetry plane.” *See Mirror symmetry -> 2-view stereo geometry* (2003) at 142-143. “5.3. Face model The technique clearly applies beautifully to perfectly symmetric objects. We also wanted to try the more challenging problem posed by (quasi-)human faces. We used a bust of Darth Maul, which is fairly symmetric. The input and synthetic symmetric views are presented in Fig. 4a. The wireframe model and camera positions and orientations as recovered by Photomodeler are presented in Fig. 4b. Finally, the resulting textured model is shown in Fig. 4c. The polygonal model, although coarse, captures the geometry of the face fairly well, so that the resulting textured model is easily recognized as a face under various viewpoints.” *See Mirror symmetry -> 2-view stereo geometry* (2003) at 143. *See Mirror symmetry -> 2-view stereo geometry* (2003) at Fig. 4(a):  (a) Input image (left) of a Darth Maul bust and inverted image (right), used as a stereo pair

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	"This document highlights and addresses architecture level software development issues facing researchers and practitioners in the field of Computer Vision. A new framework, or architectural style, called SAI, is introduced. It provides a formalism for the design, implementation and analysis of software systems that perform distributed parallel processing of generic data streams. Architectural patterns are illustrated with a number of demonstration projects ranging from single stream automatic real-time video processing to fully integrated distributed interactive systems mixing live video, graphics and sound. SAI is supported by an open source architectural middleware called MFSM." *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 1 (Abstract). "4.3 Handheld mirror simulation The Virtual Mirror project [16, 15] started as a feasibility study for the development and construction of a handheld mirror simulation device. The perception of the world reflected through a mirror depends on the viewer's position with respect to the mirror and the 3-D geometry of the world. In order to simulate a real mirror on a computer screen, images of the observed world, consistent with the viewer's position, must be synthesized and displayed in real-time. This is of course geometrically impossible, but with a few simplifying assumptions (e.g. planar world), the image transform required was made simple yet convincing enough to consider building an actual device. The current prototype system (see Figure 12) is comprised of an LCD screen manipulated by the user, a single camera fixed on the screen, and a tracking device. The continuous input video stream and tracker data is used to synthesize, in real-time, a continuous video stream displayed on the LCD screen. The synthesized video stream is a close approximation of what the user would see on the screen surface if it were a real mirror. Figure 13 shows the corresponding conceptual application graph. The single stream application does not involve any complicated structure. The stream originates in a live video input cell. A tracker input cell adds position and orientation data to the stream. A mirror transform cell uses the synchronous image and tracking data to synthesize the mirror simulation image, which is then presented to the user by an image display cell. The two major difficulties in this application are (1) synchronizing the various input streams (video and tracking data) to compute a

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	consistent result; and (2) displaying the result with a low enough latency and a high enough throughput to produce a convincing simulation. The use of pulses in the SAI model makes synchronization a natural operation, involving no superfluous delays or computations. The asynchronous parallel processing model allow high frame rates and low latency. The essential purpose of this system is interaction. Interaction can be seen as a particular data stream loop feeding the user with a perceptual representation of the internal model (experience), collecting the users reaction through various sensory devices and modifying the state of the internal model accordingly (influence). From the systems point of view, these data streams are volatile, and the processes involved in producing and processing them are of the same nature as those carrying procedural internal evolution tasks. Here, the internal model is the mirror, implicit in the computations carried by the mirror transform cell. The user experiences the system through the image displayed on the handheld screen, and influences it by moving her head or the screen. Note that the way live video (frames) and corresponding tracker data are synchronized in the application as described in the conceptual graph is based on the assumption that the delay between the frame capture in the live input cell (push mechanism acting as pulse trigger), and the capture of tracker data in the tracker input cell (pull mechanism), is small enough that no inconsistency can be perceived. This approach happens to work in this case, even when the system is running on a modest platform, but certainly does not generalize to synchronization in more sophisticated settings. This illustrates the flexibility of the SAI style, that allows to devise general structures, as well as simplified or ad hoc design when allowed by the application. This project also illustrates the power of SAI for system integration. The modularity of the model ensures that components developed independently (but consistently with style rules) will function together seamlessly. This allows code re-use (e.g. the image node, and the live video capture and image display cells already existed), and distributed development and testing of new node and cell types. The whole project was completed in only a few months with very limited resources. The mirror simulation system can be used as a research platform. For example, it is a testbed for developing and testing video analysis techniques that could be used to replace the magnetic trackers, including face detection and tracking, and gaze tracking. The device itself constitutes a new generic interface for applications involving rich, first-person interaction. A straightforward application is the Daguerr´eotype simulation described in [22]. Beyond technical and commercial applications

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	of such a device, the use of video analysis and graphics techniques will allow artists to explore and interfere with what has always been a private, solitary act, a person looking into a mirror.” *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 13-15. *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at Figs. 12 and 13:

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Figure 12: The handheld mirror simulation system ("Virtual Mirror").

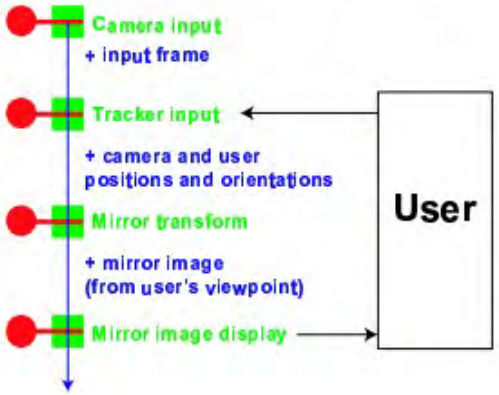
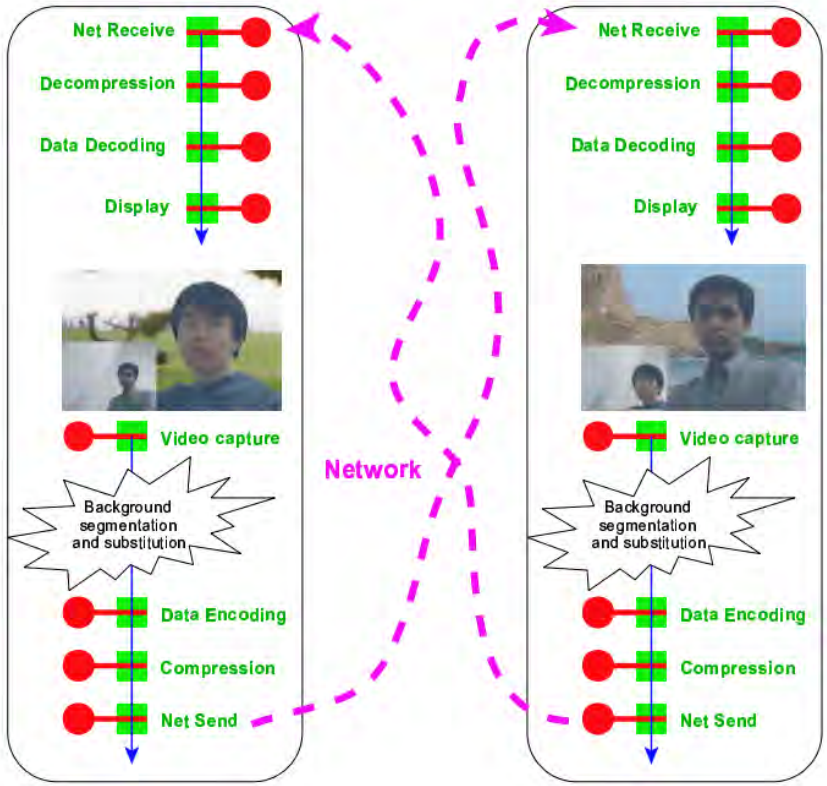


Figure 13: The Virtual Mirror application graph.

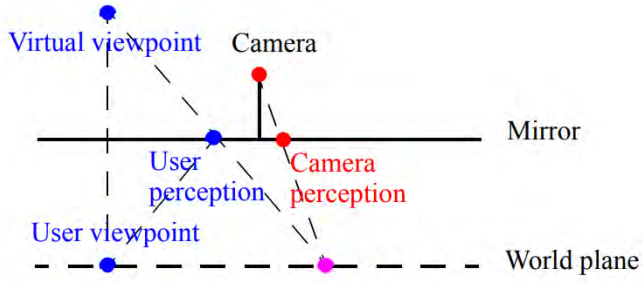
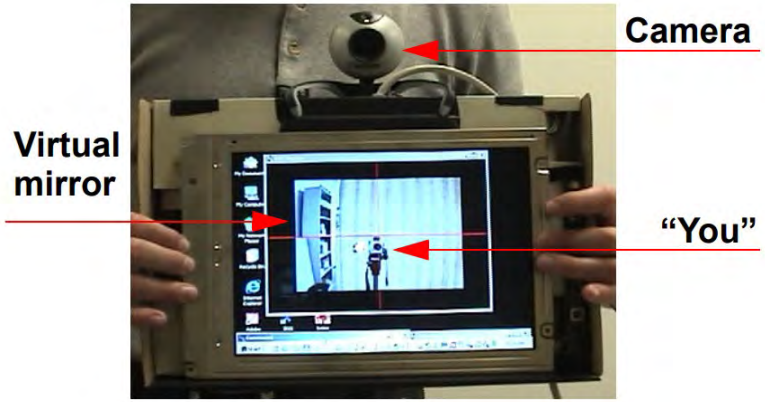
Asserted Claim of the ’110 Patent	Exemplary Citations to Francois II
	“4.5 Live video in animated 3-D graphics The example presented in this section is a real-time, interactive application requiring manipulation of het1erogenous data streams [14]. A video stream (captured live or read from a file) is used as surface texture on an animated 3-D model, rendered in real-time. The (virtual) camera used for rendering can be manipulated n real-time (e.g. with a gamepad or through a head tracking device), making the system interactive. This system was developed to illustrate the design of a scene graph-based graphics toolkit, and the advantages provided by the SAI style for manipulating independently and synchronizing different data streams in a complex interactive (possibly immersive) setting. From a Computer Vision point of view, this example illustrates how the SAI style allows to manipulate video streams and geometric models in a consistent framework. The same architectural patterns generalize to manipulating generic data streams and persistent models. Figure 16 shows the system’s conceptual graph. The graph is composed of four functional subgraphs, corresponding to four independent streams, organized around a central source that holds the 3-D model representation in the form of a scene graph, and various process parameters for the different connected cells. The rendering stream generates images of the model. The control stream updates the (virtual) camera position based on user input. Together, the rendering and control units (including the shared source) form an interaction loop with the user. The animation stream drives the dynamic evolution of the 3-D model. The texturing stream places images captured from a video source (camera or file) in the texture node in the scene graph. Interaction and modeling are now analyzed in more detail.” *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 16-17. *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at Fig. 15:

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	 Figure 15: Conceptual graph for an early version of the IMSC Communicator, with support for video (synchronized image and sound). This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois II alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants'

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	Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois II
Claim 6	
6. The method of claim 5, wherein the processor varies the image magnitude or field-of-view mapping to display a partial or full body of the user in the modified images.	To the extent the preamble is limiting, Francois II expressly and/or inherently discloses and/or renders obvious wherein the processor varies the image magnitude or field-of-view mapping to display a partial or full body of the user in the modified images. *See*, *e.g.*, disclosures below. “This sketch presents the design and construction of a handheld virtual mirror device. The perception of the world reflected through a mirror depends on the viewer's position with respect to the mirror and the 3-D geometry of the world. In order to simulate a real mirror on a computer screen, images of the observed world, consistent with the viewer's position, must be synthesized and displayed in real-time. Our system is build around a flat LCD screen manipulated by the user, a single camera fixed on the screen, and a tracking device. The continuous input video stream and tracker data is used to synthesize, in real-time, a continuous video stream displayed on the LCD screen. The synthesized video stream is a close approximation of what the user would see on the screen surface if it were a real mirror.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at the introductory paragraph. “When a person looks into a mirror, they see what they would see from the symmetrical (virtual) point of view (figure 1). A camera whose position and orientation are fixed with respect to the mirror produces a video stream that corresponds to this particular viewpoint. In order to synthesize the images corresponding to the user's viewpoint from the images captured by the camera, we must relate them geometrically. Such a transform cannot be formulated without assumptions or knowledge about the world geometry. In our case, the focus of attention is the user's own reflection in the mirror. We thus model the world as a plane parallel to the mirror, at the user's distance from the mirror. We have shown that under these assumptions, the

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	transform relating the camera view and the user view depends only on the relative positions of the user viewpoint and the camera center, and is reduced to a scaling and a translation. The transform is exact when the user viewpoint lies on the camera axis. This model provides a straightforward and efficient way of synthesizing the viewer's image stream from the camera stream, and provides a good approximation when the viewer's position remains close to the camera axis.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 1.Problem formulation and geometric analysis. “We have implemented the mirror image transform as a module in the Modular Flow Scheduling Middleware [François 2001], the open source implementation of IMSC's software architecture for Integrated Media Systems. It is specifically designed for parallel processing of concurrent data streams in real-time, and its modularity dramatically reduces development and integration time. The actual handheld virtual mirror system is composed of a handheld 10" LCD flat screen fitted with a camera and a magnetic tracker sensor (figure 2), a fixed processing unit, a fixed magnetic tracker transmitter, and a second magnetic tracker sensor placed on the user. Real-time camera and tracker inputs are used to synthesize the virtual mirror stream and display it in real-time on the LCD screen. The result is a very convincing handheld mirror simulation.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 2.2.System integration. “The design and construction of realistic virtual mirrors represents an original experiment in Human-Computer Interface, that opens the door to various interactive experiments in entertainment, arts and communication. Use of video analysis and graphics techniques will allow to explore and interfere with what has always been a private, solitary act of a person looking in a mirror.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 3.Perspectives. *See A Handheld Virtual Mirror* (2002), at Figure 1:

Asserted Claim of the '110 Patent	Exemplary Citations to Francois II
	 Figure 1. Basic mirror geometry. *See A Handheld Virtual Mirror* (2002), at Figure 2:  Figure 2. Handheld virtual mirror device. "We address the problem of 3D reconstruction from a single perspective view of a mirror symmetric scene. We establish the fundamental result that it is geometrically equivalent to observing the scene with two cameras, the cameras being symmetrical with respect to the

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois II
	unknown 3D symmetry plane. All traditional tools of classical 2-view stereo can then be applied, and the concepts of fundamental/essential matrix, epipolar geometry, rectification and disparity hold. However, the problems are greatly simplified here, as the rectification process and the computation of epipolar geometry can be easily performed from the original view only. If the camera is calibrated, we show how to synthesize the symmetric image generated by the same physical camera. A Euclidean reconstruction of the scene can then be computed from the resulting stereo pair. To validate this novel formulation, we have processed many real images, and show examples of 3D reconstruction. q 2003 Elsevier Science B.V. All rights reserved.” *See Mirror symmetry -> 2-view stereo geometry* (2003) at 137 (Abstract). “We establish more general epipolar projective properties of single views of mirror symmetric scenes, and apply them in a different context: we perform Euclidean 3D reconstruction of mirror symmetric objects from a single perspective view using traditional 2-view stereo geometry.” *See Mirror symmetry -> 2-view stereo geometry* (2003) at 137-138. “We developed our novel formulation to use existing 2- view stereo tools to perform 3D reconstruction of mirror symmetric objects from a single, real perspective image. Such systems take as input two images, taken by the same physical camera from different positions, and sometimes require the images to be rectified. If the rectification poses no theoretical problem given the availability of epipolar pencils, the synthesis of a virtual symmetric view taken by a physical camera requires more work. We show how to build such an image in the case of a calibrated pinhole camera, in order to allow Euclidean reconstruction of the scene. We then present the reconstruction results obtained by processing image pairs made of one real perspective image of a mirror symmetric object, and one synthetic symmetric view, in an off-the-shelf commercial package, Eos System’s PhotoModeler Pro 4.0. 5.1. Calibrated pinhole camera case Suppose the camera used to take the available picture is a pinhole camera. It projects the world point X into the image point x according to the formula:

$x = KR[I|(-\tilde{C})]X$

The 3×3 matrix K is the camera calibration matrix. If C is a pinhole camera, its calibration matrix is of the form:

$$k = \begin{bmatrix} \alpha_x & 0 & x_0 \\ & \alpha_y & y_0 \\ & & 1 \end{bmatrix}$$

where α_x α_y and represent the focal length of the camera in the x and y directions, respectively, and (x_0, y_0) is the principal point, all expressed in terms of pixel dimensions.

R is the 3×3 transform matrix from the world coordinate system to the camera coordinate system, in this case a rotation, defined by:

$$R = [\, e_1^{\mathrm{T}} \quad e_2^{\mathrm{T}} \quad e_3^{\mathrm{T}} \,]^{\mathrm{T}}$$

where (e_1, e_2, e_3) is the orthonormal basis of the Euclidean coordinate system associated with the camera.

Let (e'_1, e'_2, e'_3) be the orthonormal basis of the Euclidean coordinate system associated with the virtual symmetrical camera. By construction, $e'_j = \overline{e_j} = \bar{Z}e_j$. Because of the symmetry, this coordinate system's orientation is reversed compared to that of (e_1, e_2, e_3) (if one is right-handed, the other is left-handed).

The virtual camera projects the world point X into the image point x' according to:

$$x' = KR\bar{Z}[I| - \tilde{C}]X = K\bar{R}[I| - \tilde{C}]X$$

where:

$$\bar{R} = R\bar{Z} = [\, \overline{e_1}^{\mathrm{T}} \quad \overline{e_2}^{\mathrm{T}} \quad \overline{e_3}^{\mathrm{T}} \,]^{\mathrm{T}}$$

The image point of the same world point seen by the physical camera placed in $\tilde{C}$ and with principal axis direction $\overline{e_3}^{\mathrm{T}}$ is:

$$x'' = KR''[I| - \tilde{C}]X$$

where

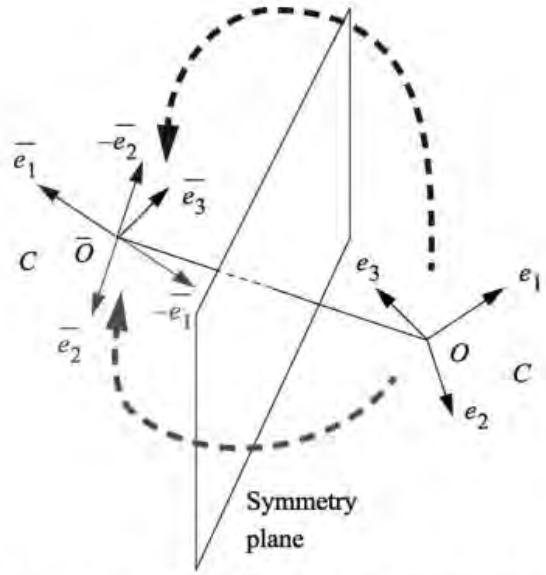
$$R'' = [\, e''_1\mathrm{T} \quad e''_2\mathrm{T} \quad \overline{e_3}^{\mathrm{T}} \,]^{\mathrm{T}}$$

and (e''_1, e''_2) is an orthonormal basis of the principal plane such that $(e''_1, e''_2, \overline{e_3})$ has the same orientation as (e_1, e_2, e_3) (both are either right or left-handed). Such a basis is obtained by applying a rotation of an arbitrary angle θ to the basis $(\overline{e_1}, \overline{e_2})$ in the plane it defines, and inverting the direction of one of the axes. The rotation of the coordinate system corresponds to a rotation of the physical camera around its optical axis.

Using the notation

$$\begin{bmatrix} a \\ b \\ c \end{bmatrix} = \bar{R}[I| - \tilde{C}]X$$

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	x'' can be written: $x'' = \begin{bmatrix} \alpha_x & 0 & x_0 \\ & \alpha_y & y_0 \\ & & 1 \end{bmatrix} \begin{bmatrix} -1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} a \\ b \\ c \end{bmatrix}$ Since we are looking to relate x'' and $x' = \begin{bmatrix} \alpha_x & 0 & x_0 \\ & \alpha_y & y_0 \\ & & 1 \end{bmatrix} \begin{bmatrix} a \\ b \\ c \end{bmatrix}$ the simplest analytic form naturally corresponds to no rotation, i.e. to the cases where the real camera coordinate system axes are aligned with that of the virtual (symmetric) ones, the direction of one of the axes being reversed to preserve the coordinate system's orientation. The two corresponding cases are shown in Fig. 2. For sake of clarity and simplicity, without loss of generality, we only consider an inversion of the x-axis. Under these conditions, x' and x'' differ only by their first component U' and U'', respectively, and thus only the image points abscissas differ: $u' = \frac{a}{c}\alpha_x + x_0, \qquad u'' = -\frac{a}{c}\alpha_x + x_0$ It follows that if the camera is calibrated, then the symmetric view of the virtual stereo pair can be obtained by simply performing a horizontal mirror of the original image with respect to a vertical axis going through the principal point.

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	 Fig. 2. How to relate the virtual view and the real camera's view from the virtual viewpoint. " *See Mirror symmetry -> 2-view stereo geometry* (2003) at 139-140. "5.2. Stealth fighter model Our first example is a toy F-117 Stealth fighter. The input image and synthesized symmetric view are presented in Fig. 3a with their epipolar pencils. The internal parameters of the digital camera used were determined using Photo-modeler's calibration tool. After specifying a minimum number of point correspondences between the two images, the software was able to perform a full calibration of both camera positions and to infer the 3D position of the object points. Adding more point and line correspondences allowed to obtain a 3D wireframe model of the object presented in Fig. 3b. Note that the recovered object is mirror symmetric, and that the recovered cameras are actually symmetrical in location and orientation with respect to the object's symmetry plane, properties that are not used at any point in Photomodeler's reconstruction algorithms (the symmetry property is only used to

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	synthesize the symmetric view). Once the 3D inference is performed, the 3D surface model shown in Fig. 3c is built and the texture can be extracted from the images. The final 3D model with texture map is shown in Fig. 3d. The construction of this 3D textured model took only a few minutes to a novice Photomodeler user. Incorporating symmetry derived constraints in the workflow and in the interface would greatly facilitate the process and reduce the time needed to build a model, while also helping in improving the accuracy of the manual input and helping deal with self occlusions across the symmetry plane.” *See Mirror symmetry -> 2-view stereo geometry* (2003) at 142-143. “5.3. Face model The technique clearly applies beautifully to perfectly symmetric objects. We also wanted to try the more challenging problem posed by (quasi-)human faces. We used a bust of Darth Maul, which is fairly symmetric. The input and synthetic symmetric views are presented in Fig. 4a. The wireframe model and camera positions and orientations as recovered by Photomodeler are presented in Fig. 4b. Finally, the resulting textured model is shown in Fig. 4c. The polygonal model, although coarse, captures the geometry of the face fairly well, so that the resulting textured model is easily recognized as a face under various viewpoints.” *See Mirror symmetry -> 2-view stereo geometry* (2003) at 143. *See Mirror symmetry -> 2-view stereo geometry* (2003) at Fig. 4(a):  (a) Input image (left) of a Darth Maul bust and inverted image (right), used as a stereo pair

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	"This document highlights and addresses architecture level software development issues facing researchers and practitioners in the field of Computer Vision. A new framework, or architectural style, called SAI, is introduced. It provides a formalism for the design, implementation and analysis of software systems that perform distributed parallel processing of generic data streams. Architectural patterns are illustrated with a number of demonstration projects ranging from single stream automatic real-time video processing to fully integrated distributed interactive systems mixing live video, graphics and sound. SAI is supported by an open source architectural middleware called MFSM." *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 1 (Abstract). "4.3 Handheld mirror simulation The Virtual Mirror project [16, 15] started as a feasibility study for the development and construction of a handheld mirror simulation device. The perception of the world reflected through a mirror depends on the viewer's position with respect to the mirror and the 3-D geometry of the world. In order to simulate a real mirror on a computer screen, images of the observed world, consistent with the viewer's position, must be synthesized and displayed in real-time. This is of course geometrically impossible, but with a few simplifying assumptions (e.g. planar world), the image transform required was made simple yet convincing enough to consider building an actual device. The current prototype system (see Figure 12) is comprised of an LCD screen manipulated by the user, a single camera fixed on the screen, and a tracking device. The continuous input video stream and tracker data is used to synthesize, in real-time, a continuous video stream displayed on the LCD screen. The synthesized video stream is a close approximation of what the user would see on the screen surface if it were a real mirror. Figure 13 shows the corresponding conceptual application graph. The single stream application does not involve any complicated structure. The stream originates in a live video input cell. A tracker input cell adds position and orientation data to the stream. A mirror transform cell uses the synchronous image and tracking data to synthesize the mirror simulation image, which is then presented to the user by an image display cell. The two major difficulties in this application are (1) synchronizing the various input streams (video and tracking data) to compute a

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	consistent result; and (2) displaying the result with a low enough latency and a high enough throughput to produce a convincing simulation. The use of pulses in the SAI model makes synchronization a natural operation, involving no superfluous delays or computations. The asynchronous parallel processing model allow high frame rates and low latency. The essential purpose of this system is interaction. Interaction can be seen as a particular data stream loop feeding the user with a perceptual representation of the internal model (experience), collecting the users reaction through various sensory devices and modifying the state of the internal model accordingly (influence). From the systems point of view, these data streams are volatile, and the processes involved in producing and processing them are of the same nature as those carrying procedural internal evolution tasks. Here, the internal model is the mirror, implicit in the computations carried by the mirror transform cell. The user experiences the system through the image displayed on the handheld screen, and influences it by moving her head or the screen. Note that the way live video (frames) and corresponding tracker data are synchronized in the application as described in the conceptual graph is based on the assumption that the delay between the frame capture in the live input cell (push mechanism acting as pulse trigger), and the capture of tracker data in the tracker input cell (pull mechanism), is small enough that no inconsistency can be perceived. This approach happens to work in this case, even when the system is running on a modest platform, but certainly does not generalize to synchronization in more sophisticated settings. This illustrates the flexibility of the SAI style, that allows to devise general structures, as well as simplified or ad hoc design when allowed by the application. This project also illustrates the power of SAI for system integration. The modularity of the model ensures that components developed independently (but consistently with style rules) will function together seamlessly. This allows code re-use (e.g. the image node, and the live video capture and image display cells already existed), and distributed development and testing of new node and cell types. The whole project was completed in only a few months with very limited resources. The mirror simulation system can be used as a research platform. For example, it is a testbed for developing and testing video analysis techniques that could be used to replace the magnetic trackers, including face detection and tracking, and gaze tracking. The device itself constitutes a new generic interface for applications involving rich, first-person interaction. A straightforward application is the Daguerr´eotype simulation described in [22]. Beyond technical and commercial applications

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	of such a device, the use of video analysis and graphics techniques will allow artists to explore and interfere with what has always been a private, solitary act, a person looking into a mirror.” *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 13-15. *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at Figs. 12 and 13:

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Figure 12: The handheld mirror simulation system ("Virtual Mirror").

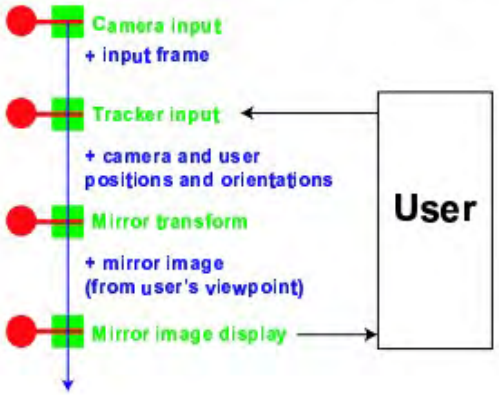
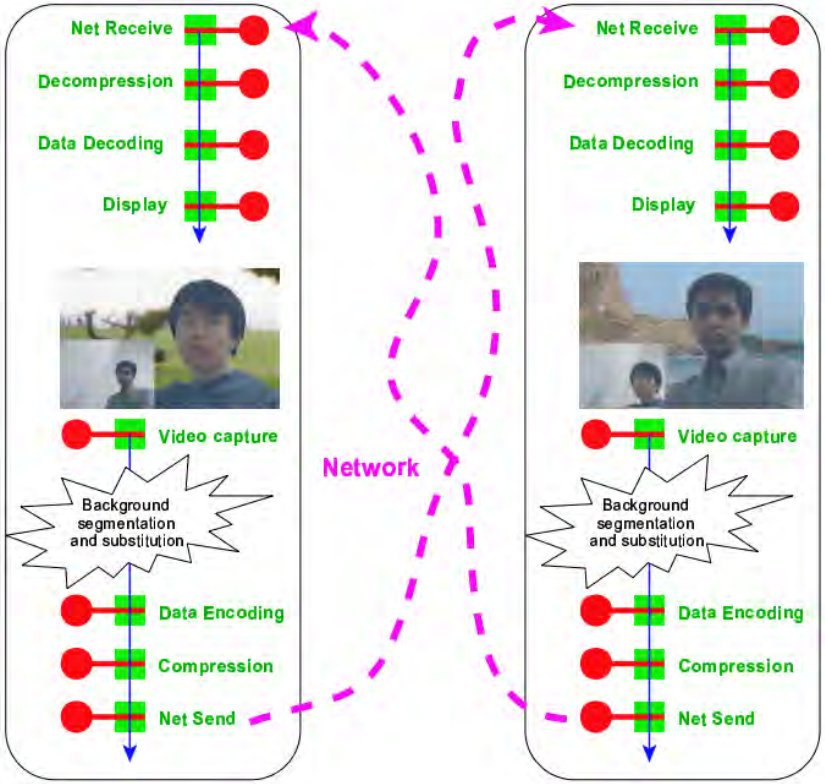


Figure 13: The Virtual Mirror application graph.

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois II
	“4.5 Live video in animated 3-D graphics The example presented in this section is a real-time, interactive application requiring manipulation of het1erogenous data streams [14]. A video stream (captured live or read from a file) is used as surface texture on an animated 3-D model, rendered in real-time. The (virtual) camera used for rendering can be manipulated n real-time (e.g. with a gamepad or through a head tracking device), making the system interactive. This system was developed to illustrate the design of a scene graph-based graphics toolkit, and the advantages provided by the SAI style for manipulating independently and synchronizing different data streams in a complex interactive (possibly immersive) setting. From a Computer Vision point of view, this example illustrates how the SAI style allows to manipulate video streams and geometric models in a consistent framework. The same architectural patterns generalize to manipulating generic data streams and persistent models. Figure 16 shows the system’s conceptual graph. The graph is composed of four functional subgraphs, corresponding to four independent streams, organized around a central source that holds the 3-D model representation in the form of a scene graph, and various process parameters for the different connected cells. The rendering stream generates images of the model. The control stream updates the (virtual) camera position based on user input. Together, the rendering and control units (including the shared source) form an interaction loop with the user. The animation stream drives the dynamic evolution of the 3-D model. The texturing stream places images captured from a video source (camera or file) in the texture node in the scene graph. Interaction and modeling are now analyzed in more detail.” *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 16-17. *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at Fig. 15:

Asserted Claim of the '110 Patent	Exemplary Citations to Francois II
	 Figure 15: Conceptual graph for an early version of the IMSC Communicator, with support for video (synchronized image and sound). This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois II alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants'

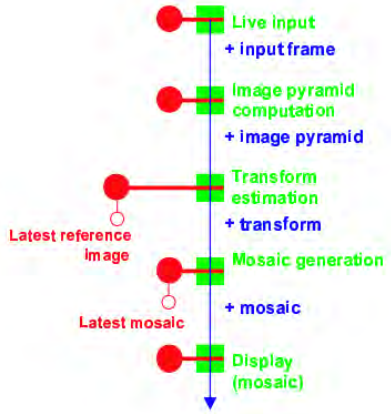
Asserted Claim of the ’110 Patent	Exemplary Citations to Francois II
	Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

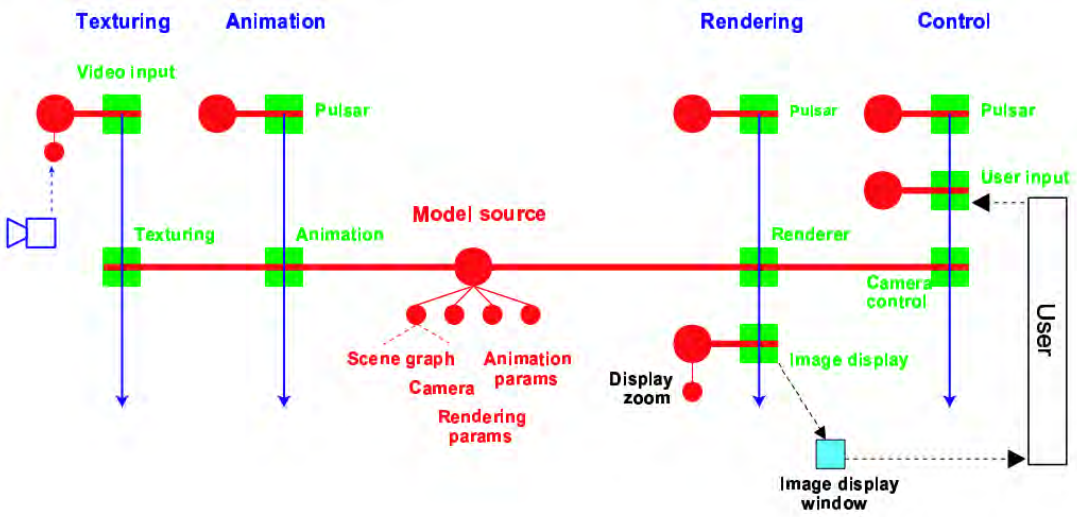
Asserted Claim of the ’110 Patent	Exemplary Citations to Francois II
Claim 10	
10. The method of claim 1, further comprising operating the processor to augment the modified images by overlaying virtual objects on a user's image appearing within the modified images.	Francois II expressly and/or inherently discloses and/or renders obvious operating the processor to augment the modified images by overlaying virtual objects on a user's image appearing within the modified images. *See*, *e.g.*, disclosures below. “4.1 Real-time video segmentation and tracking The development of real-time video analysis applications was actually a steering concern during the development of the SAI style. The system presented here was used as a testbed for the implementation, testing and refinement of some SAI concepts [18]. The video analysis tasks performed are low level segmentation and blob tracking. The segmentation is performed by change detection using an adaptive statistical color background model (the camera is assumed stationary). A review of background maintenance algorithms can be found in [28]. Blob tracking is performed using a new multiresolution algorithm whose description is out of the scope of this document. Figure 7 shows the conceptual level architecture of the software system. It is build around a single stream going through a number of cells. The graph can be decomposed into four functional subgraphs: capture, segmentation, tracking, visualization. The stream originates in the video input cell, which produces, at a given rate, pulses containing an image coming either from a live capture device or a video file. This cell and its source constitute the capture unit of the application. The stream then goes through the segmentation unit, which is analyzed below. Coming out of the segmentation, the stream goes through a tracking cell. The result visualization unit is composed of a rendering and a display subunits. Rendering of a persistent structure (here, the tracking graph) will be illustrated in a more general context in another example below (“Live Video in Animated 3-D Graphics”). The display cell simply puts on the screen its

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	input images, in this case the composite frames produced by the renderer. A very interesting aspect of this system, and certainly the most innovative when it was introduced, is the asynchronous parallel implementation of the segmentation algorithm, which contains a feed-back loop. The corresponding conceptual graph is also a flow graph of the algorithm. Each input frame is compared with a statistical background model. For each pixel, a decision is made whether it is an observation of the background or of an occluding element. The output is a foreground binary mask. This comparison is performed by the background comparison cell. Each pulse, after going through this cell, contains the input image and a binary foreground image, which is used by the connected components cell to produce a labeled components image, added to the pulse. The input image and the labeled components image are used by the background update cell to update the distributions in the background model. Since the comparison and the update cells both use the persistent background model, they are both connected to a common source that holds the background model structure. This path forms a feed back loop in which the result of the processing of each frame is used to update the adaptive background model. Because of the asynchrony of the processing, by the time the background model is updated with the result of the processing of a given frame, many other frames might have been compared to the model. In this particular context, the quality of the result is not affected–in fact, it is common practice in background model maintenance to perform only partial updates at each frame, in order to reduce computational load–and the overall system throughput permitted by this design is always significantly larger than that achievable in a sequential design." *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 10-11. "4.2 Real-time video painting The Video Painting project was developed as a demonstration of the real-time video stream processing ability provided by the SAI architectural style. It also provided valuable insight on the design and implementation of algorithms performing incremental processing along the time dimension, i.e. between different samples in a same stream. The technical core of the application is a feature-based, multi-resolution scheme to estimate frame to frame projective or affine transforms [21]. These transforms are used to warp the frames to a common space to form a mosaic. The mosaic image itself is a persistent structure that

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	evolves as more images are processed, hence the name "video painting." In a traditional sequential system, the transform between each pair of consecutive frames would be computed, and each frame would be added to the mosaic by combination of all the transforms between a reference frame and the current frame. Figure 10 shows the application graph for the SAI design. A live input unit creates the single stream, with frames captured from a camera. A simple cell computes the image pyramid associated with each input frame, and necessary for the multi-resolution frame-to-frame transform estimation performed by the next downstream cell. Comparing two samples of the same stream requires to make one persistent, which becomes the reference. Transforms are thus computed between the current frame and a reference frame. For the algorithm to work properly, though, the compared frames cannot be too far apart. The reference frame must therefore be updated constantly. Because of the asynchrony of the processing, the reference frame is not necessarily the frame "right before" the current frame in the stream. The simplistic handling of frames relationships in the sequential model is no longer sufficient. Accurate time stamps allow a more general approach to the problem. The transforms computed between two frames are no longer implicitly assumed to relate two consecutive frames, separated from a fixed time interval, but between two frames of arbitrary time stamps. For efficiency reasons, the mosaic is also computed incrementally. A persistent image containing the latest available version of the mosaic is maintained. Each new frame is warped and pasted on a copy of the mosaic by computing the accumulated transform from the frame to the mosaic reference frame. To that effect, with the mosaic is also stored the accumulated transform from the time stamp of the reference mosaic frame to the time stamp of the latest frame added, which is the time stamp for the mosaic. When a new frame is processed, the transform from the mosaic time stamp to the frame is computed by linear interpolation using the transform computed between the frame and the reference frame. This is possible only because time is an explicit component of the model. The transform is then composed with the accumulated transform to produce a new accumulated transform, used to warp the current frame to mosaic space. After pasting of the warped frame, the updated mosaic image is copied into the persistent mosaic image to become the latest reference. The accumulated transform is also updated. Note that a locking mechanism (e.g. critical section) is necessary to ensure consistency between the persistent mosaic and the accumulated

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	transform as they are accessed by different threads. In this design, the updated mosaic is also added to the active pulse so that the dynamic stream of successive mosaics can be viewed with an image display cell. Figure 11 shows two example mosaics painted in real-time from a live video stream. The horizontal black lines are image warping artifacts. This application is an example where system latency and throughput directly impact the quality of the results. The transform estimation process degrades with the dissimilarity between the frames. A lower latency allows faster reference turnaround and thus smaller frame to frame dissimilarity. Higher throughput allows to build a finer mosaic. Embedding established algorithms into a more general parallel processing framework allows to achieve high quality output in real-time. Furthermore, explicit handling of time relationships in the design might give some insight on real-time implementations of more complex mosaic building techniques, e.g. involving global constraints to correct for registration error accumulation." *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 12-13. *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at Fig. 10:

Asserted Claim of the '110 Patent	Exemplary Citations to Francois II
	 Figure 10: Conceptual graph for "video painting" application (real-time mosaicking). "4.5 Live video in animated 3-D graphics The example presented in this section is a real-time, interactive application requiring manipulation of heterogenous data streams [14]. A video stream (captured live or read from a file) is used as surface texture on an animated 3-D model, rendered in real-time. The (virtual) camera used for rendering can be manipulated n real-time (e.g. with a gamepad or through a head tracking device), making the system interactive. This system was developed to illustrate the design of a scene graph-based graphics toolkit, and the advantages provided by the SAI style for manipulating independently and synchronizing different data streams in a complex interactive (possibly immersive) setting. From a Computer Vision point of view, this example illustrates how the SAI style allows to manipulate video streams and geometric models in a consistent framework. The same architectural patterns generalize to manipulating generic data streams and persistent models. Figure 16 shows the system's conceptual graph. The graph is composed of four functional subgraphs, corresponding to four independent streams, organized around a central source that holds the 3-D model representation in the form of a scene graph, and various process parameters for the different

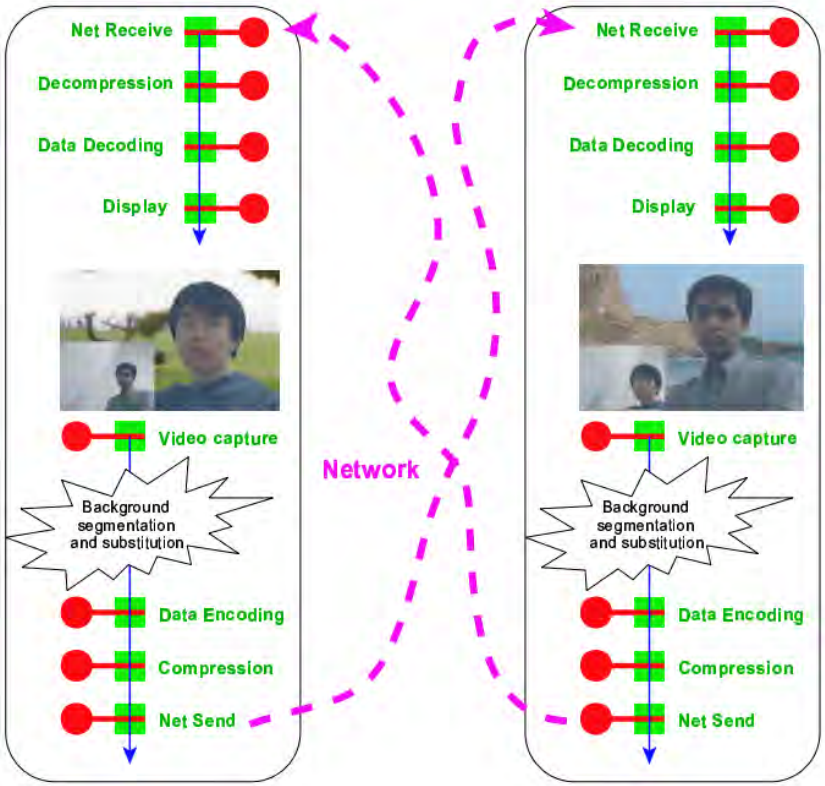
Asserted Claim of the '110 Patent	Exemplary Citations to Francois II
	connected cells. The rendering stream generates images of the model. The control stream updates the (virtual) camera position based on user input. Together, the rendering and control units (including the shared source) form an interaction loop with the user. The animation stream drives the dynamic evolution of the 3-D model. The texturing stream places images captured from a video source (camera or file) in the texture node in the scene graph. Interaction and modeling are now analyzed in more detail." *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 16-17. *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at Fig. 16:  Figure 16: Conceptual graph for integrating real-time rendering of an animated 3-D model with live video mapping and interactive camera control. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois II alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois II
	teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois II
Claim 11	
11. The method of claim 1, further comprising operating the processor to transmit the modified image over a network.	Francois II expressly and/or inherently discloses and/or renders obvious operating the processor to transmit the modified image over a network. *See*, *e.g.*, disclosures below. “4.4 IMSC Communicator The IMSC Communicator is an experimental extensible platform for remote collaborative data sharing. The system presented here is an early embodiment of a general research platform for remote interaction. From a Computer Vision point of view, the architectural patterns highlighted here directly apply to the design of distributed processing of multiple video streams. Popular architectures for communication applications include Client/Server and Peer To Peer. Different elements of the overall system are considered separate applications. Although these models can either be encapsulated or implemented in the SAI style, a communication application designed in the SAI style can also be considered as a single distributed application graph, in which some cell to cell connections are replaced with network links. From this point of view, specific network architectures would be implemented in the SAI style, as part of the overall distributed application. The core pattern of the Communicator is a sequence of cells introducing network communication between two independent subgraphs. Figure 14 shows an example sequence comprising encoding, compression and networking (send) on the emitting side, networking (receive), decompression and decoding on the receiving side. The encoding cell flattens a node structure into a linear buffer so that the structure can later be regenerated. This encoding can be specific of various data types, as is the case for the example described here. A general encoding scheme could for example be based on XML. The output of an encoding cell is a character string (binary or text). The compression cell takes as input the encoded character string, and produces a compressed

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois II
	buffer. The compression scheme used can be input data dependent, or generic, in which case it should be lossless. For the first experiments, a simple compression cell, and matching decompression cell, were developed, that encapsulate the open source LZO library [25] for real-time lossless compression/decompression. Note that the compression step is optional. The networking cells are responsible for packetizing and sending incoming character strings on one side, and receiving the packets and restoring the string on the other side. Different modalities and protocols can be implemented and tested. The first networking cells were implemented using Windows Sockets, using either TCP/IP or UDP. The decompression cell regenerates the original character string from the compressed buffer. The decoding cell regenerates the node structure into a pulse, from the encoded character string. Once a generic platform is available for developing and testing data transfer modalities, support for various specific data types can be added. The very first test system supported video only, using existing live video capture and image display cells. For the next demonstration, a new live capture cell for both image and sound was developed using Microsoft DirectShow [24]. Another new cell was developed for synchronized rendering of sound and video, also using DirectShow. Figure 15 shows the conceptual graph for an early embodiment of the 2-way communicator, with example screen shots. A background replacement unit, based on the segmentation by change detection presented above in section 4.1, was added to the capture side to illustrate how the modularity of the architecture allows to “plug-and-play” subgraphs developed independently. Having different processing of video and sound also demonstrates the advantages of adopting an asynchronous model, and of performing synchronization only when necessary, in this case in the display cell.” *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 15-16. “4.5 Live video in animated 3-D graphics The example presented in this section is a real-time, interactive application requiring manipulation of het1erogenous data streams [14]. A video stream (captured live or read from a file) is used as surface texture on an animated 3-D model, rendered in real-time. The (virtual) camera used for rendering can be manipulated n real-time (e.g. with a gamepad or through a head tracking device), making the system interactive. This system was developed to illustrate the design of a scene graph-based graphics toolkit, and the advantages provided by the SAI

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois II
	style for manipulating independently and synchronizing different data streams in a complex interactive (possibly immersive) setting. From a Computer Vision point of view, this example illustrates how the SAI style allows to manipulate video streams and geometric models in a consistent framework. The same architectural patterns generalize to manipulating generic data streams and persistent models. Figure 16 shows the system’s conceptual graph. The graph is composed of four functional subgraphs, corresponding to four independent streams, organized around a central source that holds the 3-D model representation in the form of a scene graph, and various process parameters for the different connected cells. The rendering stream generates images of the model. The control stream updates the (virtual) camera position based on user input. Together, the rendering and control units (including the shared source) form an interaction loop with the user. The animation stream drives the dynamic evolution of the 3-D model. The texturing stream places images captured from a video source (camera or file) in the texture node in the scene graph. Interaction and modeling are now analyzed in more detail.” *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 16-17. *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at Fig. 15:

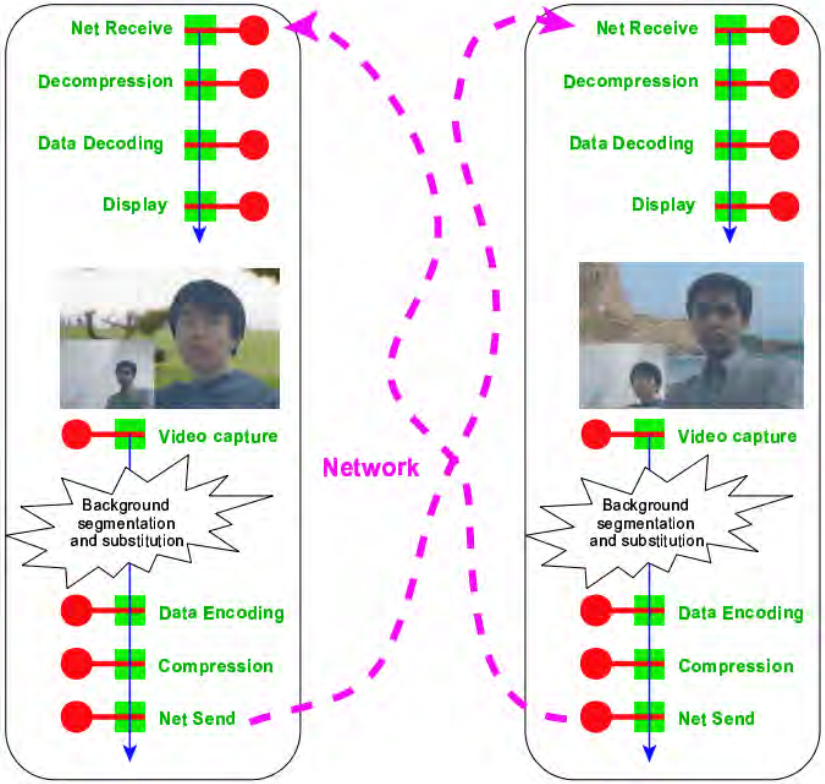
Asserted Claim of the '110 Patent	Exemplary Citations to Francois II
	 Figure 15: Conceptual graph for an early version of the IMSC Communicator, with support for video (synchronized image and sound). This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois II alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants'

Asserted Claim of the '110 Patent	Exemplary Citations to Francois II
	Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '110 Patent	Exemplary Citations to Francois II
Claim 12	
12. The method of claim 1, further comprising displaying the modified image on a remote screen for video telepresence.	Francois II expressly and/or inherently discloses and/or renders obvious displaying the modified image on a remote screen for video telepresence. *See*, *e.g.*, disclosures below. "4.4 IMSC Communicator The IMSC Communicator is an experimental extensible platform for remote collaborative data sharing. The system presented here is an early embodiment of a general research platform for remote interaction. From a Computer Vision point of view, the architectural patterns highlighted here directly apply to the design of distributed processing of multiple video streams. Popular architectures for communication applications include Client/Server and Peer To Peer. Different elements of the overall system are considered separate applications. Although these models can either be encapsulated or implemented in the SAI style, a communication application designed in the SAI style can also be considered as a single distributed application graph, in which some cell to cell connections are replaced with network links. From this point of view, specific network architectures would be implemented in the SAI style, as part of the overall distributed application. The core pattern of the Communicator is a sequence of cells introducing network communication between two independent subgraphs. Figure 14 shows an example sequence comprising encoding, compression and networking (send) on the emitting side, networking (receive), decompression and decoding on the receiving side. The encoding cell flattens a node structure into a linear buffer so that the structure can later be regenerated. This encoding can be specific of various data types, as is the case for the example described here. A general encoding scheme could for example be based on XML. The output of an encoding cell is a character string (binary or text). The compression cell takes as input the encoded character string, and produces a compressed buffer. The compression scheme used can be input data dependent, or generic, in which case it

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois II
	should be lossless. For the first experiments, a simple compression cell, and matching decompression cell, were developed, that encapsulate the open source LZO library [25] for real-time lossless compression/decompression. Note that the compression step is optional. The networking cells are responsible for packetizing and sending incoming character strings on one side, and receiving the packets and restoring the string on the other side. Different modalities and protocols can be implemented and tested. The first networking cells were implemented using Windows Sockets, using either TCP/IP or UDP. The decompression cell regenerates the original character string from the compressed buffer. The decoding cell regenerates the node structure into a pulse, from the encoded character string. Once a generic platform is available for developing and testing data transfer modalities, support for various specific data types can be added. The very first test system supported video only, using existing live video capture and image display cells. For the next demonstration, a new live capture cell for both image and sound was developed using Microsoft DirectShow [24]. Another new cell was developed for synchronized rendering of sound and video, also using DirectShow. Figure 15 shows the conceptual graph for an early embodiment of the 2-way communicator, with example screen shots. A background replacement unit, based on the segmentation by change detection presented above in section 4.1, was added to the capture side to illustrate how the modularity of the architecture allows to “plug-and-play” subgraphs developed independently. Having different processing of video and sound also demonstrates the advantages of adopting an asynchronous model, and of performing synchronization only when necessary, in this case in the display cell.” *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 15-16. “4.5 Live video in animated 3-D graphics The example presented in this section is a real-time, interactive application requiring manipulation of het1erogenous data streams [14]. A video stream (captured live or read from a file) is used as surface texture on an animated 3-D model, rendered in real-time. The (virtual) camera used for rendering can be manipulated n real-time (e.g. with a gamepad or through a head tracking device), making the system interactive. This system was developed to illustrate the design of a scene graph-based graphics toolkit, and the advantages provided by the SAI style for manipulating independently and synchronizing different data streams in a complex

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois II
	interactive (possibly immersive) setting. From a Computer Vision point of view, this example illustrates how the SAI style allows to manipulate video streams and geometric models in a consistent framework. The same architectural patterns generalize to manipulating generic data streams and persistent models. Figure 16 shows the system’s conceptual graph. The graph is composed of four functional subgraphs, corresponding to four independent streams, organized around a central source that holds the 3-D model representation in the form of a scene graph, and various process parameters for the different connected cells. The rendering stream generates images of the model. The control stream updates the (virtual) camera position based on user input. Together, the rendering and control units (including the shared source) form an interaction loop with the user. The animation stream drives the dynamic evolution of the 3-D model. The texturing stream places images captured from a video source (camera or file) in the texture node in the scene graph. Interaction and modeling are now analyzed in more detail.” *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 16-17. *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at Fig. 15:

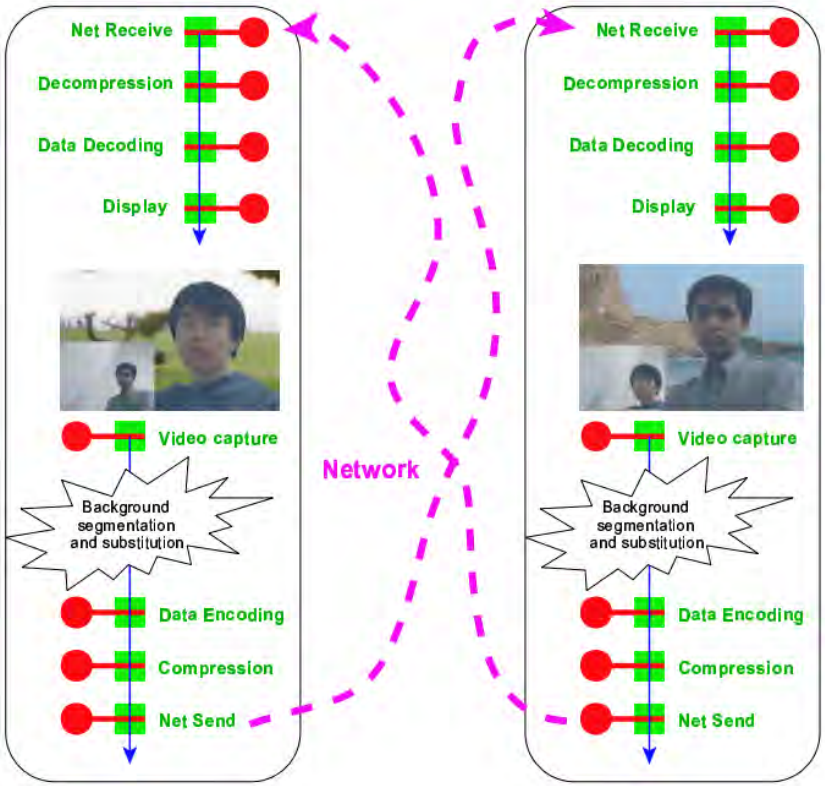
Asserted Claim of the '110 Patent	Exemplary Citations to Francois II
	 Figure 15: Conceptual graph for an early version of the IMSC Communicator, with support for video (synchronized image and sound). This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois II alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants'

Asserted Claim of the '110 Patent	Exemplary Citations to Francois II
	Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '110 Patent	Exemplary Citations to Francois II
Claim 16	
16. The method of claim 1, wherein the processor operates on the images from the camera to generate background segmentation, and replaces segments on the images by replacement segments.	Francois II expressly and/or inherently discloses and/or renders obvious wherein the processor operates on the images from the camera to generate background segmentation, and replaces segments on the images by replacement segments. *See*, *e.g.*, disclosures below. "4.1 Real-time video segmentation and tracking The development of real-time video analysis applications was actually a steering concern during the development of the SAI style. The system presented here was used as a testbed for the implementation, testing and refinement of some SAI concepts [18]. The video analysis tasks performed are low level segmentation and blob tracking. The segmentation is performed by change detection using an adaptive statistical color background model (the camera is assumed stationary). A review of background maintenance algorithms can be found in [28]. Blob tracking is performed using a new multiresolution algorithm whose description is out of the scope of this document. Figure 7 shows the conceptual level architecture of the software system. It is build around a single stream going through a number of cells. The graph can be decomposed into four functional subgraphs: capture, segmentation, tracking, visualization. The stream originates in the video input cell, which produces, at a given rate, pulses containing an image coming either from a live capture device or a video file. This cell and its source constitute the capture unit of the application. The stream then goes through the segmentation unit, which is analyzed below. Coming out of the segmentation, the stream goes through a tracking cell. The result visualization unit is composed of a rendering and a display subunits. Rendering of a persistent structure (here, the tracking graph) will be illustrated in a more general context in another example below ("Live Video in Animated 3-D Graphics"). The display cell simply puts on the screen its input images, in this case the composite frames produced by the renderer.

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois II
	A very interesting aspect of this system, and certainly the most innovative when it was introduced, is the asynchronous parallel implementation of the segmentation algorithm, which contains a feed-back loop. The corresponding conceptual graph is also a flow graph of the algorithm. Each input frame is compared with a statistical background model. For each pixel, a decision is made whether it is an observation of the background or of an occluding element. The output is a foreground binary mask. This comparison is performed by the background comparison cell. Each pulse, after going through this cell, contains the input image and a binary foreground image, which is used by the connected components cell to produce a labeled components image, added to the pulse. The input image and the labeled components image are used by the background update cell to update the distributions in the background model. Since the comparison and the update cells both use the persistent background model, they are both connected to a common source that holds the background model structure. This path forms a feed back loop in which the result of the processing of each frame is used to update the adaptive background model. Because of the asynchrony of the processing, by the time the background model is updated with the result of the processing of a given frame, many other frames might have been compared to the model. In this particular context, the quality of the result is not affected–in fact, it is common practice in background model maintenance to perform only partial updates at each frame, in order to reduce computational load–and the overall system throughput permitted by this design is always significantly larger than that achievable in a sequential design.” *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 10-11. “4.5 Live video in animated 3-D graphics The example presented in this section is a real-time, interactive application requiring manipulation of het1erogenous data streams [14]. A video stream (captured live or read from a file) is used as surface texture on an animated 3-D model, rendered in real-time. The (virtual) camera used for rendering can be manipulated n real-time (e.g. with a gamepad or through a head tracking device), making the system interactive. This system was developed to illustrate the design of a scene graph-based graphics toolkit, and the advantages provided by the SAI style for manipulating independently and synchronizing different data streams in a complex interactive (possibly immersive) setting. From a Computer Vision point of view, this example

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois II
	illustrates how the SAI style allows to manipulate video streams and geometric models in a consistent framework. The same architectural patterns generalize to manipulating generic data streams and persistent models. Figure 16 shows the system’s conceptual graph. The graph is composed of four functional subgraphs, corresponding to four independent streams, organized around a central source that holds the 3-D model representation in the form of a scene graph, and various process parameters for the different connected cells. The rendering stream generates images of the model. The control stream updates the (virtual) camera position based on user input. Together, the rendering and control units (including the shared source) form an interaction loop with the user. The animation stream drives the dynamic evolution of the 3-D model. The texturing stream places images captured from a video source (camera or file) in the texture node in the scene graph. Interaction and modeling are now analyzed in more detail.” *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 16-17. *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at Fig. 15:

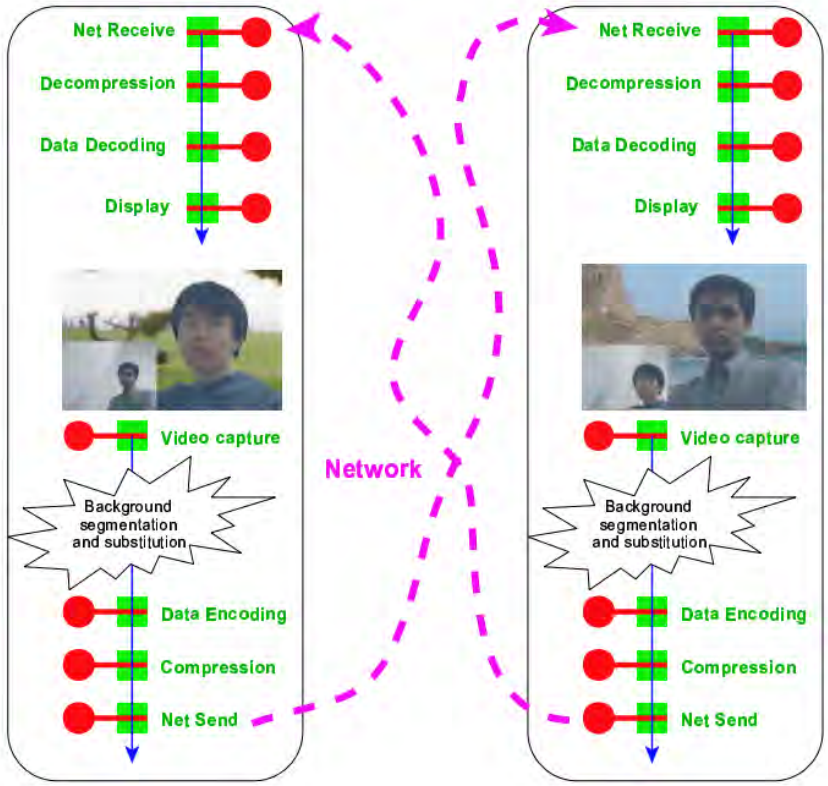
Asserted Claim of the '110 Patent	Exemplary Citations to Francois II
	 Figure 15: Conceptual graph for an early version of the IMSC Communicator, with support for video (synchronized image and sound). This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois II alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants'

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois II
	Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois II
Claim 17	
17. The method of claim 16, wherein the replacement segments comprise virtual background or background that was captured in a different setting.	Francois II expressly and/or inherently discloses and/or renders obvious wherein the replacement segments comprise virtual background or background that was captured in a different setting. *See*, *e.g.*, disclosures below. “4.1 Real-time video segmentation and tracking The development of real-time video analysis applications was actually a steering concern during the development of the SAI style. The system presented here was used as a testbed for the implementation, testing and refinement of some SAI concepts [18]. The video analysis tasks performed are low level segmentation and blob tracking. The segmentation is performed by change detection using an adaptive statistical color background model (the camera is assumed stationary). A review of background maintenance algorithms can be found in [28]. Blob tracking is performed using a new multiresolution algorithm whose description is out of the scope of this document. Figure 7 shows the conceptual level architecture of the software system. It is build around a single stream going through a number of cells. The graph can be decomposed into four functional subgraphs: capture, segmentation, tracking, visualization. The stream originates in the video input cell, which produces, at a given rate, pulses containing an image coming either from a live capture device or a video file. This cell and its source constitute the capture unit of the application. The stream then goes through the segmentation unit, which is analyzed below. Coming out of the segmentation, the stream goes through a tracking cell. The result visualization unit is composed of a rendering and a display subunits. Rendering of a persistent structure (here, the tracking graph) will be illustrated in a more general context in another example below (“Live Video in Animated 3-D Graphics”). The display cell simply puts on the screen its input images, in this case the composite frames produced by the renderer. A

Asserted Claim of the '110 Patent	Exemplary Citations to Francois II
	very interesting aspect of this system, and certainly the most innovative when it was introduced, is the asynchronous parallel implementation of the segmentation algorithm, which contains a feed-back loop. The corresponding conceptual graph is also a flow graph of the algorithm. Each input frame is compared with a statistical background model. For each pixel, a decision is made whether it is an observation of the background or of an occluding element. The output is a foreground binary mask. This comparison is performed by the background comparison cell. Each pulse, after going through this cell, contains the input image and a binary foreground image, which is used by the connected components cell to produce a labeled components image, added to the pulse. The input image and the labeled components image are used by the background update cell to update the distributions in the background model. Since the comparison and the update cells both use the persistent background model, they are both connected to a common source that holds the background model structure. This path forms a feed back loop in which the result of the processing of each frame is used to update the adaptive background model. Because of the asynchrony of the processing, by the time the background model is updated with the result of the processing of a given frame, many other frames might have been compared to the model. In this particular context, the quality of the result is not affected–in fact, it is common practice in background model maintenance to perform only partial updates at each frame, in order to reduce computational load–and the overall system throughput permitted by this design is always significantly larger than that achievable in a sequential design." *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 10-11. "4.5 Live video in animated 3-D graphics The example presented in this section is a real-time, interactive application requiring manipulation of het1erogenous data streams [14]. A video stream (captured live or read from a file) is used as surface texture on an animated 3-D model, rendered in real-time. The (virtual) camera used for rendering can be manipulated n real-time (e.g. with a gamepad or through a head tracking device), making the system interactive. This system was developed to illustrate the design of a scene graph-based graphics toolkit, and the advantages provided by the SAI style for manipulating independently and synchronizing different data streams in a complex interactive (possibly immersive) setting. From a Computer Vision point of view, this example

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois II
	illustrates how the SAI style allows to manipulate video streams and geometric models in a consistent framework. The same architectural patterns generalize to manipulating generic data streams and persistent models. Figure 16 shows the system’s conceptual graph. The graph is composed of four functional subgraphs, corresponding to four independent streams, organized around a central source that holds the 3-D model representation in the form of a scene graph, and various process parameters for the different connected cells. The rendering stream generates images of the model. The control stream updates the (virtual) camera position based on user input. Together, the rendering and control units (including the shared source) form an interaction loop with the user. The animation stream drives the dynamic evolution of the 3-D model. The texturing stream places images captured from a video source (camera or file) in the texture node in the scene graph. Interaction and modeling are now analyzed in more detail.” *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at 16-17. *See Software Architecture for Computer Vision: Beyond Pipes and Filters* (2003) at Fig. 15:

Asserted Claim of the '110 Patent	Exemplary Citations to Francois II
	 Figure 15: Conceptual graph for an early version of the IMSC Communicator, with support for video (synchronized image and sound). This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois II alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants'

Asserted Claim of the ’110 Patent	Exemplary Citations to Francois II
	Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

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Exhibit B-04: Invalidity of U.S. Patent No. 8,982,110 in view of U.S. Patent Pub. No. 2011/0298910 ("Haan")

This chart is subject to all reservations, objections, and disclaimers in Defendants' Invalidity Contentions and any amendment, supplement, or modification thereof, which are incorporated herein by reference in their entirety.

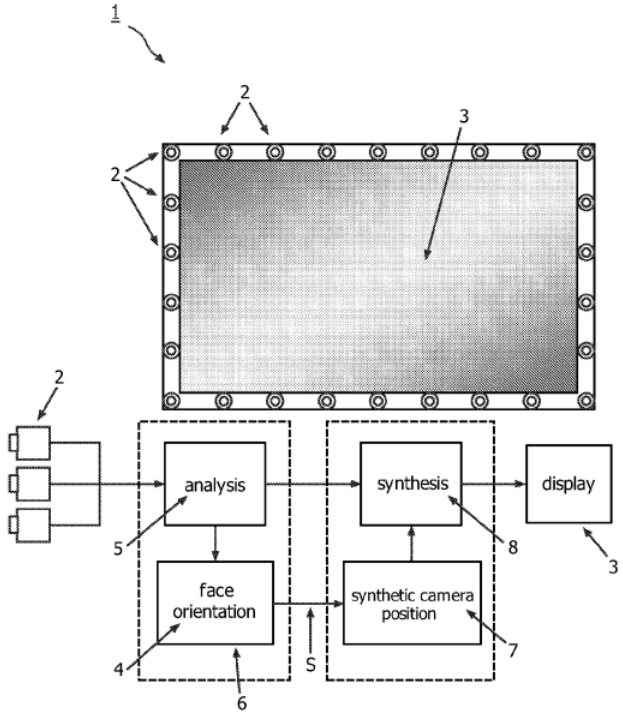
Haan was originally filed February 15, 2010 and was published December 8, 2011, and thus is available as prior art to U.S. Patent No. 8,982,110 (the "'110 Patent") under at least 35 U.S.C. §§ 102(a), (b) and (e).

Haan anticipates the Asserted Claims of the '110 Patent. To the extent it is found Haan does not expressly disclose certain limitations in the asserted claim, such limitations are at least implicitly or inherently disclosed. Moreover, to the extent it is found that Haan does not anticipate the asserted claim, Haan renders obvious the asserted claim, either alone or in combination with other prior art identified in the cover pleading or herein, and/or in combination with the general knowledge of a person having ordinary skill in the art.

In these contentions, Defendants have relied in part on Plaintiff's Infringement Contentions. In those contentions, Plaintiff appears to pursue overly broad claim constructions in an effort to assert infringement where none exists, and to accuse products that do not infringe the claims. Defendants' assertion that a particular limitation is disclosed by a prior art reference and/or is disclosed in a particular manner may be based in part on Plaintiff's apparent claim interpretations. In relying on Plaintiff's apparent claim interpretations, Defendants do not admit that Plaintiff's apparent claim interpretations are supportable or proper or that the claim limitations in question are definite or otherwise amenable to construction.

Defendants have endeavored to provide as much detail as possible in these contentions and, in doing so, have exceeded the level of detail required. The inclusion of specific details in some areas is not a concession that such details are required or that the omission of similar details in other areas is a defect. These citations to portions of any reference in this chart are exemplary only. Defendants will rely on the entirety of the references cited in this chart to show that the Asserted Claims are invalid.

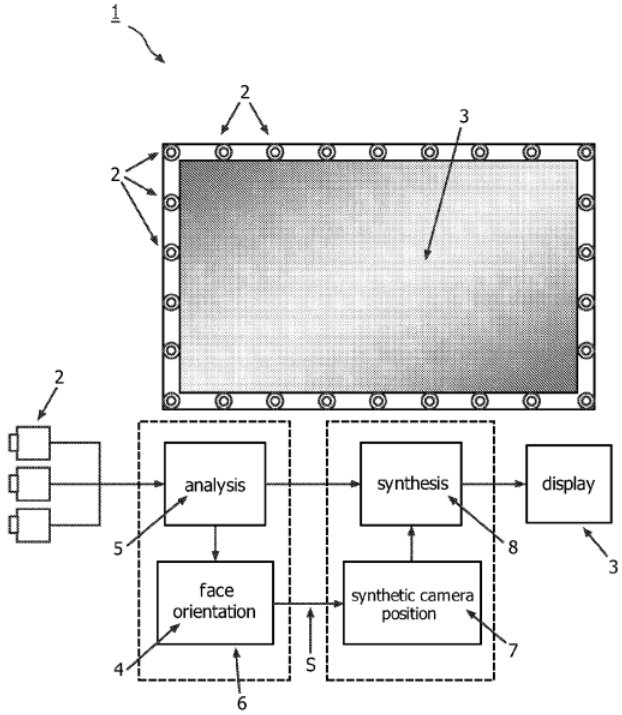
Asserted Claim of the '110 Patent	Exemplary Citations to Haan
Claim 1	
1[pre]. A computerized method for operating a display system, the display system having a camera, a monitor, and a processor, the method comprising:	To the extent the preamble is limiting, Haan expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. "Mirror device (1) comprises a display device (3) and a camera (2) to record an image. The device comprises means for determining (4, 41) the position of a body part. Said means put out a signal (S) indicative of the position of the body part with respect to the a display screen of a display device (3) for a viewer in front of the mirror device. In dependence of this signal (S) the view point from which the to be displayed image is recorded is changed." *See* Abstract. "FIG. 2 illustrates a first embodiment of the invention. The mirror device 1 comprises a number of cameras 2 and a display 3. The recorded images by cameras 2 are fed to a position determination means 4. In the position determination means the images are analyzed in analyzing means 5 and in this example face orientation is determined in means 6. When a single image is analyzed, a coarse measure for the orientation of a head is for instance the ratio between the size of the head and the distance between the eyes, or the ratio between the distance between the eyes and the distance between the eyes and the mouth. Also clues such as the relative size (in horizontal direction) of the ears can be taken as a measure for the angle. When two images are taken 3-D analysis can be used to determine the angle of rotation of the head in respect of the mirror device and to determine the distance to the display screen. The face orientation is fed into a means for determining the position at which the image that is to be displayed is recorded. Using several cameras one can, by synthesis of the various images, construct a virtual camera position and/or magnification. The output of the face orientation determining means 6 is fed in to a synthetic position and magnification means 7, which determines the parameters for synthesizing the image to be displayed, which synthesizing is performed in synthesis means 8. The synthesized image is displayed on a display screen of the display device 3. The data from a number of cameras is, in this example, combined by the processing means to arrive at a single image signal from a virtual view point. The position of the virtual viewpoint is dependent on the determined face orientation, i.e.

Asserted Claim of the '110 Patent	Exemplary Citations to Haan
	signal S. One could use the date of all, or a large number of the cameras for synthesizing the image. *See* paras. [0056] – [0058]. *See* Fig. 2:  FIG. 2

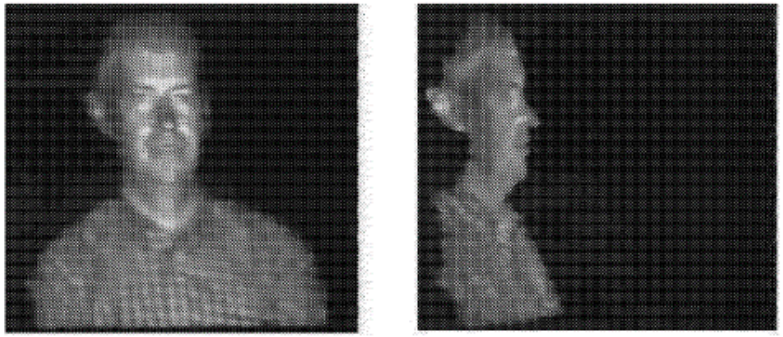
Asserted Claim of the '110 Patent	Exemplary Citations to Haan
	This limitation would have been obvious to a person of ordinary skill in the art based on (1) Haan alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' invalidity contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[a]. operating the camera to generate a stream of images of the user;	Haan expressly and/or inherently discloses and/or renders obvious operating the camera to generate a stream of images of the user. *See*, *e.g.*, disclosures below. *See* Claim 1: "1. Mirror device (1) comprising a display device (3) with a display screen at least one image recording device (2) to record an image a means (4, 41) to determine a position of a body part with respect to the display screen of the display device (3), said means outputting a indication signal (S) to indicate the position of the body part of a viewer in front of the display screen a means to change (7) the view point from which the image is recorded in dependence on said indication signal (S) a means to display the recorded image on the display screen of the display device (3)." "In embodiments the mirror device comprises a movable camera and means to move the movable camera, wherein the position of the movable camera is determined by the position of e.g. the head or body. In embodiments the mirror devices comprises more than one camera, wherein the position or orientation of the image recording is determined by determining which camera or cameras are used to record the image. In a simple embodiment only a single camera is used, so that the position is determined by the position of the single camera. The device is provided with means to move the camera.

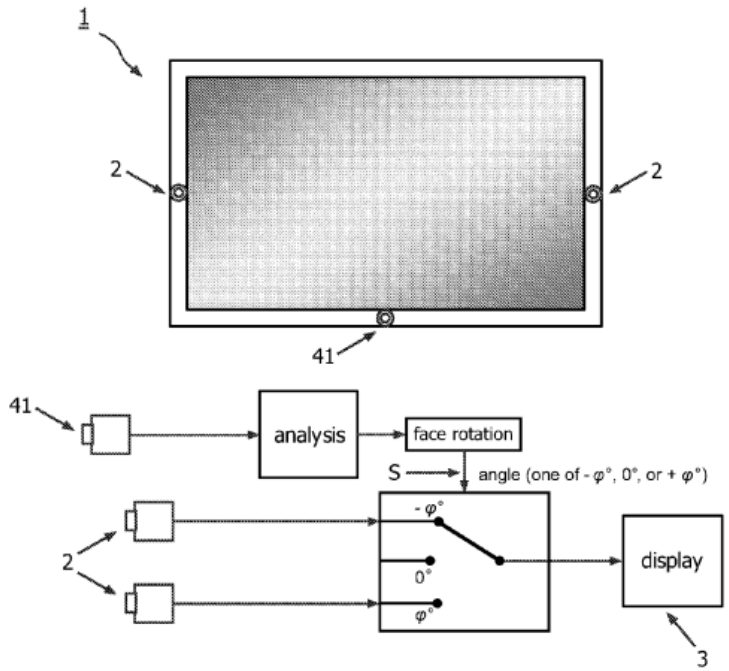
Asserted Claim of the '110 Patent	Exemplary Citations to Haan
	This is a mechanical solution for changing the point of view, i.e. the position of the camera. In more sophisticated embodiments more freedom in the position of the camera can be obtained by combining electronically the images of more than one camera into a combined image. Such more sophisticated embodiments allow changing the position of the camera in a gradual manner and electronically by mixing signals of various cameras. A virtual camera position can be made and one is no longer bounded by the actual positions of the camera(s). All of the cameras can be fixed, or a mix of fixed and movable cameras can be used." *See* paras. [0024]-[0027]. "The recorded images by cameras 2 are fed to a position determination means 4. In the position determination means the images are analyzed in analyzing means 5 and in this example face orientation is determined in means 6. When a single image is analyzed, a coarse measure for the orientation of a head is for instance the ratio between the size of the head and the distance between the eyes, or the ratio between the distance between the eyes and the distance between the eyes and the mouth. Also clues such as the relative size (in horizontal direction) of the ears can be taken as a measure for the angle. When two images are taken 3-D analysis can be used to determine the angle of rotation of the head in respect of the mirror device and to determine the distance to the display screen. The face orientation is fed into a means for determining the position at which the image that is to be displayed is recorded. Using several cameras one can, by synthesis of the various images, construct a virtual camera position and/or magnification. The output of the face orientation determining means 6 is fed in to a synthetic position and magnification means 7, which determines the parameters for synthesizing the image to be displayed, which synthesizing is performed in synthesis means 8. The synthesized image is displayed on a display screen of the display device 3. The data from a number of cameras is, in this example, combined by the processing means to arrive at a single image signal from a virtual view point. The position of the virtual viewpoint is dependent on the determined face orientation, i.e. signal S. One could use the date of all, or a large number of the cameras for synthesizing the image." *See* para. [0058]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Haan alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the

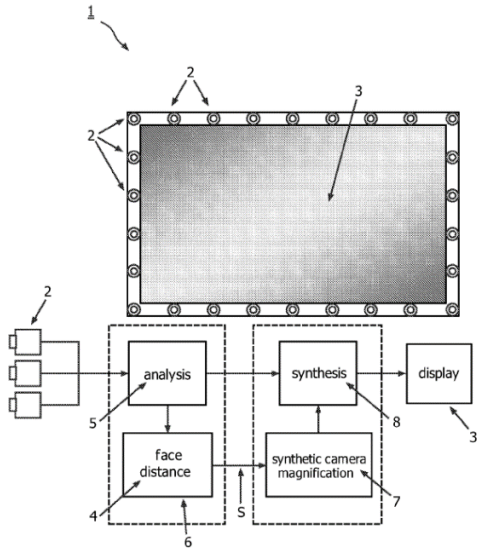
Asserted Claim of the '110 Patent	Exemplary Citations to Haan
	teachings with respect to this claim element as detailed in the cover document of Defendants' invalidity contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[b]. operating the processor to detect the presence of the user in the stream of image;	Haan expressly and/or inherently discloses and/or renders obvious operating the processor to detect the presence of the user in the stream of image. *See*, *e.g.*, disclosures below. "FIG. 2 illustrates a first embodiment of the invention. The mirror device 1 comprises a number of cameras 2 and a display 3. The recorded images by cameras 2 are fed to a position determination means 4. In the position determination means the images are analyzed in analyzing means 5 and in this example face orientation is determined in means 6. When a single image is analyzed, a coarse measure for the orientation of a head is for instance the ratio between the size of the head and the distance between the eyes, or the ratio between the distance between the eyes and the distance between the eyes and the mouth. Also clues such as the relative size (in horizontal direction) of the ears can be taken as a measure for the angle. When two images are taken 3-D analysis can be used to determine the angle of rotation of the head in respect of the mirror device and to determine the distance to the display screen. The face orientation is fed into a means for determining the position at which the image that is to be displayed is recorded. Using several cameras one can, by synthesis of the various images, construct a virtual camera position and/or magnification. The output of the face orientation determining means 6 is fed in to a synthetic position and magnification means 7, which determines the parameters for synthesizing the image to be displayed, which synthesizing is performed in synthesis means 8. The synthesized image is displayed on a display screen of the display device 3. The data from a number of cameras is, in this example, combined by the processing means to arrive at a single image signal from a virtual view point. The position of the virtual viewpoint is dependent

Asserted Claim of the '110 Patent	Exemplary Citations to Haan
	on the determined face orientation, i.e. signal S. One could use the date of all, or a large number of the cameras for synthesizing the image. *See* paras. [0056] – [0058]. *See* Fig. 2:  FIG. 2 "In simple embodiments, instead of a synthesized image, the image of a particular camera is used for a particular range of orientation of the head. Such a solution, although

Asserted Claim of the ’110 Patent	Exemplary Citations to Haan
	within the scope of the invention, however could lead to an image that jumps from one camera position to another. An embodiment intermediate to the two above described embodiments is that, dependent on the signal S, the number of camera used for synthesizing the image is limited to a small number, for instance two or three around the optimal virtual position, instead of using all of the data from all the cameras. FIG. 3 illustrates the effect of the invention. The orientation determining means establish for instance that the angle of turn of the head is 12 degrees. A normal mirror would then show the head being turned 12 degrees. This is shown for example in part 31. In the mirror device of the invention, the turning of the head can be exaggerated so that, instead of the head being displayed at a turning angle of 12 degrees, the turning angle (and thereby the camera position, i.e. the point of view from the image is recorded) is increased for instance 7-fold, so that a 12 degree turn of the head causes the head, as displayed on the display screen, to be turned 84 degrees. FIG. 3 is a somewhat exaggerated example. In most applications the ratio between the actual turning angle of the head and the turning angle of the displayed head will be closer to 1 for instance a factor of 1.2 to 3, preferably between 1.3 and 2. The amplification of the rotation should be great enough to have an appreciable effect, yet not so great that the enlargement of view and amplified rotation would not be perceived by the user intuitively as using a normal mirror.” *See* paras. [0059]-[0063].

Asserted Claim of the ’110 Patent	Exemplary Citations to Haan
	 31 32 FIG. 3 “FIG. 4 shows an embodiment of the invention. In this embodiment the means for determining the orientation comprise an orientation sensing camera 41. The image taken by the orientation sensing camera determines the angle of rotation of the head in respect of the mirror. This is done in analysis means 42. When the determined angle is below a threshold value, the display device is not turned on, and the device acts as a normal mirror. When it is determined that the head is turned to the left or right over an angle more than the threshold, the right side camera is switched on and the image of the right side camera is displayed on the display device and vice versa.” *See* paras. [0065]-[0066].

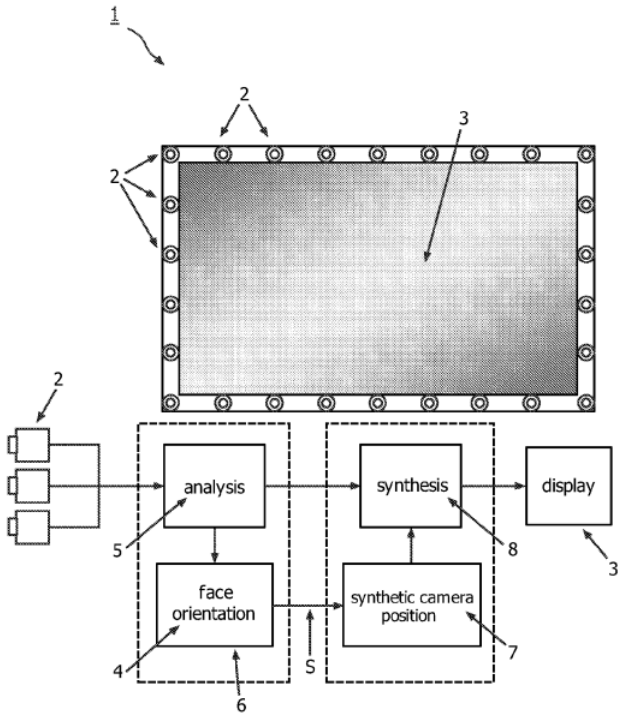
Asserted Claim of the ’110 Patent	Exemplary Citations to Haan
	 FIG. 4 In FIG. 7 face distance determining means determine the distance of the face in respect of the mirror device. This determination determines the magnification of the displayed image. It is remarked that magnification is in fact equivalent to moving a camera with fixed magnification closer to the object, so all applications can be seen, in fact as changing the point of view, or in other words the position of the camera, be it a real camera or a virtual camera. Exaggerating the angle of rotation means in fact that one shifts the point of view from which the image is recorded further to the left or to the right

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	then one would do for a mirror, amplification equals a shift of the point of view towards the object. Distance can be determined in various ways, for instance, when using a single camera, the size of object provides a rough estimation of the distance; when two camera's are used, distance can be determined in much the same way as human eyes and brains determine distance namely by the parallax. Ultrasound means can also be used to measure distance, or such means as are regularly used for cameras to focus can be used.” *See* paras. [0073]-[0074].  FIG. 7

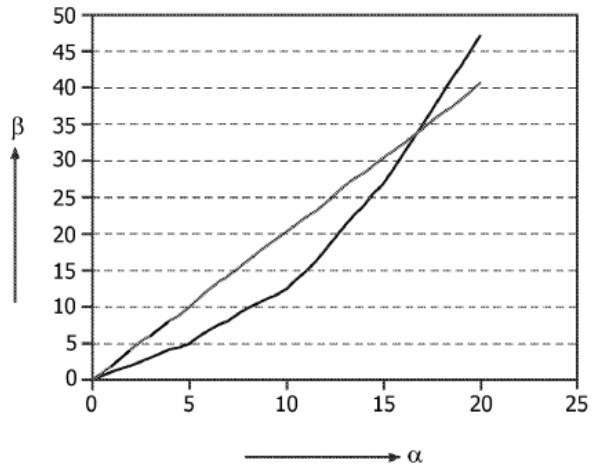
Asserted Claim of the '110 Patent	Exemplary Citations to Haan
	This limitation would have been obvious to a person of ordinary skill in the art based on (1) Haan alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' invalidity contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[c]. operating the processor to apply adaptive transformation mapping to the stream of images captured by the camera to generate modified images that appear to be captured from a different point of view of the camera's actual point of view; and	Haan expressly and/or inherently discloses and/or renders obvious operating the processor to apply adaptive transformation mapping to the stream of images captured by the camera to generate modified images that appear to be captured from a different point of view of the camera's actual point of view. *See*, *e.g.*, disclosures below. "In embodiments, the means to change the view point are arranged to increase the angle of turn of the display imaged in respect of a reflected image. The angle of turn is the angle at which a head of body is displayed in the mirror in comparison to displaying a face looking straight at the mirror. This angle is, for mirrors, determined by the simple rule that the angle of incidence equals the angle of reflection, i.e. the turn angle is the same as the angle at which the head is turned. If one turns the head 10 degrees to the right standing in front of a normal mirror the image of the face one sees in the normal mirror is also turned 10 degrees. In a device according to this preferred embodiment the image of the head would be turned more than 10 degrees, for instance 20 degrees. When one looks in a mirror the image seems to be positioned behind the mirror, and the position of this image is determined by the reflection in the mirror. When one looks in a flat mirror the angle of view is geometrically restricted. By choosing the position of the view point such that the angle of view is increased compared to the geometrical angle of view when looking in a mirror, the viewer is able to see beyond the normal range of view, and those areas that are just out of view, have been moved into view. Increasing the angle of turn means that the head or body is rotated further than would be in a mirror image, and one would see those areas of the face that are normally just out of sight. Consequently one can apply make-up or shave areas carefully and keeping an eye on

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	what one does, where in the past using a normal mirror, one would have to apply make-up or shave without actually seeing what one does." *See* paras. [0018]-[0019]. "In embodiments the mirror devices comprises more than one camera, wherein the position or orientation of the image recording is determined by determining which camera or cameras are used to record the image. In a simple embodiment only a single camera is used, so that the position is determined by the position of the single camera. The device is provided with means to move the camera. This is a mechanical solution for changing the point of view, i.e. the position of the camera. In more sophisticated embodiments more freedom in the position of the camera can be obtained by combining electronically the images of more than one camera into a combined image. Such more sophisticated embodiments allow changing the position of the camera in a gradual manner and electronically by mixing signals of various cameras. A virtual camera position can be made and one is no longer bounded by the actual positions of the camera(s). All of the cameras can be fixed, or a mix of fixed and movable cameras can be used." *See* paras. [0025]-[0027]. "In simple embodiment, wherein the layer is switchable between a reflective and transmitting state, one could have the display displaying the recorded image all of the time, and switch the layer between a reflective and transmitting state." *See* para. [0033]. "FIG. 2 illustrates a first embodiment of the invention. The mirror device 1 comprises a number of cameras 2 and a display 3. The recorded images by cameras 2 are fed to a position determination means 4. In the position determination means the images are analyzed in analyzing means 5 and in this example face orientation is determined in means 6. When a single image is analyzed, a coarse measure for the orientation of a head is for instance the ratio between the size of

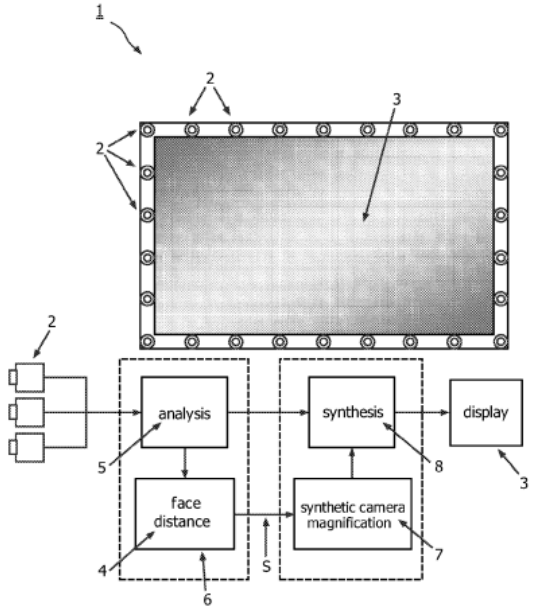
Asserted Claim of the '110 Patent	Exemplary Citations to Haan
	the head and the distance between the eyes, or the ratio between the distance between the eyes and the distance between the eyes and the mouth. Also clues such as the relative size (in horizontal direction) of the ears can be taken as a measure for the angle. When two images are taken 3-D analysis can be used to determine the angle of rotation of the head in respect of the mirror device and to determine the distance to the display screen. The face orientation is fed into a means for determining the position at which the image that is to be displayed is recorded. Using several cameras one can, by synthesis of the various images, construct a virtual camera position and/or magnification. The output of the face orientation determining means 6 is fed in to a synthetic position and magnification means 7, which determines the parameters for synthesizing the image to be displayed, which synthesizing is performed in synthesis means 8. The synthesized image is displayed on a display screen of the display device 3. The data from a number of cameras is, in this example, combined by the processing means to arrive at a single image signal from a virtual view point. The position of the virtual viewpoint is dependent on the determined face orientation, i.e. signal S. One could use the date of all, or a large number of the cameras for synthesizing the image. In simple embodiments, instead of a synthesized image, the image of a particular camera is used for a particular range of orientation of the head. Such a solution, although within the scope of the invention, however could lead to an image that jumps from one camera position to another. An embodiment intermediate to the two above described embodiments is that, dependent on the signal S, the number of camera used for synthesizing the image is limited to a small number, for instance two or three around the optimal virtual position, instead of using all of the data from all the cameras." *See* paras. [0056]-[0059].

Asserted Claim of the ’110 Patent	Exemplary Citations to Haan
	 FIG. 2 “FIG. 3 illustrates the effect of the invention. The orientation determining means establish for instance that the angle of turn of the head is 12 degrees. A normal mirror would then show the head being turned 12 degrees. This is shown for example in part 31. In the mirror device of the invention, the turning of the head can be exaggerated so that, instead of the head being displayed at a turning angle of 12 degrees, the turning angle (and thereby the camera position, i.e. the point of

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	view from the image is recorded) is increased for instance 7-fold, so that a 12 degree turn of the head causes the head, as displayed on the display screen, to be turned 84 degrees. FIG. 3 is a somewhat exaggerated example. In most applications the ratio between the actual turning angle of the head and the turning angle of the displayed head will be closer to 1 for instance a factor of 1.2 to 3, preferably between 1.3 and 2. The amplification of the rotation should be great enough to have an appreciable effect, yet not so great that the enlargement of view and amplified rotation would not be perceived by the user intuitively as using a normal mirror. In FIG. 2 the cameras are shown mounted in a frame of the display device, around the display. This is an embodiment. The cameras can be mounted at some distance from the framework, to increase the possible view points. The cameras, or at least some or one of them, can also be positioned some distance in front of the display. In embodiments the camera can be positioned in side parts attached to the mirror device. The mirror device can have for instance two closing doors, which open when the mirror device is used, wherein cameras are mounted around the perimeter of the display device, as shown in FIG. 2, as well as on the doors, so that the range of possible view points is increased.” *See* paras. [0060]-[0064].

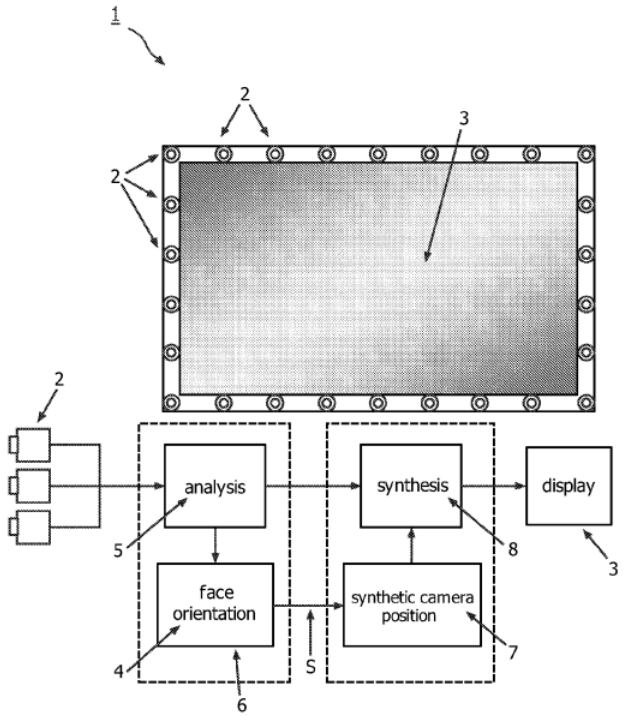
Asserted Claim of the ’110 Patent	Exemplary Citations to Haan
	 FIG. 6 “The straight line depicts a situation in which the display device does not comprise a reflective semi-transparent layer, and the cameras are always used to record the image and show the head. In this example the relation between the angles α and β is β=2α, i.e. the rotation of a displayed head or torso is exaggerated by a factor of 2. This is a simple linear relation between the two rotation angles. The curved line depicts a situation wherein for small angle, smaller than 5 degrees no image is displayed and the device comprises a semi-transparent reflective layer. Between 0 and 5 degrees of turn both angles are equal to each other since the device works as a simple mirror, wherein the image is reflected in the semi-transparent reflective layer. When one turns the head over an angle larger than 5 degrees, an image is displayed with an exaggerated angle of turn. At first the exaggeration is only small, but it grows as the head is turned more. In this example a non-linear relation between the angles α and β is used.

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	FIG. 7 illustrates a further embodiment of the invention. When one looks into a flat mirror the perceived distance at which the image is formed is the same as the distance between the object and the mirror. It is possible to use a convex mirror which allows magnification of the object. However this is a fixed magnification. Within embodiments of the invention the displayed image is magnified as a function of the distance to the mirror device. Typically, a viewer holds and maintains a certain distance to a mirror. When he/she wants to take a better look at a detail he/she reduces the distance to the mirror. FIG. 7 illustrates an embodiment of the invention. In FIG. 7 face distance determining means determine the distance of the face in respect of the mirror device. This determination determines the magnification of the displayed image. It is remarked that magnification is in fact equivalent to moving a camera with fixed magnification closer to the object, so all applications can be seen, in fact as changing the point of view, or in other words the position of the camera, be it a real camera or a virtual camera. Exaggerating the angle of rotation means in fact that one shifts the point of view from which the image is recorded further to the left or to the right then one would do for a mirror, amplification equals a shift of the point of view towards the object. Distance can be determined in various ways, for instance, when using a single camera, the size of object provides a rough estimation of the distance; when two camera's are used, distance can be determined in much the same way as human eyes and brains determine distance namely by the parallax. Ultrasound means can also be used to measure distance, or such means as are regularly used for cameras to focus can be used.” *See* paras. [0071]-[0074].

Asserted Claim of the ’110 Patent	Exemplary Citations to Haan
	 FIG. 7 “FIG. 8 illustrates an exemplary relation between the magnification M of the image and the distance d in centimeter to the mirror. For distances d larger than a threshold value, for instance in this example 35 cm distance, the magnification is kept at a fixed value of, in this example 1. This can be done for instance by using the device as a simple mirror, i.e. not displaying an image on the display device, but using the device in the reflective mode. For smaller distances, as the viewer moves his head or torso closer to the display screen, an enlarged image is displayed, i.e. with a magnification larger than 1. To avoid a sudden jump in the image there is a smooth transition between the two regions. In embodiment there can be a range of distances for which the magnification factor is less than 1. This can be for instance

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	useful when a hat is tried on, a normal mirror would show the face, but only part of the hat. By using a magnification smaller than 1, it does become possible to see the hat even at relatively small distances from the mirror. This would also be useful in small size changing cubicles." *See* paras. [0075]-[0076]. "For simplicity and ease of understanding FIGS. 3, 4 and 7 show set-ups in which the orientation (FIGS. 3, 4) respectively the distance (FIG. 7) is measured. Combinations of the two, in which both orientation and distance are measured, form preferred embodiments." *See* para. [0095]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Haan alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' invalidity contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[d]. displaying the modified images on the monitor;	Haan expressly and/or inherently discloses and/or renders obvious displaying the modified images on the monitor. *See*, *e.g.*, disclosures below. "To this end the mirror device in accordance with a first aspect of the invention comprises: a display device with a display screen at least one image recording device to record an image a means to determine a position of a body part with respect to the display screen of the display device, said means outputting a indication signal to indicate the position of the body part of a viewer in front of the display screen a means to change the view point from which the image is recorded in dependence on said indication signal

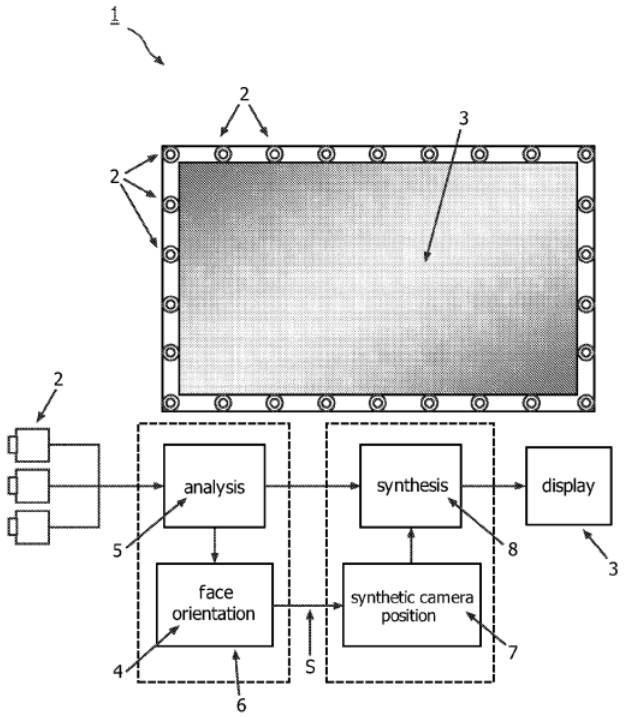
Asserted Claim of the '110 Patent	Exemplary Citations to Haan
	a means to display the recorded image on the display device." *See* paras. [0006]-[0011]. "FIG. 2 illustrates a first embodiment of the invention. The mirror device 1 comprises a number of cameras 2 and a display 3. The recorded images by cameras 2 are fed to a position determination means 4. In the position determination means the images are analyzed in analyzing means 5 and in this example face orientation is determined in means 6. When a single image is analyzed, a coarse measure for the orientation of a head is for instance the ratio between the size of the head and the distance between the eyes, or the ratio between the distance between the eyes and the distance between the eyes and the mouth. Also clues such as the relative size (in horizontal direction) of the ears can be taken as a measure for the angle. When two images are taken 3-D analysis can be used to determine the angle of rotation of the head in respect of the mirror device and to determine the distance to the display screen. The face orientation is fed into a means for determining the position at which the image that is to be displayed is recorded. Using several cameras one can, by synthesis of the various images, construct a virtual camera position and/or magnification. The output of the face orientation determining means 6 is fed in to a synthetic position and magnification means 7, which determines the parameters for synthesizing the image to be displayed, which synthesizing is performed in synthesis means 8. The synthesized image is displayed on a display screen of the display device 3. The data from a number of cameras is, in this example, combined by the processing means to arrive at a single image signal from a virtual view point. The position of the virtual viewpoint is dependent on the determined face orientation, i.e. signal S. One could use the date of all, or a large number of the cameras for synthesizing the image." *See* paras. [0056] – [0058]. *See* Fig. 2:

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	 FIG. 2 *See* Claim 1: “1. Mirror device (1) comprising a display device (3) with a display screen at least one image recording device (2) to record an image

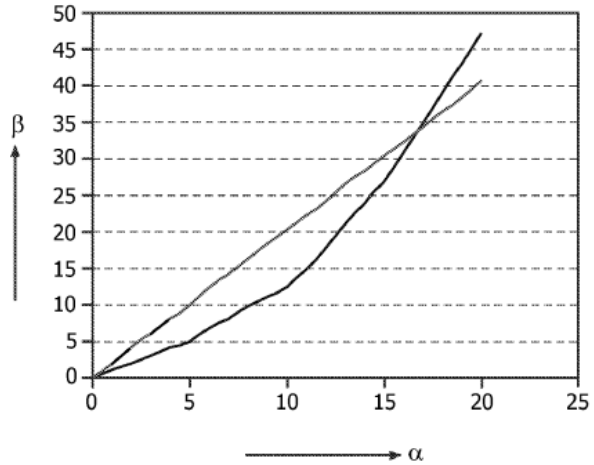
Asserted Claim of the '110 Patent	Exemplary Citations to Haan
	a means (4, 41) to determine a position of a body part with respect to the display screen of the display device (3), said means outputting a indication signal (S) to indicate the position of the body part of a viewer in front of the display screen a means to change (7) the view point from which the image is recorded in dependence on said indication signal (S) a means to display the recorded image on the display screen of the display device (3)." *See* claim 1. "FIG. 7 illustrates a further embodiment of the invention. When one looks into a flat mirror the perceived distance at which the image is formed is the same as the distance between the object and the mirror. It is possible to use a convex mirror which allows magnification of the object. However this is a fixed magnification. Within embodiments of the invention the displayed image is magnified as a function of the distance to the mirror device. Typically, a viewer holds and maintains a certain distance to a mirror. When he/she wants to take a better look at a detail he/she reduces the distance to the mirror. FIG. 7 illustrates an embodiment of the invention." *See* para. [0072]. For distances d larger than a threshold value, for instance in this example 35 cm distance, the magnification is kept at a fixed value of, in this example 1. This can be done for instance by using the device as a simple mirror, i.e. not displaying an image on the display device, but using the device in the reflective mode. For smaller distances, as the viewer moves his head or torso closer to the display screen, an enlarged image is displayed, i.e. with a magnification larger than 1. To avoid a sudden jump in the image there is a smooth transition between the two regions. In embodiment there can be a range of distances for which the magnification factor is less than 1. This can be for instance useful when a hat is tried on, a normal mirror would show the face, but only part of the hat. By using a magnification smaller than 1, it does become possible to see the hat even at relatively small distances from the mirror. This would also be useful in small size changing cubicles." *See* para. [0076].

Asserted Claim of the '110 Patent	Exemplary Citations to Haan
	This limitation would have been obvious to a person of ordinary skill in the art based on (1) Haan alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' invalidity contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[e]. wherein the different point of view corresponds to an image taken from a different angle and a different distance than the actual images captured by the camera; and	Haan expressly and/or inherently discloses and/or renders obvious wherein the different point of view corresponds to an image taken from a different angle and a different distance than the actual images captured by the camera. *See*, *e.g.*, disclosures below. "FIG. 2 illustrates a first embodiment of the invention. The mirror device 1 comprises a number of cameras 2 and a display 3. The recorded images by cameras 2 are fed to a position determination means 4. In the position determination means the images are analyzed in analyzing means 5 and in this example face orientation is determined in means 6. When a single image is analyzed, a coarse measure for the orientation of a head is for instance the ratio between the size of the head and the distance between the eyes, or the ratio between the distance between the eyes and the distance between the eyes and the mouth. Also clues such as the relative size (in horizontal direction) of the ears can be taken as a measure for the angle. When two images are taken 3-D analysis can be used to determine the angle of rotation of the head in respect of the mirror device and to determine the distance to the display screen. The face orientation is fed into a means for determining the position at which the image that is to be displayed is recorded. Using several cameras one can, by synthesis of the various images, construct a virtual camera position and/or magnification. The output of the face orientation determining means 6 is fed in to a synthetic position and magnification means 7, which determines the parameters for synthesizing the image to be displayed, which synthesizing is performed in synthesis means 8. The synthesized image is displayed on a display screen of the display device 3. The data from a number of cameras is, in this example, combined by the processing means to arrive at a single image signal from a virtual view point. The position of the virtual viewpoint is dependent

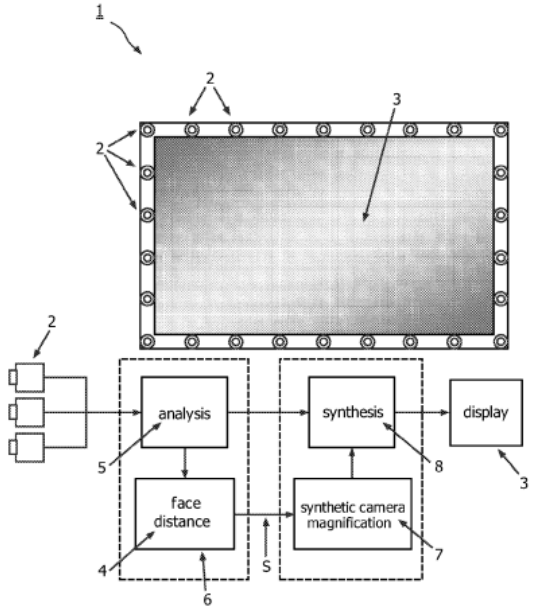
Asserted Claim of the ’110 Patent	Exemplary Citations to Haan
	on the determined face orientation, i.e. signal S. One could use the date of all, or a large number of the cameras for synthesizing the image. In simple embodiments, instead of a synthesized image, the image of a particular camera is used for a particular range of orientation of the head. Such a solution, although within the scope of the invention, however could lead to an image that jumps from one camera position to another. An embodiment intermediate to the two above described embodiments is that, dependent on the signal S, the number of camera used for synthesizing the image is limited to a small number, for instance two or three around the optimal virtual position, instead of using all of the data from all the cameras.” *See* paras. [0056]-[0059].

Asserted Claim of the ’110 Patent	Exemplary Citations to Haan
	 FIG. 2 “FIG. 3 illustrates the effect of the invention. The orientation determining means establish for instance that the angle of turn of the head is 12 degrees. A normal mirror would then show the head being turned 12 degrees. This is shown for example in part 31. In the mirror device of the invention, the turning of the head can be exaggerated so that, instead of the head being displayed at a turning angle of 12 degrees, the turning angle (and thereby the camera position, i.e. the point of

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	view from the image is recorded) is increased for instance 7-fold, so that a 12 degree turn of the head causes the head, as displayed on the display screen, to be turned 84 degrees." *See* paras. [0060]-[0061]. "FIG. 6 illustrates embodiments of the invention. In the form of a graph the relation between the angle α at which the head is turned and the angle β at which the displayed head is shown. For a flat mirror these two angles are per definition the same, i.e. α≡β. The straight line depicts a situation in which the display device does not comprise a reflective semi-transparent layer, and the cameras are always used to record the image and show the head. In this example the relation between the angles α and β is β=2α, i.e. the rotation of a displayed head or torso is exaggerated by a factor of 2. This is a simple linear relation between the two rotation angles. The curved line depicts a situation wherein for small angle, smaller than 5 degrees no image is displayed and the device comprises a semi-transparent reflective layer. Between 0 and 5 degrees of turn both angles are equal to each other since the device works as a simple mirror, wherein the image is reflected in the semi-transparent reflective layer. When one turns the head over an angle larger than 5 degrees, an image is displayed with an exaggerated angle of turn. At first the exaggeration is only small, but it grows as the head is turned more. In this example a non-linear relation between the angles α and β is used." *See* paras. [0070]-[0071].

Asserted Claim of the ’110 Patent	Exemplary Citations to Haan
	 FIG. 6 “FIG. 7 illustrates a further embodiment of the invention. When one looks into a flat mirror the perceived distance at which the image is formed is the same as the distance between the object and the mirror. It is possible to use a convex mirror which allows magnification of the object. However this is a fixed magnification. Within embodiments of the invention the displayed image is magnified as a function of the distance to the mirror device. Typically, a viewer holds and maintains a certain distance to a mirror. When he/she wants to take a better look at a detail he/she reduces the distance to the mirror. FIG. 7 illustrates an embodiment of the invention. In FIG. 7 face distance determining means determine the distance of the face in respect of the mirror device. This determination determines the magnification of the displayed image. It is remarked that magnification is in fact equivalent to moving a camera with fixed magnification closer to the object, so all applications can be seen, in fact as changing the point of view, or in other words the position of the camera, be it a real

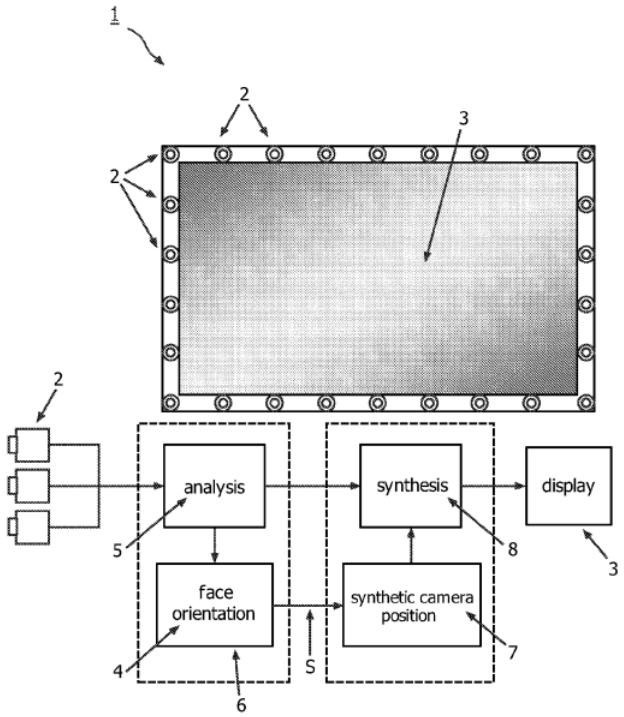
Asserted Claim of the ’110 Patent	Exemplary Citations to Haan
	camera or a virtual camera. Exaggerating the angle of rotation means in fact that one shifts the point of view from which the image is recorded further to the left or to the right then one would do for a mirror, amplification equals a shift of the point of view towards the object. Distance can be determined in various ways, for instance, when using a single camera, the size of object provides a rough estimation of the distance; when two camera's are used, distance can be determined in much the same way as human eyes and brains determine distance namely by the parallax. Ultrasound means can also be used to measure distance, or such means as are regularly used for cameras to focus can be used.” *See* paras. [0072]-[0074].

Asserted Claim of the ’110 Patent	Exemplary Citations to Haan
	 FIG. 7 “FIG. 8 illustrates an exemplary relation between the magnification M of the image and the distance d in centimeter to the mirror. For distances d larger than a threshold value, for instance in this example 35 cm distance, the magnification is kept at a fixed value of, in this example 1. This can be done for instance by using the device as a simple mirror, i.e. not displaying an image on the display device, but using the device in the reflective mode. For smaller distances, as the viewer moves his head or torso closer to the display screen, an enlarged image is displayed, i.e. with a magnification larger than 1. To avoid a sudden jump in the image there is a smooth transition between the two regions. In embodiment there can be a range of distances for which the magnification factor is less than 1. This can be for instance

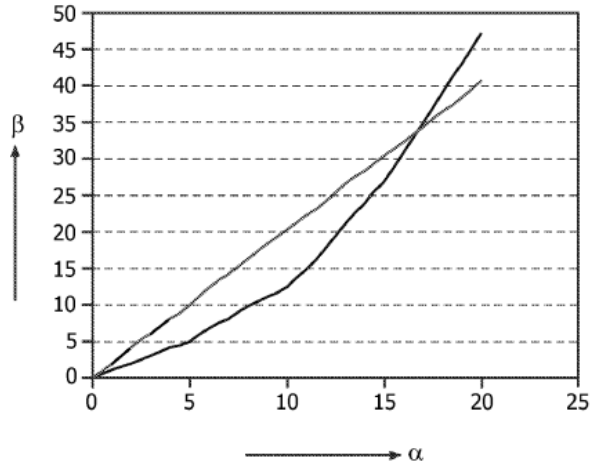
Asserted Claim of the '110 Patent	Exemplary Citations to Haan
	useful when a hat is tried on, a normal mirror would show the face, but only part of the hat. By using a magnification smaller than 1, it does become possible to see the hat even at relatively small distances from the mirror. This would also be useful in small size changing cubicles." *See* paras. [0075]-[0076]. "For simplicity and ease of understanding FIGS. 3, 4 and 7 show set-ups in which the orientation (FIGS. 3, 4) respectively the distance (FIG. 7) is measured. Combinations of the two, in which both orientation and distance are measured, form preferred embodiments. In FIGS. 3, 4 and 7 the cameras are shown in fixed positions. Even if the cameras are in fixed positions, the angle at which the cameras are positioned in respect of the mirror device may still be changed by rotating one or more cameras. Some of the cameras may be fixed in position and angle, while some of the cameras may be movable and/or rotatable. In those embodiments wherein the distance is measured, the field of view of the cameras is, in embodiments, changed in dependence on the measured distance d. When the subject moves closer to the mirror, not only the magnification is changed, but also the cameras are rotated so that the cameras are pointed at the position of the viewer. This improves the image. To this end the mirror device is provided with means to rotate the means for recording. FIG. 13 illustrates such embodiments. The signal S in indicative of the distance, drive D3 rotates the cameras 2 so that they are pointing at the position of the head of the viewer." *See* paras. [0095]-[0097]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Haan alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' invalidity contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

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1[f]. wherein during mirror tracking mode the processor utilizes the angle of the images captured by the camera and applies parametric input for a mapping transformation that changes imaging perspective of the images captured by the camera.	Haan expressly and/or inherently discloses and/or renders obvious wherein during mirror tracking mode the processor utilizes the angle of the images captured by the camera and applies parametric input for a mapping transformation that changes imaging perspective of the images captured by the camera. *See*, *e.g.*, disclosures below. "The position may comprise one or more of the positional parameters, for instance the distance to the display screen, angle of turn of the head of torso in respect of the display screen, or derivates in time of such position parameters, such as movements to and/or from the display screen, i.e. changes in distances, or nodding of the head, i.e. a chance in turning angle, or in coordinates: x, y and or z coordinates, and/or angles of turn and/or dx/dt, dz/dt etc. The indication signal can, dependent on the embodiment of the invention, indicate the orientation of the head or body." *See* para. [0014]. "FIG. 2 illustrates a first embodiment of the invention. The mirror device 1 comprises a number of cameras 2 and a display 3. The recorded images by cameras 2 are fed to a position determination means 4. In the position determination means the images are analyzed in analyzing means 5 and in this example face orientation is determined in means 6. When a single image is analyzed, a coarse measure for the orientation of a head is for instance the ratio between the size of the head and the distance between the eyes, or the ratio between the distance between the eyes and the distance between the eyes and the mouth. Also clues such as the relative size (in horizontal direction) of the ears can be taken as a measure for the angle. When two images are taken 3-D analysis can be used to determine the angle of rotation of the head in respect of the mirror device and to determine the distance to the display screen. The face orientation is fed into a means for determining the position at which the image that is to be displayed is recorded. Using several cameras one can, by synthesis of the various images, construct a virtual camera position and/or magnification. The output of the face orientation determining means 6 is fed in to a synthetic position and magnification means 7, which determines the parameters for synthesizing the image to be displayed, which synthesizing is performed in synthesis means 8. The synthesized

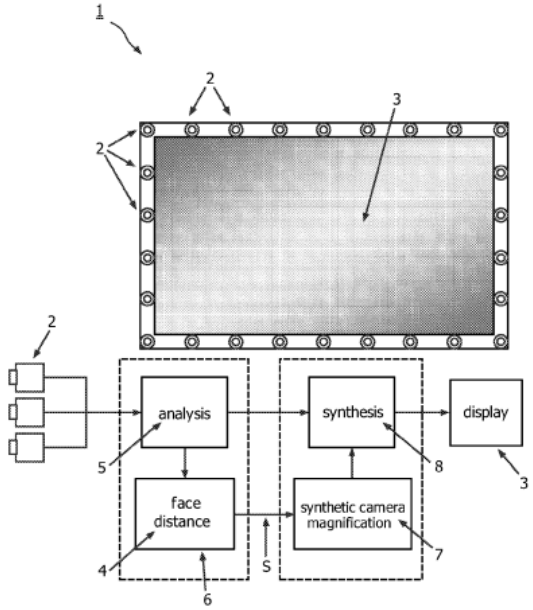
Asserted Claim of the ’110 Patent	Exemplary Citations to Haan
	image is displayed on a display screen of the display device 3. The data from a number of cameras is, in this example, combined by the processing means to arrive at a single image signal from a virtual view point. The position of the virtual viewpoint is dependent on the determined face orientation, i.e. signal S. One could use the date of all, or a large number of the cameras for synthesizing the image. In simple embodiments, instead of a synthesized image, the image of a particular camera is used for a particular range of orientation of the head. Such a solution, although within the scope of the invention, however could lead to an image that jumps from one camera position to another. An embodiment intermediate to the two above described embodiments is that, dependent on the signal S, the number of camera used for synthesizing the image is limited to a small number, for instance two or three around the optimal virtual position, instead of using all of the data from all the cameras.” *See* paras. [0056]-[0059].

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	 FIG. 2 “FIG. 3 illustrates the effect of the invention. The orientation determining means establish for instance that the angle of turn of the head is 12 degrees. A normal mirror would then show the head being turned 12 degrees. This is shown for example in part 31. In the mirror device of the invention, the turning of the head can be exaggerated so that, instead of the head being displayed at a turning angle of 12 degrees, the turning angle (and thereby the camera position, i.e. the point of

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	view from the image is recorded) is increased for instance 7-fold, so that a 12 degree turn of the head causes the head, as displayed on the display screen, to be turned 84 degrees.” *See* paras. [0060]-[0061]. “FIG. 6 illustrates embodiments of the invention. In the form of a graph the relation between the angle α at which the head is turned and the angle β at which the displayed head is shown. For a flat mirror these two angles are per definition the same, i.e. α≡β. The straight line depicts a situation in which the display device does not comprise a reflective semi-transparent layer, and the cameras are always used to record the image and show the head. In this example the relation between the angles α and β is β=2α, i.e. the rotation of a displayed head or torso is exaggerated by a factor of 2. This is a simple linear relation between the two rotation angles. The curved line depicts a situation wherein for small angle, smaller than 5 degrees no image is displayed and the device comprises a semi-transparent reflective layer. Between 0 and 5 degrees of turn both angles are equal to each other since the device works as a simple mirror, wherein the image is reflected in the semi-transparent reflective layer. When one turns the head over an angle larger than 5 degrees, an image is displayed with an exaggerated angle of turn. At first the exaggeration is only small, but it grows as the head is turned more. In this example a non-linear relation between the angles α and β is used.” *See* paras. [0070]-[0071].

Asserted Claim of the ’110 Patent	Exemplary Citations to Haan
	 FIG. 6 “FIG. 7 illustrates a further embodiment of the invention. When one looks into a flat mirror the perceived distance at which the image is formed is the same as the distance between the object and the mirror. It is possible to use a convex mirror which allows magnification of the object. However this is a fixed magnification. Within embodiments of the invention the displayed image is magnified as a function of the distance to the mirror device. Typically, a viewer holds and maintains a certain distance to a mirror. When he/she wants to take a better look at a detail he/she reduces the distance to the mirror. FIG. 7 illustrates an embodiment of the invention. In FIG. 7 face distance determining means determine the distance of the face in respect of the mirror device. This determination determines the magnification of the displayed image. It is remarked that magnification is in fact equivalent to moving a camera with fixed magnification closer to the object, so all applications can be seen, in fact as changing the point of view, or in other words the position of the camera, be it a real

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	camera or a virtual camera. Exaggerating the angle of rotation means in fact that one shifts the point of view from which the image is recorded further to the left or to the right then one would do for a mirror, amplification equals a shift of the point of view towards the object. Distance can be determined in various ways, for instance, when using a single camera, the size of object provides a rough estimation of the distance; when two camera's are used, distance can be determined in much the same way as human eyes and brains determine distance namely by the parallax. Ultrasound means can also be used to measure distance, or such means as are regularly used for cameras to focus can be used.” *See* paras. [0072]-[0074].

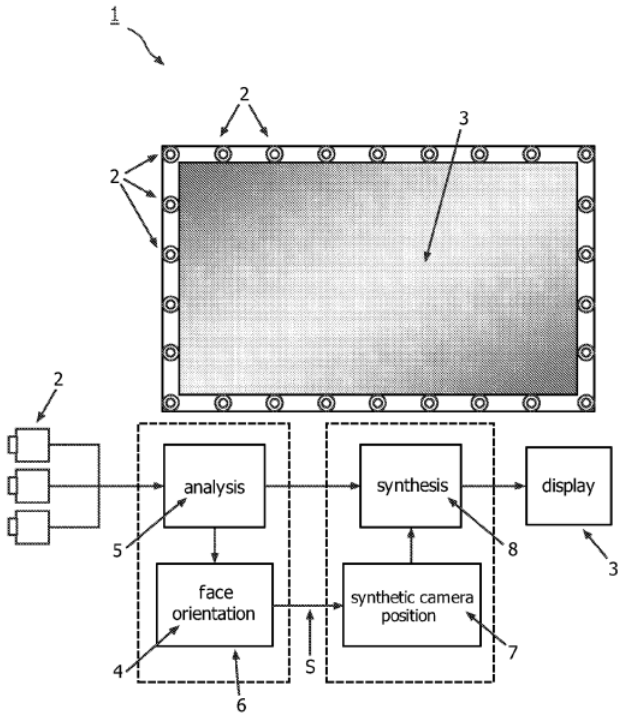
Asserted Claim of the ’110 Patent	Exemplary Citations to Haan
	 FIG. 7 “FIG. 8 illustrates an exemplary relation between the magnification M of the image and the distance d in centimeter to the mirror. For distances d larger than a threshold value, for instance in this example 35 cm distance, the magnification is kept at a fixed value of, in this example 1. This can be done for instance by using the device as a simple mirror, i.e. not displaying an image on the display device, but using the device in the reflective mode. For smaller distances, as the viewer moves his head or torso closer to the display screen, an enlarged image is displayed, i.e. with a magnification larger than 1. To avoid a sudden jump in the image there is a smooth transition between the two regions. In embodiment there can be a range of distances for which the magnification factor is less than 1. This can be for instance

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	useful when a hat is tried on, a normal mirror would show the face, but only part of the hat. By using a magnification smaller than 1, it does become possible to see the hat even at relatively small distances from the mirror. This would also be useful in small size changing cubicles." *See* paras. [0075]-[0076]. "For simplicity and ease of understanding FIGS. 3, 4 and 7 show set-ups in which the orientation (FIGS. 3, 4) respectively the distance (FIG. 7) is measured. Combinations of the two, in which both orientation and distance are measured, form preferred embodiments." *See* para. [0095]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Haan alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' invalidity contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

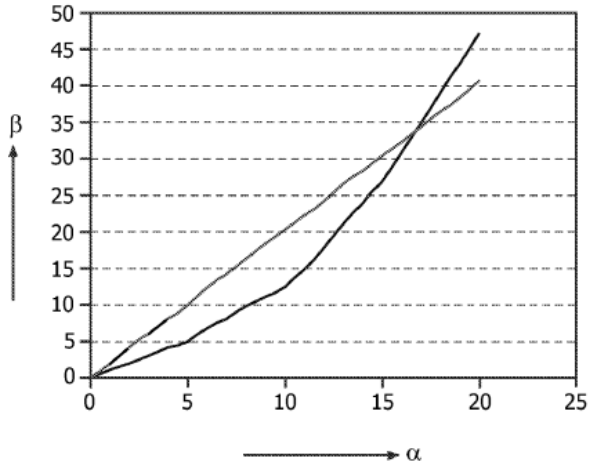
Asserted Claim of the '110 Patent	Exemplary Citations to Haan
Claim 2	
2. The method of claim 1, wherein the mapping transformation comprises a combination of at least two of the following transformations: vertical flips about a vertical axis, a projection transformation, rotation, resize, two-dimensional offset, optic distortion correction, and polynomial mapping on part or entire captured image.	Haan expressly and/or inherently discloses and/or renders obvious wherein the mapping transformation comprises a combination of at least two of the following transformations: vertical flips about a vertical axis, a projection transformation, rotation, resize, two-dimensional offset, optic distortion correction, and polynomial mapping on part or entire captured image. *See*, *e.g.*, disclosures below. "To this end the mirror device in accordance with a first aspect of the invention comprises: a display device with a display screen

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	at least one image recording device to record an image a means to determine a position of a body part with respect to the display screen of the display device, said means outputting a indication signal to indicate the position of the body part of a viewer in front of the display screen a means to change the view point from which the image is recorded in dependence on said indication signal a means to display the recorded image on the display device." *See* paras. [0006]-[0011]. "In embodiments the means to change the point of view are arranged to change the magnification (M) of the displayed image, with respect to a reflected image. This allows a viewer to change the magnification by for instance getting closer to the display screen. This is impossible with a normal flat mirror." *See* paras. [0022]-[0023]. "In embodiments the point of view is changeable in one direction, in more sophisticated embodiments in more than one direction. If one wants to look at the side of the head an enlargement of viewing possibilities in a left-right direction is useful; however, if one wants to look into one's own mouth an up-down increase in viewing angles is useful. In embodiments the position of recording can also be changed in a direction perpendicular to the display surface. In such embodiments an enlarged image can be provided." *See* para. [0028]. "FIG. 2 illustrates a first embodiment of the invention. The mirror device 1 comprises a number of cameras 2 and a display 3. The recorded images by cameras 2 are fed to a position determination means 4. In the position determination means the images are analyzed in analyzing means 5 and in this example face orientation is determined in means 6. When a single image is analyzed, a coarse measure for the orientation of a head is for instance the ratio between the size of

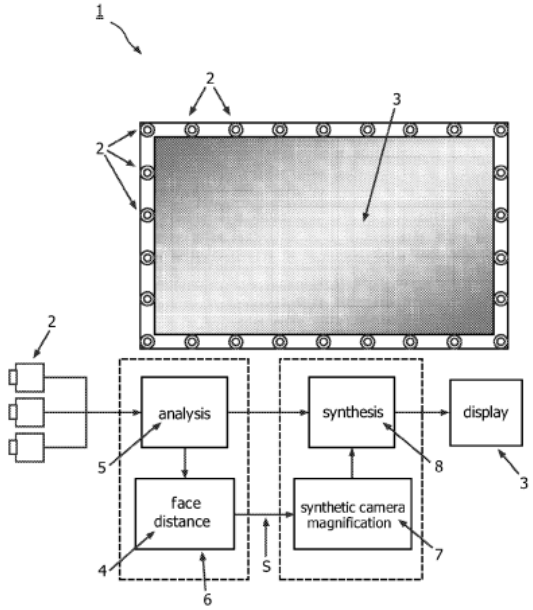
Asserted Claim of the '110 Patent	Exemplary Citations to Haan
	the head and the distance between the eyes, or the ratio between the distance between the eyes and the distance between the eyes and the mouth. Also clues such as the relative size (in horizontal direction) of the ears can be taken as a measure for the angle. When two images are taken 3-D analysis can be used to determine the angle of rotation of the head in respect of the mirror device and to determine the distance to the display screen. The face orientation is fed into a means for determining the position at which the image that is to be displayed is recorded. Using several cameras one can, by synthesis of the various images, construct a virtual camera position and/or magnification. The output of the face orientation determining means 6 is fed in to a synthetic position and magnification means 7, which determines the parameters for synthesizing the image to be displayed, which synthesizing is performed in synthesis means 8. The synthesized image is displayed on a display screen of the display device 3. The data from a number of cameras is, in this example, combined by the processing means to arrive at a single image signal from a virtual view point. The position of the virtual viewpoint is dependent on the determined face orientation, i.e. signal S. One could use the date of all, or a large number of the cameras for synthesizing the image. In simple embodiments, instead of a synthesized image, the image of a particular camera is used for a particular range of orientation of the head. Such a solution, although within the scope of the invention, however could lead to an image that jumps from one camera position to another. An embodiment intermediate to the two above described embodiments is that, dependent on the signal S, the number of camera used for synthesizing the image is limited to a small number, for instance two or three around the optimal virtual position, instead of using all of the data from all the cameras." *See* paras. [0056]-[0059].

Asserted Claim of the ’110 Patent	Exemplary Citations to Haan
	 FIG. 2 “FIG. 3 illustrates the effect of the invention. The orientation determining means establish for instance that the angle of turn of the head is 12 degrees. A normal mirror would then show the head being turned 12 degrees. This is shown for example in part 31. In the mirror device of the invention, the turning of the head can be exaggerated so that, instead of the head being displayed at a turning angle of 12 degrees, the turning angle (and thereby the camera position, i.e. the point of

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	view from the image is recorded) is increased for instance 7-fold, so that a 12 degree turn of the head causes the head, as displayed on the display screen, to be turned 84 degrees. FIG. 3 is a somewhat exaggerated example. In most applications the ratio between the actual turning angle of the head and the turning angle of the displayed head will be closer to 1 for instance a factor of 1.2 to 3, preferably between 1.3 and 2. The amplification of the rotation should be great enough to have an appreciable effect, yet not so great that the enlargement of view and amplified rotation would not be perceived by the user intuitively as using a normal mirror. In FIG. 2 the cameras are shown mounted in a frame of the display device, around the display. This is an embodiment. The cameras can be mounted at some distance from the framework, to increase the possible view points. The cameras, or at least some or one of them, can also be positioned some distance in front of the display. In embodiments the camera can be positioned in side parts attached to the mirror device. The mirror device can have for instance two closing doors, which open when the mirror device is used, wherein cameras are mounted around the perimeter of the display device, as shown in FIG. 2, as well as on the doors, so that the range of possible view points is increased.” *See* paras. [0060]-[0064]. “FIG. 6 illustrates embodiments of the invention. In the form of a graph the relation between the angle α at which the head is turned and the angle β at which the displayed head is shown. For a flat mirror these two angles are per definition the same, i.e. α≡β. The straight line depicts a situation in which the display device does not comprise a reflective semi-transparent layer, and the cameras are always used to record the image and show the head. In this example the relation between the angles α and β is β=2α, i.e. the rotation of a displayed head or torso is exaggerated by a factor of 2. This is a simple linear relation between the two rotation angles. The curved line depicts a situation wherein for small angle, smaller than 5 degrees no image is displayed and the device

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	comprises a semi-transparent reflective layer. Between 0 and 5 degrees of turn both angles are equal to each other since the device works as a simple mirror, wherein the image is reflected in the semi-transparent reflective layer. When one turns the head over an angle larger than 5 degrees, an image is displayed with an exaggerated angle of turn. At first the exaggeration is only small, but it grows as the head is turned more. In this example a non-linear relation between the angles α and β is used.” *See* paras. [0070]-[0071].  FIG. 6 “FIG. 7 illustrates a further embodiment of the invention. When one looks into a flat mirror the perceived distance at which the image is formed is the same as the distance between the object and the mirror. It is possible to use a convex mirror which allows magnification of the object. However this is a fixed magnification. Within embodiments of the invention the displayed image is magnified as a function of the distance to the mirror device. Typically, a viewer holds and maintains a certain distance to a mirror.

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	When he/she wants to take a better look at a detail he/she reduces the distance to the mirror. FIG. 7 illustrates an embodiment of the invention. In FIG. 7 face distance determining means determine the distance of the face in respect of the mirror device. This determination determines the magnification of the displayed image. It is remarked that magnification is in fact equivalent to moving a camera with fixed magnification closer to the object, so all applications can be seen, in fact as changing the point of view, or in other words the position of the camera, be it a real camera or a virtual camera. Exaggerating the angle of rotation means in fact that one shifts the point of view from which the image is recorded further to the left or to the right then one would do for a mirror, amplification equals a shift of the point of view towards the object. Distance can be determined in various ways, for instance, when using a single camera, the size of object provides a rough estimation of the distance; when two camera's are used, distance can be determined in much the same way as human eyes and brains determine distance namely by the parallax. Ultrasound means can also be used to measure distance, or such means as are regularly used for cameras to focus can be used.” *See* paras. [0072]-[0074].

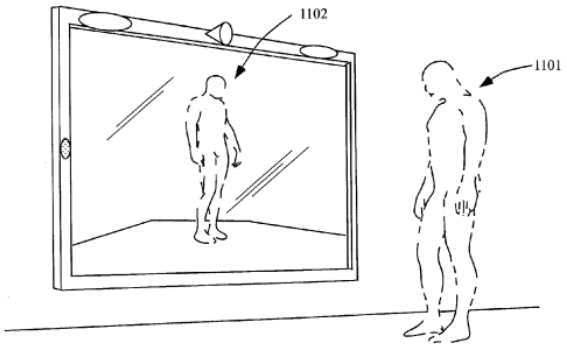
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	 FIG. 7 “FIG. 8 illustrates an exemplary relation between the magnification M of the image and the distance d in centimeter to the mirror. For distances d larger than a threshold value, for instance in this example 35 cm distance, the magnification is kept at a fixed value of, in this example 1. This can be done for instance by using the device as a simple mirror, i.e. not displaying an image on the display device, but using the device in the reflective mode. For smaller distances, as the viewer moves his head or torso closer to the display screen, an enlarged image is displayed, i.e. with a magnification larger than 1. To avoid a sudden jump in the image there is a smooth transition between the two regions. In embodiment there can be a range of distances for which the magnification factor is less than 1. This can be for instance

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	useful when a hat is tried on, a normal mirror would show the face, but only part of the hat. By using a magnification smaller than 1, it does become possible to see the hat even at relatively small distances from the mirror. This would also be useful in small size changing cubicles." *See* paras. [0075]-[0076]. "For simplicity and ease of understanding FIGS. 3, 4 and 7 show set-ups in which the orientation (FIGS. 3, 4) respectively the distance (FIG. 7) is measured. Combinations of the two, in which both orientation and distance are measured, form preferred embodiments." *See* para. [0095]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Haan alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' invalidity contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

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Claim 3	
3. The method of claim 1, wherein during idle mode the camera continuously sends captured images to the processor, and the user presence is identified by the processor detecting a body part in the images.	Haan expressly and/or inherently discloses and/or renders obvious wherein during idle mode the camera continuously sends captured images to the processor, and the user presence is identified by the processor detecting a body part in the images. *See*, *e.g.*, disclosures below. "In another aspect of the invention a device is provided that comprises a frame with a recording device to record an image for a display device, a means to determine a position of a body part with respect to the frame, said means outputting a indication signal to indicate the position of the body part of a viewer with respect to the frame, a means to change the view point from which the image is recorded in dependence on said indication

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	signal, a means to generate an image signal of the recorded image for display on a display screen of a display device.” *See* para. [0036]. “The recorded images by cameras 2 are fed to a position determination means 4. In the position determination means the images are analyzed in analyzing means 5 and in this example face orientation is determined in means 6. When a single image is analyzed, a coarse measure for the orientation of a head is for instance the ratio between the size of the head and the distance between the eyes, or the ratio between the distance between the eyes and the distance between the eyes and the mouth. Also clues such as the relative size (in horizontal direction) of the ears can be taken as a measure for the angle. When two images are taken 3-D analysis can be used to determine the angle of rotation of the head in respect of the mirror device and to determine the distance to the display screen. The face orientation is fed into a means for determining the position at which the image that is to be displayed is recorded. Using several cameras one can, by synthesis of the various images, construct a virtual camera position and/or magnification. The output of the face orientation determining means 6 is fed in to a synthetic position and magnification means 7, which determines the parameters for synthesizing the image to be displayed, which synthesizing is performed in synthesis means 8. The synthesized image is displayed on a display screen of the display device 3. The data from a number of cameras is, in this example, combined by the processing means to arrive at a single image signal from a virtual view point. The position of the virtual viewpoint is dependent on the determined face orientation, i.e. signal S. One could use the date of all, or a large number of the cameras for synthesizing the image.” *See* para. [0058]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Haan alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ invalidity contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

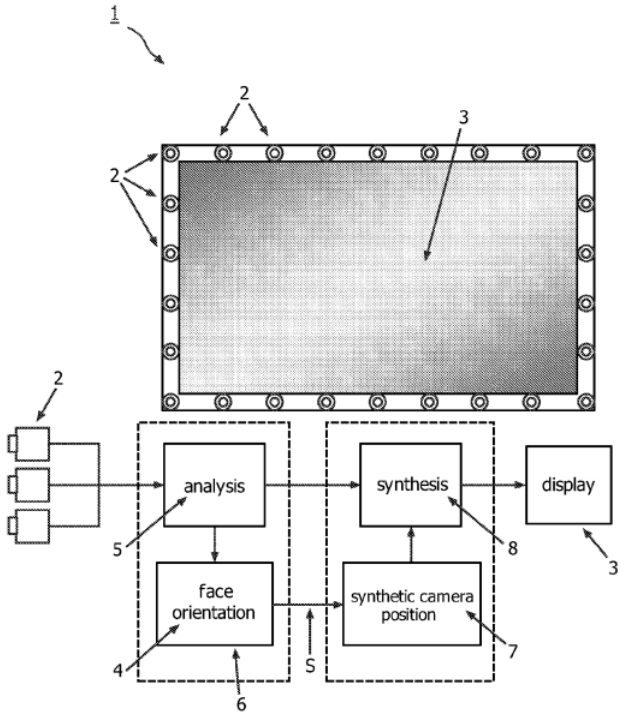
Asserted Claim of the '110 Patent	Exemplary Citations to Haan
Claim 4	
4. The method of claim 3, wherein the body part comprises one of legs, face, eyes, and hands.	Haan expressly and/or inherently discloses and/or renders obvious wherein the body part comprises one of legs, face, eyes, and hands. *See*, *e.g.*, disclosures below. "In another aspect of the invention a device is provided that comprises a frame with a recording device to record an image for a display device, a means to determine a position of a body part with respect to the frame, said means outputting a indication signal to indicate the position of the body part of a viewer with respect to the frame, a means to change the view point from which the image is recorded in dependence on said indication signal, a means to generate an image signal of the recorded image for display on a display screen of a display device." *See* para. [0036]. "The recorded images by cameras 2 are fed to a position determination means 4. In the position determination means the images are analyzed in analyzing means 5 and in this example face orientation is determined in means 6. When a single image is analyzed, a coarse measure for the orientation of a head is for instance the ratio between the size of the head and the distance between the eyes, or the ratio between the distance between the eyes and the distance between the eyes and the mouth. Also clues such as the relative size (in horizontal direction) of the ears can be taken as a measure for the angle. When two images are taken 3-D analysis can be used to determine the angle of rotation of the head in respect of the mirror device and to determine the distance to the display screen. The face orientation is fed into a means for determining the position at which the image that is to be displayed is recorded. Using several cameras one can, by synthesis of the various images, construct a virtual camera position and/or magnification. The output of the face orientation determining means 6 is fed in to a synthetic position and magnification means 7, which determines the parameters for synthesizing the image to be displayed, which synthesizing is performed in synthesis means 8. The synthesized image is displayed on a display screen of the display device 3. The data from a number of cameras is, in this example, combined by the processing means to arrive at a single image signal from a virtual view point. The position of the virtual viewpoint is dependent

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	on the determined face orientation, i.e. signal S. One could use the date of all, or a large number of the cameras for synthesizing the image.” *See* para. [0058]. “FIG. 11 illustrates an embodiment using a single camera and a rotation sensing means 41. As in the embodiment of FIG. 4, the rotation of the face or body is sensed by rotation sensing means 41. This provides a signal that determines the camera position and possibly also orientation. This drives an actuator 8 which changes the position of the camera.” *See* para. [0078].  Fig. 11 “The invention is also embodied in a device or system as shown in FIG. 14. In this aspect of the invention the display itself is not part of the device or system according to the invention, but the device comprises a frame with a recording device to record an image for a display device, a means 4 to determine a position of a body part with respect to the frame, said means outputting a indication signal (S) to indicate the position of the body part of a viewer with respect to the frame, a means to change (7) the view point from which the image is recorded in dependence on said indication signal (S), a means to

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	generate an image signal (I) of the recorded image for display on a display screen of a display device. FIG. 14 illustrates such embodiments. On position 10 a display can be provided." *See* paras. [0099]-[0100]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Haan alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' invalidity contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

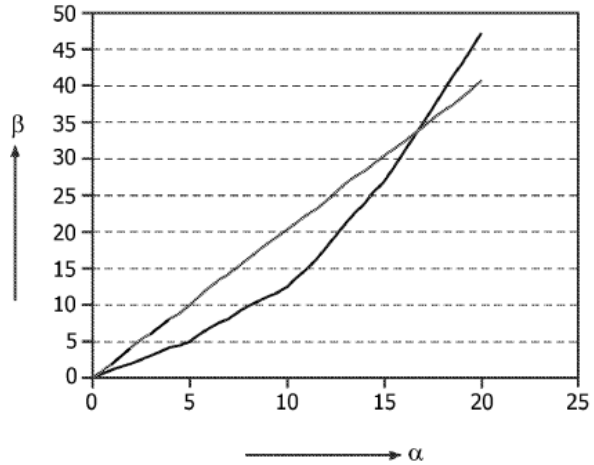
Asserted Claim of the '110 Patent	Exemplary Citations to Haan
Claim 5	
5. The method of claim 1, further comprising receiving user input and operating the processor to vary image magnitude or field-of-view of the modified images according to the user input.	Haan expressly and/or inherently discloses and/or renders obvious receiving user input and operating the processor to vary image magnitude or field-of-view of the modified images according to the user input. *See*, *e.g.*, disclosures below. "To this end the mirror device in accordance with a first aspect of the invention comprises: a display device with a display screen at least one image recording device to record an image a means to determine a position of a body part with respect to the display screen of the display device, said means outputting a indication signal to indicate the position of the body part of a viewer in front of the display screen

Asserted Claim of the '110 Patent	Exemplary Citations to Haan
	a means to change the view point from which the image is recorded in dependence on said indication signal a means to display the recorded image on the display device." *See* paras. [0006]-[0011]. "FIG. 2 illustrates a first embodiment of the invention. The mirror device 1 comprises a number of cameras 2 and a display 3. The recorded images by cameras 2 are fed to a position determination means 4. In the position determination means the images are analyzed in analyzing means 5 and in this example face orientation is determined in means 6. When a single image is analyzed, a coarse measure for the orientation of a head is for instance the ratio between the size of the head and the distance between the eyes, or the ratio between the distance between the eyes and the distance between the eyes and the mouth. Also clues such as the relative size (in horizontal direction) of the ears can be taken as a measure for the angle. When two images are taken 3-D analysis can be used to determine the angle of rotation of the head in respect of the mirror device and to determine the distance to the display screen. The face orientation is fed into a means for determining the position at which the image that is to be displayed is recorded. Using several cameras one can, by synthesis of the various images, construct a virtual camera position and/or magnification. The output of the face orientation determining means 6 is fed in to a synthetic position and magnification means 7, which determines the parameters for synthesizing the image to be displayed, which synthesizing is performed in synthesis means 8. The synthesized image is displayed on a display screen of the display device 3. The data from a number of cameras is, in this example, combined by the processing means to arrive at a single image signal from a virtual view point. The position of the virtual viewpoint is dependent on the determined face orientation, i.e. signal S. One could use the date of all, or a large number of the cameras for synthesizing the image. In simple embodiments, instead of a synthesized image, the image of a particular camera is used for a particular range of orientation of the head. Such a solution, although within

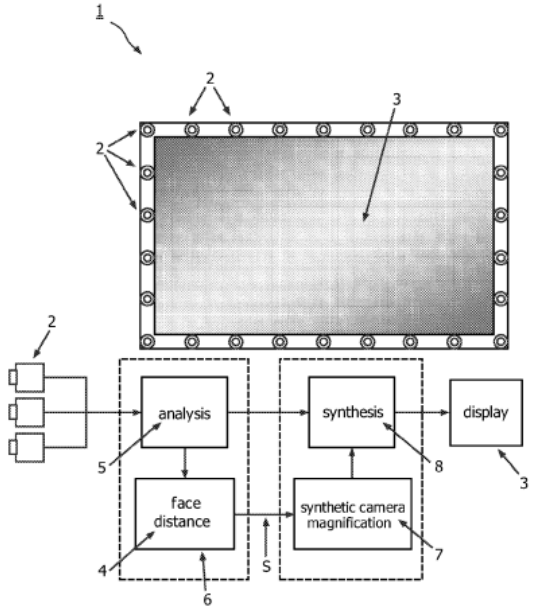
Asserted Claim of the '110 Patent	Exemplary Citations to Haan
	the scope of the invention, however could lead to an image that jumps from one camera position to another. An embodiment intermediate to the two above described embodiments is that, dependent on the signal S, the number of camera used for synthesizing the image is limited to a small number, for instance two or three around the optimal virtual position, instead of using all of the data from all the cameras." *See* paras. [0056]-[0059].  FIG. 2

Asserted Claim of the ’110 Patent	Exemplary Citations to Haan
	“FIG. 3 illustrates the effect of the invention. The orientation determining means establish for instance that the angle of turn of the head is 12 degrees. A normal mirror would then show the head being turned 12 degrees. This is shown for example in part 31. In the mirror device of the invention, the turning of the head can be exaggerated so that, instead of the head being displayed at a turning angle of 12 degrees, the turning angle (and thereby the camera position, i.e. the point of view from the image is recorded) is increased for instance 7-fold, so that a 12 degree turn of the head causes the head, as displayed on the display screen, to be turned 84 degrees. FIG. 3 is a somewhat exaggerated example. In most applications the ratio between the actual turning angle of the head and the turning angle of the displayed head will be closer to 1 for instance a factor of 1.2 to 3, preferably between 1.3 and 2. The amplification of the rotation should be great enough to have an appreciable effect, yet not so great that the enlargement of view and amplified rotation would not be perceived by the user intuitively as using a normal mirror. In FIG. 2 the cameras are shown mounted in a frame of the display device, around the display. This is an embodiment. The cameras can be mounted at some distance from the framework, to increase the possible view points. The cameras, or at least some or one of them, can also be positioned some distance in front of the display. In embodiments the camera can be positioned in side parts attached to the mirror device. The mirror device can have for instance two closing doors, which open when the mirror device is used, wherein cameras are mounted around the perimeter of the display device, as shown in FIG. 2, as well as on the doors, so that the range of possible view points is increased.” *See* paras. [0060]-[0064].

Asserted Claim of the ’110 Patent	Exemplary Citations to Haan
	“FIG. 6 illustrates embodiments of the invention. In the form of a graph the relation between the angle α at which the head is turned and the angle β at which the displayed head is shown. For a flat mirror these two angles are per definition the same, i.e. α≡β. The straight line depicts a situation in which the display device does not comprise a reflective semi-transparent layer, and the cameras are always used to record the image and show the head. In this example the relation between the angles α and β is β=2α, i.e. the rotation of a displayed head or torso is exaggerated by a factor of 2. This is a simple linear relation between the two rotation angles. The curved line depicts a situation wherein for small angle, smaller than 5 degrees no image is displayed and the device comprises a semi-transparent reflective layer. Between 0 and 5 degrees of turn both angles are equal to each other since the device works as a simple mirror, wherein the image is reflected in the semi-transparent reflective layer. When one turns the head over an angle larger than 5 degrees, an image is displayed with an exaggerated angle of turn. At first the exaggeration is only small, but it grows as the head is turned more. In this example a non-linear relation between the angles α and β is used.” *See* paras. [0070]-[0071].

Asserted Claim of the ’110 Patent	Exemplary Citations to Haan
	 FIG. 6 “FIG. 7 illustrates a further embodiment of the invention. When one looks into a flat mirror the perceived distance at which the image is formed is the same as the distance between the object and the mirror. It is possible to use a convex mirror which allows magnification of the object. However this is a fixed magnification. Within embodiments of the invention the displayed image is magnified as a function of the distance to the mirror device. Typically, a viewer holds and maintains a certain distance to a mirror. When he/she wants to take a better look at a detail he/she reduces the distance to the mirror. FIG. 7 illustrates an embodiment of the invention. In FIG. 7 face distance determining means determine the distance of the face in respect of the mirror device. This determination determines the magnification of the displayed image. It is remarked that magnification is in fact equivalent to moving a camera with fixed magnification closer to the object, so all applications can be seen, in fact as changing the point of view, or in other words the position of the camera, be it a real

Asserted Claim of the ’110 Patent	Exemplary Citations to Haan
	camera or a virtual camera. Exaggerating the angle of rotation means in fact that one shifts the point of view from which the image is recorded further to the left or to the right then one would do for a mirror, amplification equals a shift of the point of view towards the object. Distance can be determined in various ways, for instance, when using a single camera, the size of object provides a rough estimation of the distance; when two camera's are used, distance can be determined in much the same way as human eyes and brains determine distance namely by the parallax. Ultrasound means can also be used to measure distance, or such means as are regularly used for cameras to focus can be used.” *See* paras. [0072]-[0074].

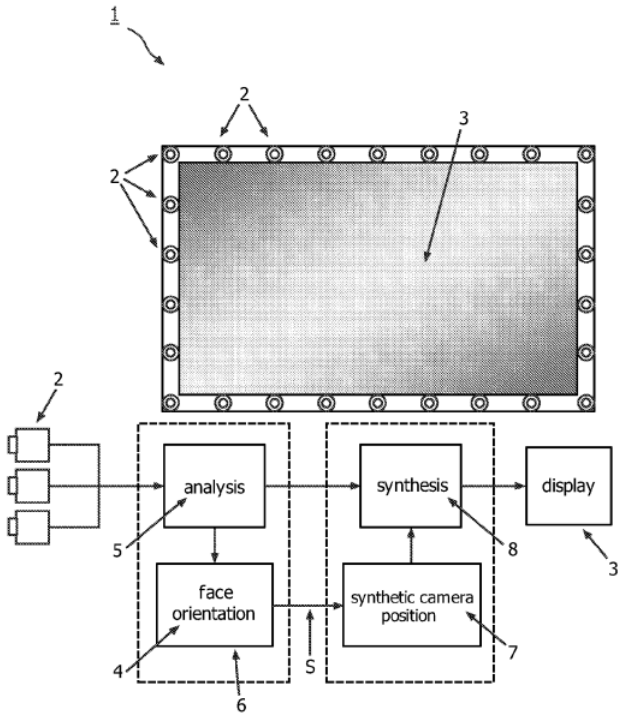
Asserted Claim of the ’110 Patent	Exemplary Citations to Haan
	 FIG. 7 “FIG. 8 illustrates an exemplary relation between the magnification M of the image and the distance d in centimeter to the mirror. For distances d larger than a threshold value, for instance in this example 35 cm distance, the magnification is kept at a fixed value of, in this example 1. This can be done for instance by using the device as a simple mirror, i.e. not displaying an image on the display device, but using the device in the reflective mode. For smaller distances, as the viewer moves his head or torso closer to the display screen, an enlarged image is displayed, i.e. with a magnification larger than 1. To avoid a sudden jump in the image there is a smooth transition between the two regions. In embodiment there can be a range of distances for which the magnification factor is less than 1. This can be for instance

Asserted Claim of the '110 Patent	Exemplary Citations to Haan
	useful when a hat is tried on, a normal mirror would show the face, but only part of the hat. By using a magnification smaller than 1, it does become possible to see the hat even at relatively small distances from the mirror. This would also be useful in small size changing cubicles." *See* paras. [0075]-[0076]. "For simplicity and ease of understanding FIGS. 3, 4 and 7 show set-ups in which the orientation (FIGS. 3, 4) respectively the distance (FIG. 7) is measured. Combinations of the two, in which both orientation and distance are measured, form preferred embodiments." *See* para. [0095]. "In those embodiments wherein the distance is measured, the field of view of the cameras is, in embodiments, changed in dependence on the measured distance d. When the subject moves closer to the mirror, not only the magnification is changed, but also the cameras are rotated so that the cameras are pointed at the position of the viewer. This improves the image. To this end the mirror device is provided with means to rotate the means for recording. FIG. 13 illustrates such embodiments. The signal S in indicative of the distance, drive D3 rotates the cameras 2 so that they are pointing at the position of the head of the viewer." *See* para. [0097]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Haan alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' invalidity contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

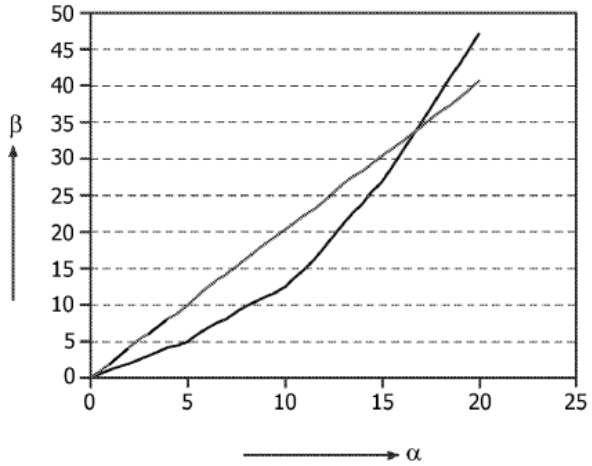
Asserted Claim of the '110 Patent	Exemplary Citations to Haan
Claim 6	

Asserted Claim of the '110 Patent	Exemplary Citations to Haan
6. The method of claim 5, wherein the processor varies the image magnitude or field-of-view mapping to display a partial or full body of the user in the modified images.	Haan expressly and/or inherently discloses and/or renders obvious wherein the processor varies the image magnitude or field-of-view mapping to display a partial or full body of the user in the modified images. *See*, *e.g.*, disclosures below. "To this end the mirror device in accordance with a first aspect of the invention comprises: a display device with a display screen at least one image recording device to record an image a means to determine a position of a body part with respect to the display screen of the display device, said means outputting a indication signal to indicate the position of the body part of a viewer in front of the display screen a means to change the view point from which the image is recorded in dependence on said indication signal a means to display the recorded image on the display device." *See* paras. [0006]-[0011]. "FIG. 2 illustrates a first embodiment of the invention. The mirror device 1 comprises a number of cameras 2 and a display 3. The recorded images by cameras 2 are fed to a position determination means 4. In the position determination means the images are analyzed in analyzing means 5 and in this example face orientation is determined in means 6. When a single image is analyzed, a coarse measure for the orientation of a head is for instance the ratio between the size of the head and the distance between the eyes, or the ratio between the distance between the eyes and the distance between the eyes and the mouth. Also clues such as the relative size (in horizontal direction) of the ears can be taken as a measure for the angle. When two images are taken 3-D analysis can be used to determine the angle of rotation of the head in respect of the mirror device and to determine the distance to the display screen.

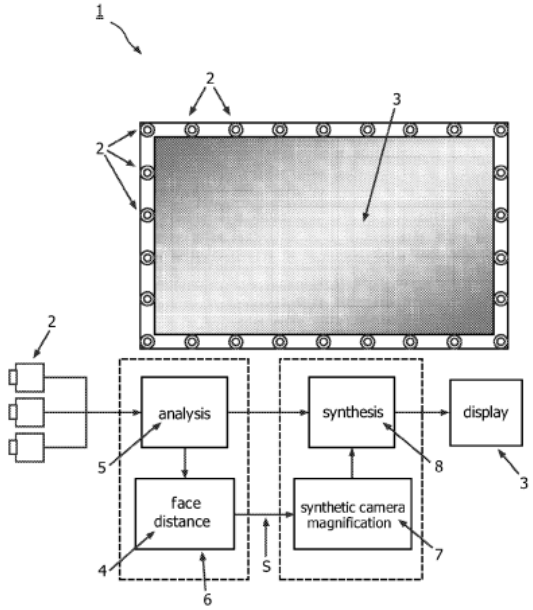
Asserted Claim of the ’110 Patent	Exemplary Citations to Haan
	The face orientation is fed into a means for determining the position at which the image that is to be displayed is recorded. Using several cameras one can, by synthesis of the various images, construct a virtual camera position and/or magnification. The output of the face orientation determining means 6 is fed in to a synthetic position and magnification means 7, which determines the parameters for synthesizing the image to be displayed, which synthesizing is performed in synthesis means 8. The synthesized image is displayed on a display screen of the display device 3. The data from a number of cameras is, in this example, combined by the processing means to arrive at a single image signal from a virtual view point. The position of the virtual viewpoint is dependent on the determined face orientation, i.e. signal S. One could use the date of all, or a large number of the cameras for synthesizing the image. In simple embodiments, instead of a synthesized image, the image of a particular camera is used for a particular range of orientation of the head. Such a solution, although within the scope of the invention, however could lead to an image that jumps from one camera position to another. An embodiment intermediate to the two above described embodiments is that, dependent on the signal S, the number of camera used for synthesizing the image is limited to a small number, for instance two or three around the optimal virtual position, instead of using all of the data from all the cameras.” *See* paras. [0056]-[0059].

Asserted Claim of the ’110 Patent	Exemplary Citations to Haan
	 FIG. 2 “FIG. 3 illustrates the effect of the invention. The orientation determining means establish for instance that the angle of turn of the head is 12 degrees. A normal mirror would then show the head being turned 12 degrees. This is shown for example in part 31. In the mirror device of the invention, the turning of the head can be exaggerated so that, instead of the head being displayed at a turning angle of 12 degrees, the turning angle (and thereby the camera position, i.e. the point of

Asserted Claim of the ’110 Patent	Exemplary Citations to Haan
	view from the image is recorded) is increased for instance 7-fold, so that a 12 degree turn of the head causes the head, as displayed on the display screen, to be turned 84 degrees. FIG. 3 is a somewhat exaggerated example. In most applications the ratio between the actual turning angle of the head and the turning angle of the displayed head will be closer to 1 for instance a factor of 1.2 to 3, preferably between 1.3 and 2. The amplification of the rotation should be great enough to have an appreciable effect, yet not so great that the enlargement of view and amplified rotation would not be perceived by the user intuitively as using a normal mirror. In FIG. 2 the cameras are shown mounted in a frame of the display device, around the display. This is an embodiment. The cameras can be mounted at some distance from the framework, to increase the possible view points. The cameras, or at least some or one of them, can also be positioned some distance in front of the display. In embodiments the camera can be positioned in side parts attached to the mirror device. The mirror device can have for instance two closing doors, which open when the mirror device is used, wherein cameras are mounted around the perimeter of the display device, as shown in FIG. 2, as well as on the doors, so that the range of possible view points is increased.” *See* paras. [0060]-[0064]. “FIG. 6 illustrates embodiments of the invention. In the form of a graph the relation between the angle α at which the head is turned and the angle β at which the displayed head is shown. For a flat mirror these two angles are per definition the same, i.e. α≡β. The straight line depicts a situation in which the display device does not comprise a reflective semi-transparent layer, and the cameras are always used to record the image and show the head. In this example the relation between the angles α and β is β=2α, i.e. the rotation of a displayed head or torso is exaggerated by a factor of 2. This is a simple linear relation between the two rotation angles. The curved line depicts a situation wherein for small angle, smaller than 5 degrees no image is displayed and the device

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	comprises a semi-transparent reflective layer. Between 0 and 5 degrees of turn both angles are equal to each other since the device works as a simple mirror, wherein the image is reflected in the semi-transparent reflective layer. When one turns the head over an angle larger than 5 degrees, an image is displayed with an exaggerated angle of turn. At first the exaggeration is only small, but it grows as the head is turned more. In this example a non-linear relation between the angles α and β is used.” *See* paras. [0070]-[0071].  FIG. 6 “FIG. 7 illustrates a further embodiment of the invention. When one looks into a flat mirror the perceived distance at which the image is formed is the same as the distance between the object and the mirror. It is possible to use a convex mirror which allows magnification of the object. However this is a fixed magnification. Within embodiments of the invention the displayed image is magnified as a function of the distance to the mirror device. Typically, a viewer holds and maintains a certain distance to a mirror.

Asserted Claim of the ’110 Patent	Exemplary Citations to Haan
	When he/she wants to take a better look at a detail he/she reduces the distance to the mirror. FIG. 7 illustrates an embodiment of the invention. In FIG. 7 face distance determining means determine the distance of the face in respect of the mirror device. This determination determines the magnification of the displayed image. It is remarked that magnification is in fact equivalent to moving a camera with fixed magnification closer to the object, so all applications can be seen, in fact as changing the point of view, or in other words the position of the camera, be it a real camera or a virtual camera. Exaggerating the angle of rotation means in fact that one shifts the point of view from which the image is recorded further to the left or to the right then one would do for a mirror, amplification equals a shift of the point of view towards the object. Distance can be determined in various ways, for instance, when using a single camera, the size of object provides a rough estimation of the distance; when two camera's are used, distance can be determined in much the same way as human eyes and brains determine distance namely by the parallax. Ultrasound means can also be used to measure distance, or such means as are regularly used for cameras to focus can be used.” *See* paras. [0072]-[0074].

Asserted Claim of the ’110 Patent	Exemplary Citations to Haan
	 FIG. 7 “FIG. 8 illustrates an exemplary relation between the magnification M of the image and the distance d in centimeter to the mirror. For distances d larger than a threshold value, for instance in this example 35 cm distance, the magnification is kept at a fixed value of, in this example 1. This can be done for instance by using the device as a simple mirror, i.e. not displaying an image on the display device, but using the device in the reflective mode. For smaller distances, as the viewer moves his head or torso closer to the display screen, an enlarged image is displayed, i.e. with a magnification larger than 1. To avoid a sudden jump in the image there is a smooth transition between the two regions. In embodiment there can be a range of distances for which the magnification factor is less than 1. This can be for instance

Asserted Claim of the '110 Patent	Exemplary Citations to Haan
	useful when a hat is tried on, a normal mirror would show the face, but only part of the hat. By using a magnification smaller than 1, it does become possible to see the hat even at relatively small distances from the mirror. This would also be useful in small size changing cubicles." *See* paras. [0075]-[0076]. "For simplicity and ease of understanding FIGS. 3, 4 and 7 show set-ups in which the orientation (FIGS. 3, 4) respectively the distance (FIG. 7) is measured. Combinations of the two, in which both orientation and distance are measured, form preferred embodiments." *See* para. [0095]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Haan alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' invalidity contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '110 Patent	Exemplary Citations to Haan
Claim 10	
10. The method of claim 1, further comprising operating the processor to augment the modified images by overlaying virtual objects on a user's image appearing within the modified images.	Haan expressly and/or inherently discloses and/or renders obvious operating the processor to augment the modified images by overlaying virtual objects on a user's image appearing within the modified images. *See*, *e.g.*, disclosures below. "In embodiments the image displayed on the display screen is simply the image as captured by the cameras. In further embodiments the displayed image may be an image derived from or associated with the captured image. A few examples of such embodiments are:

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	in or for preparation for the application of make-up or grime: The generated image is the image of the viewer, but as it would look after application of the make-up, i.e. colors, extent of make-up etc. A computer program would overlay and adjust the recorded image to simulate applied make-up. The viewer can than take a good look, and at various angles and maybe even at artificial light conditions or at a magnification to judge the effect of the application of make-up. Only when the viewer is satisfied and has made his/her choice the make up or grime is applied. This safes time and money. in preparation for cutting hair at the hair-dresser. The shown mirror image is the image of the viewer as taken, but computer altered to provide various different hair styles and color. The viewer can than judge various hairstyles and colors, at various angels. It would allow the customer a much improved mechanism of choosing the hairstyle and color he or she wants, much better than by looking at photos of models with various hairstyles. In such photos the result always looks very good. This will not only safe time and money but also reduce the chance on disappointment. in preparation for application of tattoos. in preparation for plastic surgery. In such embodiments the viewer is presented with an image that is composed of his or her own mirror image but altered in a way to represent the expected result after surgery. The patient can view his or her image as would be expected after surgery from various angles in the mirror, and thus get a good look at the expected result and, not unimportantly, get familiar with the expected result. This will allow the patient to discuss different options with the surgeon, and immediately see, with his/her own eyes the expected result of the various options. The patient can even, in the embodiments in which the invention is a frame that can be put in front of a normal TV or computer monitor, take the frame home and show to and discuss the expected results with others.

Asserted Claim of the ’110 Patent	Exemplary Citations to Haan
	In dressing rooms: The image provided on the display screen is the mirror image of the viewer, but by computer simulation the image is altered to show the result of a particular dress, gown etc. This would help to make a first selection. In the above examples the mirror image shown is a composite of the recorded image with some artificial compounds. In most extreme examples the mirror image could be completely or almost completely artificial, though still in pose corresponding in large part to the person sitting or standing in front of the mirror device. For instance in games people often choose a character to represent themselves in the game. The synthesized image would be that of the chosen character. The size of the head would for instance still be in accordance with that of the person sitting in front of the mirror. The viewer can look in the “mirror” and, turning his of her head or body, see a reflected image of the chosen character moving in the same way as the viewer, but with increased angles of view. The viewer can get familiar with the chosen character. Often such characters can be provided with accessories, as in real life. The invention, in this embodiment, allows a viewer to “try on” these accessories in a very natural manner and see the result in the mirror with improved viewing possibilities.” *See* paras. [0110]-[0118]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Haan alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ invalidity contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the ’110 Patent	Exemplary Citations to Haan
Claim 11	
11. The method of claim 1, further comprising operating the processor to	Haan expressly and/or inherently discloses and/or renders obvious operating the processor to transmit the modified image over a network. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Haan alone; (2)

Asserted Claim of the '110 Patent	Exemplary Citations to Haan
transmit the modified image over a network.	knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' invalidity contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '110 Patent	Exemplary Citations to Haan
Claim 12	
12. The method of claim 1, further comprising displaying the modified image on a remote screen for video telepresence.	Haan expressly and/or inherently discloses and/or renders obvious displaying the modified image on a remote screen for video telepresence. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Haan alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' invalidity contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '110 Patent	Exemplary Citations to Haan
Claim 16	
16. The method of claim 1, wherein the processor operates on the images from the camera to generate background segmentation, and replaces segments on the images by replacement segments.	Haan expressly and/or inherently discloses and/or renders obvious wherein the processor operates on the images from the camera to generate background segmentation, and replaces segments on the images by replacement segments. *See*, *e.g.*, disclosures below. "The generated image is the image of the viewer, but as it would look after application of the make-up, i.e. colors, extent of make-up etc. A computer program would overlay and adjust the recorded image to simulate applied make-up. The viewer can than take a good look, and at various angles and maybe even at artificial light conditions or at a

Asserted Claim of the '110 Patent	Exemplary Citations to Haan
	magnification to judge the effect of the application of make-up. Only when the viewer is satisfied and has made his/her choice the make up or grime is applied. This safes time and money." *See* paras. [0113]. "in preparation for plastic surgery. In such embodiments the viewer is presented with an image that is composed of his or her own mirror image but altered in a way to represent the expected result after surgery. The patient can view his or her image as would be expected after surgery from various angles in the mirror, and thus get a good look at the expected result and, not unimportantly, get familiar with the expected result. This will allow the patient to discuss different options with the surgeon, and immediately see, with his/her own eyes the expected result of the various options. The patient can even, in the embodiments in which the invention is a frame that can be put in front of a normal TV or computer monitor, take the frame home and show to and discuss the expected results with others." *See* paras. [0116]. "In dressing rooms: The image provided on the display screen is the mirror image of the viewer, but by computer simulation the image is altered to show the result of a particular dress, gown etc. This would help to make a first selection." *See* paras. [0117]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Haan alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' invalidity contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '110 Patent	Exemplary Citations to Haan
Claim 17	

Asserted Claim of the '110 Patent	Exemplary Citations to Haan
17. The method of claim 16, wherein the replacement segments comprise virtual background or background that was captured in a different setting.	Haan expressly and/or inherently discloses and/or renders obvious wherein the replacement segments comprise virtual background or background that was captured in a different setting. *See*, *e.g.*, disclosures below. "The generated image is the image of the viewer, but as it would look after application of the make-up, i.e. colors, extent of make-up etc. A computer program would overlay and adjust the recorded image to simulate applied make-up. The viewer can than take a good look, and at various angles and maybe even at artificial light conditions or at a magnification to judge the effect of the application of make-up. Only when the viewer is satisfied and has made his/her choice the make up or grime is applied. This safes time and money." *See* paras. [0113]. "in preparation for plastic surgery. In such embodiments the viewer is presented with an image that is composed of his or her own mirror image but altered in a way to represent the expected result after surgery. The patient can view his or her image as would be expected after surgery from various angles in the mirror, and thus get a good look at the expected result and, not unimportantly, get familiar with the expected result. This will allow the patient to discuss different options with the surgeon, and immediately see, with his/her own eyes the expected result of the various options. The patient can even, in the embodiments in which the invention is a frame that can be put in front of a normal TV or computer monitor, take the frame home and show to and discuss the expected results with others." *See* paras. [0116]. "In dressing rooms: The image provided on the display screen is the mirror image of the viewer, but by computer simulation the image is altered to show the result of a particular dress, gown etc. This would help to make a first selection." *See* paras. [0117]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Haan alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of

Asserted Claim of the ’110 Patent	Exemplary Citations to Haan
	Defendants’ invalidity contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

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Exhibit B-05: Invalidity of U.S. Patent No. 8,982,110 in view of JP Patent Pub. No. 2010-177777 A ("Hatanaka")

This chart is subject to all reservations, objections, and disclaimers in Defendants' Invalidity Contentions and any amendment, supplement, or modification thereof, which are incorporated herein by reference in their entirety.

Hatanaka was originally filed January 27, 2009 and published on August 12, 2010, and thus is available as prior art to U.S. Patent No. 8,982,110 (the "'110 Patent") under at least 35 U.S.C. §§ 102(a) and (b).

Hatanaka anticipates the Asserted Claims of the '110 Patent. To the extent it is found Hatanaka does not expressly disclose certain limitations in the Asserted Claims, such limitations are at least implicitly or inherently disclosed. Moreover, to the extent it is found that Hatanaka does not anticipate the Asserted Claims, Hatanaka renders obvious the Asserted Claims, either alone or in combination with other prior art identified in the cover pleading or herein, and/or in combination with the general knowledge of a person having ordinary skill in the art.

In these contentions, Defendants have relied in part on Plaintiff's Infringement Contentions. In those contentions, Plaintiff appears to pursue overly broad claim constructions in an effort to assert infringement where none exists, and to accuse products that do not infringe the claims. Defendants' assertion that a particular limitation is disclosed by a prior art reference and/or is disclosed in a particular manner may be based in part on Plaintiff's apparent claim interpretations. In relying on Plaintiff's apparent claim interpretations, Defendants do not admit that Plaintiff's apparent claim interpretations are supportable or proper or that the claim limitations in question are definite or otherwise amenable to construction.

Defendants have endeavored to provide as much detail as possible in these contentions and, in doing so, have exceeded the level of detail required. The inclusion of specific details in some areas is not a concession that such details are required or that the omission of similar details in other areas is a defect. These citations to portions of any reference in this chart are exemplary only. Defendants will rely on the entirety of the references cited in this chart to show that the Asserted Claims are invalid.

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Claim 1	
1[pre]. A computerized method for operating a display system, the display system having a camera, a monitor, and a processor, the method comprising:	To the extent the preamble is limiting, Hatanaka expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. "This invention pertains to an image communication system as well as an image-processing control device and method. For example, they can be applied to systems that distribute live video images." *See* para. [0001]. "Consequently, there have been demands for ways to reduce the throughput of image-data-related processing in image communication systems that are configured to encode images on the transmitting side and then -- on the receiving side -- decode the encoded images for display. The image communication system according to the first invention of the present application is an image communication system provided with (1) an encoding means for encoding an image to create the encoded image data, a decoding means for decoding the encoded image data, and a representation output part which outputs the representation of the decoded image to viewers; said image communication system characterized by comprising (2) a viewer detection means for performing detections about the relative position between the above-mentioned representation output part and a viewer(s), and (3) an encoding-content setting means for setting the content of the encoding performed by the above-mentioned encoding means according to the result detected by the above-mentioned viewer detection means. The image-processing control device according to the second invention of the present application is an image-processing control device that controls the content of image-related processing in an image communication system provided with (1) an encoding means for encoding an image to create the encoded image data, a decoding means for decoding the encoded image data, and a representation output part which outputs the representation of the decoded image to viewers; said image-processing control device characterized by comprising (2) a viewer detection means for performing detections

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	about the relative position between the above-mentioned representation output part and a viewer(s), and (3) an encoding-content setting means for setting the content of the encoding performed by the above-mentioned encoding means according to the result detected by the above-mentioned viewer detection means. The image-processing control method according to the second invention of the present application is an image-processing control method used to control the content of image-related processing in an image communication system provided with (1) an encoding means for encoding an image to create the encoded image data, a decoding means for decoding the encoded image data, and a representation output part which outputs the representation of the decoded image to viewers; said image-processing control method characterized by comprising (2) a viewer detection means and an encoding-content setting means, wherein: (3) The above-mentioned viewer detection means performs detections about the relative position between the above-mentioned representation output part and a viewer; and (4) The above-mentioned encoding-content setting means sets the content of the encoding performed by the above-mentioned encoding means, doing so according to the result detected by the above-mentioned viewer detection means. The present inventions make it possible to reduce the throughput of image-data-related processing in an image communication system configured to encode images on the transmitting side and then decode the encoded data on the receiving side to output the representation of the images. Figure 1 shows a block diagram that illustrates the overall configuration of the image communication system and image-processing control device claimed in the first embodiment.

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	Figure 2 shows an illustrative drawing that explains the viewing distance according to the image-processing control device claimed in the first embodiment. Figure 3 shows a flowchart that illustrates the operation of the image-processing control device claimed in the first embodiment. Figure 4 shows a block diagram that illustrates the overall configuration of the image communication system and image-processing control device claimed in the second embodiment. Figure 5 shows an illustrative drawing that explains the viewing distance and viewing angle according to the image-processing control device claimed in the second embodiment. Figure 6 shows a flowchart that illustrates the operation of the image-processing control device claimed in the second embodiment." *See* paras. [0008]-[0013]. "**(A-1) Configuration of the First Embodiment** Figure 1 shows a block diagram that illustrates the overall configuration of image communication system 1 and image-processing control device 40 according to the present embodiment. Image communication system 1 has camera 10, transmission device 20, receiving device 30, and representation apparatus 50. Transmission device 20 has capturer 21, encoder 22, and encoding controller 23. Receiving device 30 has decoder 31, representation control part 32, and image-processing control device 40. In Figure 1, image-processing control device 40 is illustrated as having at least sensor 41 and assessment part 42. However, encoding controller 23 may be installed on the image-processing-control-device-40 side. In Figure 1, image-processing control device

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	40 is shown as being installed on the receiving-device-30 side, but it may be constructed as an independent discrete device. Camera 10 captures video images and provides signals representing the captured video images to transmission device 20. Camera 10 may be a conventional CCD camera or video camera. There is no restriction on the type of the camera. It should be noted that while images captured by camera 10 may be video or still images, video images are used in the first embodiment to illustrate images captured by camera 10. Transmission device 20 encodes video image signals provided by camera 10 and provides the encoded video image data to receiving device 30. Communication between transmission device 20 and receiving device 30 may be achieved via a network such as the Internet or a public telephone network, or it may be achieved through a direct connection. There is no restriction on the method of communication. Receiving device 30 — upon receipt of encoded video-image data from transmission device 20 — decodes the data and outputs a video image signal to representation apparatus 50.” *See* paras. [0015]-[0020]. “Representation apparatus 50 outputs the representation of the video image to the audience (which may be hereinafter referred to as the "viewer") 60 according to the video image signals provided by receiving device 30. Representation apparatus 50 may be a conventional display device or any other device that can display information on a screen. There is no restriction on the type of the representation apparatus. It should be noted that, though not illustrated in Figure 1, the transmission-device-20 side may be configured so as to use a microphone to acquire audio as camera 10 captures video images as well as to encode the audio thus acquired and transmit it to the receiving-device-30 side so that the audio and the video image are output together to audience 60. The following is an explanation of the internal configuration of transmission device 20: Transmission device 20 has capturer 21, encoder 22, and encoding controller 23.

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	Capturer 21 and encoder 22 in transmission device 20 are responsible for uploading and encoding the video image signals output from camera 10. If video image signals provided by camera 10 are analog signals, capturer 21 converts them to digital signals. However, if video image signals provided by camera 10 are digital signals, capturer 21 handles the signals in the as-is state. Then, capturer 21 gives the video image data to encoder 22. The video image data are then encoded by encoder 22 (which may use, for example, a conventional encoding scheme such as MPEG4) and are sent to receiving device 30. While transmission device 20 is equipped with capturer 21 in Figure 1, capturer 21 may be omitted if camera 10 provides video image data in the digital format or if a camera equipped with a capturer is used. Encoding controller 23 is responsible for controlling the content of the video-image encoding process performed by capturer 21 and encoding controller 22 in response to the control communicated from receiving device 30 (i.e., assessment part 42, which shall be described in a later section). The detailed description of the control provided by encoding controller 23 shall be described in a later section." *See* paras. [0021]-[0024]. "Representation control part 32 converts the image data decoded by decoder 31 into an image signal of the size that can be displayed on representation apparatus 50 and then provides the image signal of said display size to representation apparatus 50. Representation control part 32 may be installed on the representation apparatus-50 side. Representation control part 32 applicable herein may be any means for converting image data to be displayed into a signal of an image of the size that can be displayed on a display used to output the representation of said image according to the resolution of the image data, doing so in a conventional display device or computer, for example." *See* para. [0027]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Hatanaka alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of

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	Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[a]. operating the camera to generate a stream of images of the user;	Hatanaka expressly and/or inherently discloses and/or renders obvious operating the camera to generate a stream of images of the user. *See*, *e.g.*, disclosures below. "This invention pertains to an image communication system as well as an image-processing control device and method. For example, they can be applied to systems that distribute live video images. Conventionally, the devices described in patent documents 1 and 2 have been used to encode images, such as live video images. The device described in Patent Document 1 can dynamically alter the encoding resolution according to the amount of movement in the video image." *See* paras. [0001]-[0003]. "**(A-1) Configuration of the First Embodiment** Figure 1 shows a block diagram that illustrates the overall configuration of image communication system 1 and image-processing control device 40 according to the present embodiment. Image communication system 1 has camera 10, transmission device 20, receiving device 30, and representation apparatus 50. Transmission device 20 has capturer 21, encoder 22, and encoding controller 23. Receiving device 30 has decoder 31, representation control part 32, and image-processing control device 40. In Figure 1, image-processing control device 40 is illustrated as having at least sensor 41 and assessment part 42. However, encoding controller 23 may be installed on the image-processing-control-device-40 side. In Figure 1, image-processing control device

Asserted Claim of the ’110 Patent	Exemplary Citations to Hatanaka
	40 is shown as being installed on the receiving-device-30 side, but it may be constructed as an independent discrete device. Camera 10 captures video images and provides signals representing the captured video images to transmission device 20. Camera 10 may be a conventional CCD camera or video camera. There is no restriction on the type of the camera. It should be noted that while images captured by camera 10 may be video or still images, video images are used in the first embodiment to illustrate images captured by camera 10. Transmission device 20 encodes video image signals provided by camera 10 and provides the encoded video image data to receiving device 30. Communication between transmission device 20 and receiving device 30 may be achieved via a network such as the Internet or a public telephone network, or it may be achieved through a direct connection. There is no restriction on the method of communication. Receiving device 30 — upon receipt of encoded video-image data from transmission device 20 — decodes the data and outputs a video image signal to representation apparatus 50.” *See* paras. [0015]-[0020]. “Representation apparatus 50 outputs the representation of the video image to the audience (which may be hereinafter referred to as the "viewer") 60 according to the video image signals provided by receiving device 30. Representation apparatus 50 may be a conventional display device or any other device that can display information on a screen. There is no restriction on the type of the representation apparatus. It should be noted that, though not illustrated in Figure 1, the transmission-device-20 side may be configured so as to use a microphone to acquire audio as camera 10 captures video images as well as to encode the audio thus acquired and transmit it to the receiving-device-30 side so that the audio and the video image are output together to audience 60. The following is an explanation of the internal configuration of transmission device 20: Transmission device 20 has capturer 21, encoder 22, and encoding controller 23.

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	Capturer 21 and encoder 22 in transmission device 20 are responsible for uploading and encoding the video image signals output from camera 10. If video image signals provided by camera 10 are analog signals, capturer 21 converts them to digital signals. However, if video image signals provided by camera 10 are digital signals, capturer 21 handles the signals in the as-is state. Then, capturer 21 gives the video image data to encoder 22. The video image data are then encoded by encoder 22 (which may use, for example, a conventional encoding scheme such as MPEG4) and are sent to receiving device 30. While transmission device 20 is equipped with capturer 21 in Figure 1, capturer 21 may be omitted if camera 10 provides video image data in the digital format or if a camera equipped with a capturer is used. Encoding controller 23 is responsible for controlling the content of the video-image encoding process performed by capturer 21 and encoding controller 22 in response to the control communicated from receiving device 30 (i.e., assessment part 42, which shall be described in a later section). The detailed description of the control provided by encoding controller 23 shall be described in a later section." *See* paras. [0021]-[0024]. "Assessment part 42 provides instructions to encoding controller 23 so as to control the content to be encoded according to viewing distance D measured by sensor 41. Then, encoding controller 23 controls the content of the video-image encoding process performed by capturer 21 and encoder 22 according to the instructions from assessment part 42. For example, assessment part 42 adjusts the content to be encoded in such a way as to reduce the amount of encoding throughput and the amount of post-encoding data as viewing distance D increases. Additionally, assessment part 42 may be configured to adjust the content to be encoded in such a way as to minimize the amount of encoding throughput and the amount of post-encoding data when sensor 41 does not detect any audience 60. For example, suppose video image signals provided by camera 10 are analog signals (e.g., NTSC signals or the like). In this case, when the signal is uploaded to capturer 21 and converted to a digital image at a prescribed resolution, the resolution used in this event may be altered in response to the control provided by encoding controller 23. For

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	example, a resolution in compliance with the instructions from encoding controller 23 may be used for the encoding rendered by encoder 22." *See* paras. [0037]-[0038]. "Figure 3 shows a diagram that illustrates the sequence of the operation involved in the video image processing control in the image communication system. In Figure 3, it is assumed that the video image data encoded by transmission device 20 is given to receiving device 30 and output from receiving device 30 to representation apparatus 50, and the video image is presented to audience 60 through representation apparatus 50 — from the beginning of the processing. First, sensor 41 measures viewing distance D (S101). Next, upon receipt of viewing distance D from sensor 41, assessment part 42 sends out a signal, which controls the content to be encoded according to viewing distance D, to transmission device 20 (encoding controller 23) (S102). Upon receipt of the decoding-content control signal from assessment part 42, encoding controller 23 controls capturer 21 and encoder 22 according to said signal, and then capturer 21 and encoder 22 continue to encode video images according to that content (S103)." *See* paras. [0041]-[0045]. "In capturer 21 and encoder 22, video image data are encoded at the resolution determined by assessment part 42 based on viewing distance D measured by sensor 41. Then, the video image data thus encoded are decoded by decoder 31 and displayed on representation apparatus 50. In this event, the resolution of the video image can be lowered to the extent that the audience cannot recognize the image, thus reducing the amount of encoding throughput. Additionally, the reduction of the amount of post-encoding data makes it possible to reduce the amount of data transmitted from transmission device 20 (encoder 22) to receiving device 30 (decoder 31), thereby reducing the load on the network.

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	For example, in a company having multiple offices, image communication system 1 is preferably adopted in a system that transmits live video images between multiple locations, for example, to distribute images of each office's sceneries as captured with a camera to other offices or distribute images of rivers, bays, etc., as captured with surveillance cameras to a monitoring center. In such a system that transmits live video images between multiple locations, the audience is not always near the representation apparatus (display) while the system is in operation. However, the present embodiment allows for the encoding/decoding at a lower resolution, etc., when there is no audience in the immediate vicinity of the representation apparatus (display), thus enabling efficient processing of images." *See* paras. [0049]-[0051]. "Image communication system 1A has camera 10, transmission device 20, receiving device 30, and representation apparatus 50. Camera 10, transmission device 20, and representation apparatus 50 are similar to those illustrated in the first embodiment. Accordingly, the explanation thereof shall be omitted hereafter. Receiving device 30A has decoder 31, representation control part 32, and image-processing control device 40A. Decoder 31 and representation control part 32 are similar to those illustrated in the first embodiment. Accordingly, the explanation thereof shall be omitted hereafter. Image-processing control device 40A has sensor 41A and assessment part 42A." *See* paras. [0055]-[0057]. "Figure 6 shows a diagram that illustrates the sequence of the operation involved in the video image processing control in the image communication system 1A. It is assumed, in Figure 6, that the video image data encoded by transmission device 20 is given to receiving device 30A and output from receiving device 30A to representation apparatus 50, and the video image is presented to audience 60 through representation apparatus 50 — from the beginning of the processing.

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	First, sensor 41A measures viewing distance D and viewing angle θ (S201). Next, upon receipt of viewing distance D and viewing angle θ from sensor 41A, assessment part 42A sends out a signal, which controls the content of the encoding according to viewing distance D and viewing angle θ, to transmission device 20 (encoding controller 23) (S202). Upon receipt of the encoding-content control signal from assessment part 42A, encoding controller 23 controls capturer 21 and encoder 22 according to said signal, and subsequently, capturer 21 and encoder 22 continue to encode video images according to that content (S203)." *See* paras. [0071]-[0075]. "**(C-3)** All the embodiments described above assume that the encoder uploads and encodes live video images captured by the camera. However, the subjects of encoding performed by the encoder are not limited to live video images captured by the camera. For example, video images recorded on a medium, such as a videotape or DVD, may be encoded in a format used for transmission to the receiving device." *See* para. [0086]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Hatanaka alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[b]. operating the processor to detect the presence of the user in the stream of image;	Hatanaka expressly and/or inherently discloses and/or renders obvious operating the processor to detect the presence of the user in the stream of image. *See*, *e.g.*, disclosures below. "This invention pertains to an image communication system as well as an image-processing control device and method. For example, they can be applied to systems that distribute live video images." *See* para. [0001].

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	"Consequently, there have been demands for ways to reduce the throughput of image-data-related processing in image communication systems that are configured to encode images on the transmitting side and then -- on the receiving side -- decode the encoded images for display. The image communication system according to the first invention of the present application is an image communication system provided with (1) an encoding means for encoding an image to create the encoded image data, a decoding means for decoding the encoded image data, and a representation output part which outputs the representation of the decoded image to viewers; said image communication system characterized by comprising (2) a viewer detection means for performing detections about the relative position between the above-mentioned representation output part and a viewer(s), and (3) an encoding-content setting means for setting the content of the encoding performed by the above-mentioned encoding means according to the result detected by the above-mentioned viewer detection means. The image-processing control device according to the second invention of the present application is an image-processing control device that controls the content of image-related processing in an image communication system provided with (1) an encoding means for encoding an image to create the encoded image data, a decoding means for decoding the encoded image data, and a representation output part which outputs the representation of the decoded image to viewers; said image-processing control device characterized by comprising (2) a viewer detection means for performing detections about the relative position between the above-mentioned representation output part and a viewer(s), and (3) an encoding-content setting means for setting the content of the encoding performed by the above-mentioned encoding means according to the result detected by the above-mentioned viewer detection means. The image-processing control method according to the second invention of the present application is an image-processing control method used to control the content of image-related processing in an image communication system provided with (1) an encoding means for encoding an image to create the encoded image data, a decoding

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	means for decoding the encoded image data, and a representation output part which outputs the representation of the decoded image to viewers; said image-processing control method characterized by comprising (2) a viewer detection means and an encoding-content setting means, wherein: (3) The above-mentioned viewer detection means performs detections about the relative position between the above-mentioned representation output part and a viewer; and (4) The above-mentioned encoding-content setting means sets the content of the encoding performed by the above-mentioned encoding means, doing so according to the result detected by the above-mentioned viewer detection means. The present inventions make it possible to reduce the throughput of image-data-related processing in an image communication system configured to encode images on the transmitting side and then decode the encoded data on the receiving side to output the representation of the images. Figure 1 shows a block diagram that illustrates the overall configuration of the image communication system and image-processing control device claimed in the first embodiment. Figure 2 shows an illustrative drawing that explains the viewing distance according to the image-processing control device claimed in the first embodiment. Figure 3 shows a flowchart that illustrates the operation of the image-processing control device claimed in the first embodiment. Figure 4 shows a block diagram that illustrates the overall configuration of the image communication system and image-processing control device claimed in the second embodiment.

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	Figure 5 shows an illustrative drawing that explains the viewing distance and viewing angle according to the image-processing control device claimed in the second embodiment. Figure 6 shows a flowchart that illustrates the operation of the image-processing control device claimed in the second embodiment.” *See* paras. [0008]-[0013]. “The following is an explanation of the configuration of image-processing control device 40. Image-processing control device 40 has sensor 41 and assessment part 42. Sensor 41 measures the distance between audience 60 and representation apparatus 50 (hereinafter referred to as "viewing distance D") and provides assessment part 42 with the measurement result. Incidentally, sensor 41 may be placed around representation apparatus 50 so as to measure the distance between representation apparatus 50 and audience 60 and deem the distance thus measured as viewing distance D.” *See* paras. [0028]-[0029]. “An example of the method used to measure viewing distance D in sensor 41 may involve the use of, for example, a motion sensor, a wireless IC tag, or the like as described in relation to the “proximity detection means” according to Patent Document 2. Another example of the method used to measure viewing distance D in sensor 41 may involve having audience 60 hold a wireless communication terminal (which, for example, may be built into a terminal used to operate representation apparatus 50, etc., such as a remote control terminal, a mobile phone terminal, or the like) and installing sensor 41 around representation apparatus 50 so that sensor 41 communicates with the above-described wireless communication terminal to thereby measure the distance between the above-described wireless communication terminal and sensor 41, i.e., viewing distance D. The above-described distance between the wireless communication terminal and sensor 41 may be measured based, for example, on the

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	intensity of the signal received or the transmission lag time. Wireless communication between the above-described wireless communication terminal and sensor 41 may be achieved through the use of light, such as radio waves or infrared rays. However, there is no restriction on the communication method insofar as viewing distance D can be measured. Yet another example of the method used to measure viewing distance D in sensor 41 may involve installing multiple motion sensors around representation apparatus 50 and pre-registering the respective viewing distance for each motion sensor so as to recognize the distance of the audience based on which motion sensor has detected the audience. For example, motion sensors may be placed at equal distances from representation apparatus 50 to measure audience distance L. Incidentally, conventional motion sensors can be used as the motion sensors adopted for sensor 41." *See* paras. [0033]-[0035]. "Assessment part 42 provides instructions to encoding controller 23 so as to control the content to be encoded according to viewing distance D measured by sensor 41. Then, encoding controller 23 controls the content of the video-image encoding process performed by capturer 21 and encoder 22 according to the instructions from assessment part 42. For example, assessment part 42 adjusts the content to be encoded in such a way as to reduce the amount of encoding throughput and the amount of post-encoding data as viewing distance D increases. Additionally, assessment part 42 may be configured to adjust the content to be encoded in such a way as to minimize the amount of encoding throughput and the amount of post-encoding data when sensor 41 does not detect any audience 60." *See* para. [0037]. "For example, in a company having multiple offices, image communication system 1 is preferably adopted in a system that transmits live video images between multiple locations, for example, to distribute images of each office's sceneries as captured with a camera to other offices or distribute images of rivers, bays, etc., as captured with surveillance cameras to a monitoring center. In such a system that transmits live video images between multiple locations, the audience is not always near the representation apparatus (display) while the system is in operation. However, the present embodiment

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	allows for the encoding/decoding at a lower resolution, etc., when there is no audience in the immediate vicinity of the representation apparatus (display), thus enabling efficient processing of images.” *See* para. [0051]. “Image-processing control device 40A has sensor 41A and assessment part 42A. As described above, sensor 41 in the first embodiment measures viewing distance D only. However, sensor 41A in the present embodiment differs from sensor 41 in that sensor 41A also measures the direction in which audience 60 is located relative to representation apparatus 50 (hereinafter, the "viewing direction"). Figure 5 shows an illustrative drawing that illustrates an example of viewing distance D (which is the distance between representation apparatus 50 and audience 60) and the audience direction. Figure 5 (a) shows an example of representation apparatus 50 (a display device in this example) in the state in which representation apparatus 50 (a display device) is viewed from the front. Figure 5 (b) shows an illustrative drawing that illustrates examples of viewing distance D, i.e., the distance between representation apparatus 50 and audience 60, and the viewing direction in the state in which representation apparatus 50 shown in Figure 5 (a) is viewed from the top. The method used to measure viewing distance D in sensor 41A is similar to that of the first embodiment. Accordingly, the explanation thereof shall be omitted hereafter Here, sensor 41A uses a line passing through the center of representation apparatus 50 anterior to the representation apparatus 50 as a reference line to determine the viewing direction by measuring the angle formed between the reference line and a straight line formed between the above-described center position and audience 60’s position

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	(hereinafter referred to as "viewing angle θ"), as shown in Figure 5(b). However, the viewing angle may be measured based on a different center position and reference line. In the same way as in the case of viewing distance D, an example of the method used to measure viewing angle θ in sensor 41A may involve the use of, for example, a motion sensor, a wireless IC tag, or the like, as described in relation to the “proximity detection means” according to Patent Document 2, whereby sensor 41A recognizes the positional relationship between audience 60 and representation apparatus 50 to thereby determine viewing angle θ. Figure 5 shows an example of detecting the two-dimensional direction of audience 60 relative to representation apparatus 50. However, sensor 41A may also be configured to detect the direction of audience 60 relative to representation apparatus 50 three-dimensionally (including the elevation angle). For example, by having audience 60 hold a wireless communication terminal (which, for example, may be built into a terminal used to operate representation apparatus 50, etc., such as a remote control terminal, a mobile phone terminal, or the like), it becomes possible for sensor 41A to communicate with the above-described wireless communication terminal so that sensor 41A can determine viewing angle θ by measuring the direction in which a wireless signal (e.g., radio waves, infrared rays, etc.) is acquired from the above-described wireless communication terminal. Wireless communication between the above-described wireless communication terminal and sensor 41 may be achieved through the use of light, such as radio waves or infrared rays. However, there is no restriction on the communication method insofar as viewing angle θ can be measured. Another example of the method used to measure viewing angle θ in sensor 41A may involve installing multiple motion sensors around representation apparatus 50 and pre-registering the viewing angle for each motion sensor so as to recognize the positional relationship between audience 60 and representation apparatus 50 and detect viewing angle θ based on the positional relationship thus recognized. However, there is no

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	restriction on the method used in sensor 41A insofar as viewing angle θ can be measured." *See* paras. [0057]-[0066]. "(**C-1)** In the first embodiment, a sensor detects viewing angle D and thereby determines the content of the encoding performed by the encoder. The second embodiment is illustrated with an example in which viewing distance D and viewing angle θ are detected for the determination of the content of the encoding performed by the encoder. However, only viewing angle θ may be detected for the determination of the content of the encoding performed by the encoder" *See* para. [0081]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Hatanaka alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[c]. operating the processor to apply adaptive transformation mapping to the stream of images captured by the camera to generate modified images that appear to be captured from a different point of view of the camera's actual point of view; and	Hatanaka expressly and/or inherently discloses and/or renders obvious operating the processor to apply adaptive transformation mapping to the stream of images captured by the camera to generate modified images that appear to be captured from a different point of view of the camera's actual point of view. *See*, *e.g.*, disclosures below. "Receiving device 30 — upon receipt of encoded video-image data from transmission device 20 — decodes the data and outputs a video image signal to representation apparatus 50." *See* para. [0020]. "Encoding controller 23 is responsible for controlling the content of the video-image encoding process performed by capturer 21 and encoding controller 22 in response to the control communicated from receiving device 30 (i.e., assessment part 42, which shall be described in a later section). The detailed description of the control provided by encoding controller 23 shall be described in a later section.

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	Next is an explanation of the internal configuration of receiving device 30. Receiving device 30 has decoder 31, representation control part 32, and image-processing control device 40. Decoder 31 decodes the encoded image data provided by transmission device 20 and provides the decoded image data to representation control part 32. Decoder 31 applicable herein may be, for example, a conventional device that can decode video images. Representation control part 32 converts the image data decoded by decoder 31 into an image signal of the size that can be displayed on representation apparatus 50 and then provides the image signal of said display size to representation apparatus 50. Representation control part 32 may be installed on the representation apparatus-50 side. Representation control part 32 applicable herein may be any means for converting image data to be displayed into a signal of an image of the size that can be displayed on a display used to output the representation of said image according to the resolution of the image data, doing so in a conventional display device or computer, for example. The following is an explanation of the configuration of image-processing control device 40. Image-processing control device 40 has sensor 41 and assessment part 42. [0024]-[0028]. "Assessment part 42 provides instructions to encoding controller 23 so as to control the content to be encoded according to viewing distance D measured by sensor 41. Then, encoding controller 23 controls the content of the video-image encoding process performed by capturer 21 and encoder 22 according to the instructions from assessment part 42. For example, assessment part 42 adjusts the content to be encoded in such a way as to reduce the amount of encoding throughput and the amount of post-encoding data as viewing distance D increases. Additionally, assessment part 42 may be configured to adjust the content to be encoded in such a way as to minimize the amount of encoding throughput and the amount of post-encoding data when sensor 41 does not detect any audience 60.

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	For example, suppose video image signals provided by camera 10 are analog signals (e.g., NTSC signals or the like). In this case, when the signal is uploaded to capturer 21 and converted to a digital image at a prescribed resolution, the resolution used in this event may be altered in response to the control provided by encoding controller 23. For example, a resolution in compliance with the instructions from encoding controller 23 may be used for the encoding rendered by encoder 22. Assessment part 42 can also be configured in other ways. For example, it may be configured so as to provide encoding controller 23 with instructions so that encoding controller 23 adjusts the frame rate, quantization step size, compression ratio, etc., according to viewing distance D. It should be noted that there are no restrictions on the method used to adjust the resolution, frame rate, etc., according to viewing distance D. The adjustment may be achieved by means of altering the parameters applied to the codec or changing the codec itself. By way of example, in the present embodiment, it is assumed that assessment part 42 and encoding controller 23 control the resolution of the image encoded by capturer 21 and encoder 22 in such a way that the resolution is lowered as viewing distance D increases." *See* paras. [0037]-[0039]. "**(A-2) Operation of the First Embodiment** The following is an explanation of the image-processing control operation (image-processing control method according to the embodiment) in image communication system 1, having the configuration described above according to the first embodiment. Figure 3 shows a diagram that illustrates the sequence of the operation involved in the video image processing control in the image communication system. In Figure 3, it is assumed that the video image data encoded by transmission device 20 is given to receiving device 30 and output from receiving device 30 to representation apparatus 50, and the video image is presented to audience 60 through representation apparatus 50 — from the beginning of the processing. First, sensor 41 measures viewing distance D (S101).

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	Next, upon receipt of viewing distance D from sensor 41, assessment part 42 sends out a signal, which controls the content to be encoded according to viewing distance D, to transmission device 20 (encoding controller 23) (S102). Upon receipt of the decoding-content control signal from assessment part 42, encoding controller 23 controls capturer 21 and encoder 22 according to said signal, and then capturer 21 and encoder 22 continue to encode video images according to that content (S103). In step S103, encoding controller 23 may be configured so as to not send a resolution-change instruction to capturer 21 and encoder 22 if it receives the same encoding resolution as the last encoding resolution used. Or, if encoding controller 23 receives a different encoding resolution from the last encoding resolution used, it may send a new encoding resolution to capturer 21 and encoder 22. Incidentally, the operation in steps S101 through S103 described above may be repeated continuously or periodically, or according to sensor 41’s detection of audience 60's movement. There is no restriction on the timing of executing the process.” *See* paras. [0040]-[0047]. “**(A-3) Effects of the First Embodiment** The first embodiment demonstrates the following effects: In capturer 21 and encoder 22, video image data are encoded at the resolution determined by assessment part 42 based on viewing distance D measured by sensor 41. Then, the video image data thus encoded are decoded by decoder 31 and displayed on representation apparatus 50. In this event, the resolution of the video image can be lowered to the extent that the audience cannot recognize the image, thus reducing the amount of encoding throughput. Additionally, the reduction of the amount of post-encoding data makes it possible to reduce the amount of data transmitted from

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	transmission device 20 (encoder 22) to receiving device 30 (decoder 31), thereby reducing the load on the network. Additionally, data encoded at a reduced encoding resolution by encoder 22 is decoded by decoder 31. This makes it possible to reduce the amount of decoding throughput in decoder 31. For example, in a company having multiple offices, image communication system 1 is preferably adopted in a system that transmits live video images between multiple locations, for example, to distribute images of each office's sceneries as captured with a camera to other offices or distribute images of rivers, bays, etc., as captured with surveillance cameras to a monitoring center. In such a system that transmits live video images between multiple locations, the audience is not always near the representation apparatus (display) while the system is in operation. However, the present embodiment allows for the encoding/decoding at a lower resolution, etc., when there is no audience in the immediate vicinity of the representation apparatus (display), thus enabling efficient processing of images." *See* paras. [0048]-[0051]. "While assessment part 42A in the first embodiment makes an assessment based only on viewing distance D, assessment part 42A in the present embodiment uses viewing distance D and viewing angle θ to make an assessment as mentioned above. Then, encoding controller 23 controls the content of the video-image encoding process performed by capturer 21 and encoder 22 according to the instructions from assessment part 42. For example, assessment part 42 gives instructions to encoding controller 23 so as to cause the amount of encoding throughput and the amount of post-encoding data to decrease as viewing distance D increases. For example, assessment part 42A may be configured to give instructions to encoding controller 23 so as to cause the transverse (horizontal) resolution to be lowered as viewing angle θ increases — e.g., so as to use a resolution applied based only on viewing distance D for comparison and multiply it by √3/2 when viewing angle θ is 30° but by

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	1/2 when viewing angle θ is 60° to obtain the transverse (horizontal) resolution. Incidentally, when detecting the direction of audience 60 relative to representation apparatus 50 three-dimensionally (i.e., when including the elevation angle associated with the direction of audience 60 in the measurement), assessment part 42A may be configured to give instructions to encoding controller 23 so as to cause the longitudinal (vertical) resolution to be lowered as the elevation angle increases, for example." *See* paras. [0067]-[0069]. "**(B-2) Operation of the Second Embodiment** The following is an explanation of the image-processing control operation (image-processing control method according to the embodiment) in image communication system 1A, having the configuration described above according to the second embodiment. Figure 6 shows a diagram that illustrates the sequence of the operation involved in the video image processing control in the image communication system 1A. It is assumed, in Figure 6, that the video image data encoded by transmission device 20 is given to receiving device 30A and output from receiving device 30A to representation apparatus 50, and the video image is presented to audience 60 through representation apparatus 50 — from the beginning of the processing. First, sensor 41A measures viewing distance D and viewing angle θ (S201). Next, upon receipt of viewing distance D and viewing angle θ from sensor 41A, assessment part 42A sends out a signal, which controls the content of the encoding according to viewing distance D and viewing angle θ, to transmission device 20 (encoding controller 23) (S202). Upon receipt of the encoding-content control signal from assessment part 42A, encoding controller 23 controls capturer 21 and encoder 22 according to said signal, and

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	subsequently, capturer 21 and encoder 22 continue to encode video images according to that content (S203). In step S203, similar to step S103 in the first embodiment described above, encoding controller 23 may be configured so as to not send a resolution-change instruction to capturer 21 and encoder 22 if it receives the same encoding resolution as the last encoding resolution used. Or, if encoding controller 23 receives a different encoding resolution from the last encoding resolution used, it may send a new encoding resolution to capturer 21 and encoder 22. Also, similar to the case of steps S101 through S103 in the first embodiment, there is no restriction on the timing of executing the process involved in the operation performed in steps S201 to S203." *See* paras. [0070]-[0077]. "**(B-3) Effects of the Second Embodiment** The second embodiment demonstrates the following effects in addition to the effects of the first embodiment: Image communication system 1A takes into account not only viewing distance D but also viewing angle θ to determine the content of the encoding performed by encoder 22. This makes it possible to include viewing angle θ in consideration for the determination of the content of the encoding performed by encoder 22 if viewing distance D is the same, thus making it possible to reduce the amount of throughput associated with the encoding and the amount of post-encoding data more than the first embodiment." *See* paras. [0078]-[0079]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Hatanaka alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

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1[d]. displaying the modified images on the monitor;	Hatanaka expressly and/or inherently discloses and/or renders obvious displaying the modified images on the monitor. *See*, *e.g.*, disclosures below. "Receiving device 30 — upon receipt of encoded video-image data from transmission device 20 — decodes the data and outputs a video image signal to representation apparatus 50." *See* para. [0020]. "Encoding controller 23 is responsible for controlling the content of the video-image encoding process performed by capturer 21 and encoding controller 22 in response to the control communicated from receiving device 30 (i.e., assessment part 42, which shall be described in a later section). The detailed description of the control provided by encoding controller 23 shall be described in a later section. Next is an explanation of the internal configuration of receiving device 30. Receiving device 30 has decoder 31, representation control part 32, and image-processing control device 40. Decoder 31 decodes the encoded image data provided by transmission device 20 and provides the decoded image data to representation control part 32. Decoder 31 applicable herein may be, for example, a conventional device that can decode video images. Representation control part 32 converts the image data decoded by decoder 31 into an image signal of the size that can be displayed on representation apparatus 50 and then provides the image signal of said display size to representation apparatus 50. Representation control part 32 may be installed on the representation apparatus-50 side. Representation control part 32 applicable herein may be any means for converting image data to be displayed into a signal of an image of the size that can be displayed on a display used to output the representation of said image according to the resolution of the image data, doing so in a conventional display device or computer, for example.

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	The following is an explanation of the configuration of image-processing control device 40. Image-processing control device 40 has sensor 41 and assessment part 42. [0024]-[0028]. "Assessment part 42 provides instructions to encoding controller 23 so as to control the content to be encoded according to viewing distance D measured by sensor 41. Then, encoding controller 23 controls the content of the video-image encoding process performed by capturer 21 and encoder 22 according to the instructions from assessment part 42. For example, assessment part 42 adjusts the content to be encoded in such a way as to reduce the amount of encoding throughput and the amount of post-encoding data as viewing distance D increases. Additionally, assessment part 42 may be configured to adjust the content to be encoded in such a way as to minimize the amount of encoding throughput and the amount of post-encoding data when sensor 41 does not detect any audience 60. For example, suppose video image signals provided by camera 10 are analog signals (e.g., NTSC signals or the like). In this case, when the signal is uploaded to capturer 21 and converted to a digital image at a prescribed resolution, the resolution used in this event may be altered in response to the control provided by encoding controller 23. For example, a resolution in compliance with the instructions from encoding controller 23 may be used for the encoding rendered by encoder 22. Assessment part 42 can also be configured in other ways. For example, it may be configured so as to provide encoding controller 23 with instructions so that encoding controller 23 adjusts the frame rate, quantization step size, compression ratio, etc., according to viewing distance D. It should be noted that there are no restrictions on the method used to adjust the resolution, frame rate, etc., according to viewing distance D. The adjustment may be achieved by means of altering the parameters applied to the codec or changing the codec itself. By way of example, in the present embodiment, it is assumed that assessment part 42 and encoding controller 23 control the resolution of the

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	image encoded by capturer 21 and encoder 22 in such a way that the resolution is lowered as viewing distance D increases." *See* paras. [0037]-[0039]. "**(A-2) Operation of the First Embodiment** The following is an explanation of the image-processing control operation (image-processing control method according to the embodiment) in image communication system 1, having the configuration described above according to the first embodiment. Figure 3 shows a diagram that illustrates the sequence of the operation involved in the video image processing control in the image communication system. In Figure 3, it is assumed that the video image data encoded by transmission device 20 is given to receiving device 30 and output from receiving device 30 to representation apparatus 50, and the video image is presented to audience 60 through representation apparatus 50 — from the beginning of the processing. First, sensor 41 measures viewing distance D (S101). Next, upon receipt of viewing distance D from sensor 41, assessment part 42 sends out a signal, which controls the content to be encoded according to viewing distance D, to transmission device 20 (encoding controller 23) (S102). Upon receipt of the decoding-content control signal from assessment part 42, encoding controller 23 controls capturer 21 and encoder 22 according to said signal, and then capturer 21 and encoder 22 continue to encode video images according to that content (S103). In step S103, encoding controller 23 may be configured so as to not send a resolution-change instruction to capturer 21 and encoder 22 if it receives the same encoding resolution as the last encoding resolution used. Or, if encoding controller 23 receives a different encoding resolution from the last encoding resolution used, it may send a new encoding resolution to capturer 21 and encoder 22.

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	Incidentally, the operation in steps S101 through S103 described above may be repeated continuously or periodically, or according to sensor 41’s detection of audience 60's movement. There is no restriction on the timing of executing the process.” *See* paras. [0040]-[0047]. “**(A-3) Effects of the First Embodiment** The first embodiment demonstrates the following effects: In capturer 21 and encoder 22, video image data are encoded at the resolution determined by assessment part 42 based on viewing distance D measured by sensor 41. Then, the video image data thus encoded are decoded by decoder 31 and displayed on representation apparatus 50. In this event, the resolution of the video image can be lowered to the extent that the audience cannot recognize the image, thus reducing the amount of encoding throughput. Additionally, the reduction of the amount of post-encoding data makes it possible to reduce the amount of data transmitted from transmission device 20 (encoder 22) to receiving device 30 (decoder 31), thereby reducing the load on the network. Additionally, data encoded at a reduced encoding resolution by encoder 22 is decoded by decoder 31. This makes it possible to reduce the amount of decoding throughput in decoder 31. For example, in a company having multiple offices, image communication system 1 is preferably adopted in a system that transmits live video images between multiple locations, for example, to distribute images of each office’s sceneries as captured with a camera to other offices or distribute images of rivers, bays, etc., as captured with surveillance cameras to a monitoring center. In such a system that transmits live video images between multiple locations, the audience is not always near the representation apparatus (display) while the system is in operation. However, the present embodiment allows for the encoding/decoding at a lower resolution, etc., when there is no audience

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	in the immediate vicinity of the representation apparatus (display), thus enabling efficient processing of images." *See* paras. [0048]-[0051]. "While assessment part 42A in the first embodiment makes an assessment based only on viewing distance D, assessment part 42A in the present embodiment uses viewing distance D and viewing angle θ to make an assessment as mentioned above. Then, encoding controller 23 controls the content of the video-image encoding process performed by capturer 21 and encoder 22 according to the instructions from assessment part 42. For example, assessment part 42 gives instructions to encoding controller 23 so as to cause the amount of encoding throughput and the amount of post-encoding data to decrease as viewing distance D increases. For example, assessment part 42A may be configured to give instructions to encoding controller 23 so as to cause the transverse (horizontal) resolution to be lowered as viewing angle θ increases — e.g., so as to use a resolution applied based only on viewing distance D for comparison and multiply it by √3/2 when viewing angle θ is 30° but by 1/2 when viewing angle θ is 60° to obtain the transverse (horizontal) resolution. Incidentally, when detecting the direction of audience 60 relative to representation apparatus 50 three-dimensionally (i.e., when including the elevation angle associated with the direction of audience 60 in the measurement), assessment part 42A may be configured to give instructions to encoding controller 23 so as to cause the longitudinal (vertical) resolution to be lowered as the elevation angle increases, for example." *See* paras. [0067]-[0069]. "**(B-2) Operation of the Second Embodiment** The following is an explanation of the image-processing control operation (image-processing control method according to the embodiment) in image communication system 1A, having the configuration described above according to the second embodiment.

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	Figure 6 shows a diagram that illustrates the sequence of the operation involved in the video image processing control in the image communication system 1A. It is assumed, in Figure 6, that the video image data encoded by transmission device 20 is given to receiving device 30A and output from receiving device 30A to representation apparatus 50, and the video image is presented to audience 60 through representation apparatus 50 — from the beginning of the processing. First, sensor 41A measures viewing distance D and viewing angle θ (S201). Next, upon receipt of viewing distance D and viewing angle θ from sensor 41A, assessment part 42A sends out a signal, which controls the content of the encoding according to viewing distance D and viewing angle θ, to transmission device 20 (encoding controller 23) (S202). Upon receipt of the encoding-content control signal from assessment part 42A, encoding controller 23 controls capturer 21 and encoder 22 according to said signal, and subsequently, capturer 21 and encoder 22 continue to encode video images according to that content (S203). In step S203, similar to step S103 in the first embodiment described above, encoding controller 23 may be configured so as to not send a resolution-change instruction to capturer 21 and encoder 22 if it receives the same encoding resolution as the last encoding resolution used. Or, if encoding controller 23 receives a different encoding resolution from the last encoding resolution used, it may send a new encoding resolution to capturer 21 and encoder 22. Also, similar to the case of steps S101 through S103 in the first embodiment, there is no restriction on the timing of executing the process involved in the operation performed in steps S201 to S203." *See* paras. [0070]-[0077]. "**(B-3) Effects of the Second Embodiment**

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	The second embodiment demonstrates the following effects in addition to the effects of the first embodiment: Image communication system 1A takes into account not only viewing distance D but also viewing angle θ to determine the content of the encoding performed by encoder 22. This makes it possible to include viewing angle θ in consideration for the determination of the content of the encoding performed by encoder 22 if viewing distance D is the same, thus making it possible to reduce the amount of throughput associated with the encoding and the amount of post-encoding data more than the first embodiment." *See* paras. [0078]-[0079]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Hatanaka alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[e]. wherein the different point of view corresponds to an image taken from a different angle and a different distance than the actual images captured by the camera; and	Hatanaka expressly and/or inherently discloses and/or renders obvious wherein the different point of view corresponds to an image taken from a different angle and a different distance than the actual images captured by the camera. *See*, *e.g.*, disclosures below. "Representation control part 32 converts the image data decoded by decoder 31 into an image signal of the size that can be displayed on representation apparatus 50 and then provides the image signal of said display size to representation apparatus 50. Representation control part 32 may be installed on the representation apparatus-50 side. Representation control part 32 applicable herein may be any means for converting image data to be displayed into a signal of an image of the size that can be displayed on a display used to output the representation of said image according to the resolution of the image data, doing so in a conventional display device or computer, for example." *See* para. [0027].

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	"Assessment part 42 provides instructions to encoding controller 23 so as to control the content to be encoded according to viewing distance D measured by sensor 41. Then, encoding controller 23 controls the content of the video-image encoding process performed by capturer 21 and encoder 22 according to the instructions from assessment part 42. For example, assessment part 42 adjusts the content to be encoded in such a way as to reduce the amount of encoding throughput and the amount of post-encoding data as viewing distance D increases. Additionally, assessment part 42 may be configured to adjust the content to be encoded in such a way as to minimize the amount of encoding throughput and the amount of post-encoding data when sensor 41 does not detect any audience 60. For example, suppose video image signals provided by camera 10 are analog signals (e.g., NTSC signals or the like). In this case, when the signal is uploaded to capturer 21 and converted to a digital image at a prescribed resolution, the resolution used in this event may be altered in response to the control provided by encoding controller 23. For example, a resolution in compliance with the instructions from encoding controller 23 may be used for the encoding rendered by encoder 22. Assessment part 42 can also be configured in other ways. For example, it may be configured so as to provide encoding controller 23 with instructions so that encoding controller 23 adjusts the frame rate, quantization step size, compression ratio, etc., according to viewing distance D. It should be noted that there are no restrictions on the method used to adjust the resolution, frame rate, etc., according to viewing distance D. The adjustment may be achieved by means of altering the parameters applied to the codec or changing the codec itself. By way of example, in the present embodiment, it is assumed that assessment part 42 and encoding controller 23 control the resolution of the image encoded by capturer 21 and encoder 22 in such a way that the resolution is lowered as viewing distance D increases." *See* paras. [0037]-[0039]. "**(A-2) Operation of the First Embodiment**

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	The following is an explanation of the image-processing control operation (image-processing control method according to the embodiment) in image communication system 1, having the configuration described above according to the first embodiment. Figure 3 shows a diagram that illustrates the sequence of the operation involved in the video image processing control in the image communication system. In Figure 3, it is assumed that the video image data encoded by transmission device 20 is given to receiving device 30 and output from receiving device 30 to representation apparatus 50, and the video image is presented to audience 60 through representation apparatus 50 — from the beginning of the processing. First, sensor 41 measures viewing distance D (S101). Next, upon receipt of viewing distance D from sensor 41, assessment part 42 sends out a signal, which controls the content to be encoded according to viewing distance D, to transmission device 20 (encoding controller 23) (S102). Upon receipt of the decoding-content control signal from assessment part 42, encoding controller 23 controls capturer 21 and encoder 22 according to said signal, and then capturer 21 and encoder 22 continue to encode video images according to that content (S103). In step S103, encoding controller 23 may be configured so as to not send a resolution-change instruction to capturer 21 and encoder 22 if it receives the same encoding resolution as the last encoding resolution used. Or, if encoding controller 23 receives a different encoding resolution from the last encoding resolution used, it may send a new encoding resolution to capturer 21 and encoder 22. Incidentally, the operation in steps S101 through S103 described above may be repeated continuously or periodically, or according to sensor 41’s detection of audience 60's

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	movement. There is no restriction on the timing of executing the process." *See* paras. [0040]-[0047]. "**(A-3) Effects of the First Embodiment** The first embodiment demonstrates the following effects: In capturer 21 and encoder 22, video image data are encoded at the resolution determined by assessment part 42 based on viewing distance D measured by sensor 41. Then, the video image data thus encoded are decoded by decoder 31 and displayed on representation apparatus 50. In this event, the resolution of the video image can be lowered to the extent that the audience cannot recognize the image, thus reducing the amount of encoding throughput. Additionally, the reduction of the amount of post-encoding data makes it possible to reduce the amount of data transmitted from transmission device 20 (encoder 22) to receiving device 30 (decoder 31), thereby reducing the load on the network. Additionally, data encoded at a reduced encoding resolution by encoder 22 is decoded by decoder 31. This makes it possible to reduce the amount of decoding throughput in decoder 31. For example, in a company having multiple offices, image communication system 1 is preferably adopted in a system that transmits live video images between multiple locations, for example, to distribute images of each office's sceneries as captured with a camera to other offices or distribute images of rivers, bays, etc., as captured with surveillance cameras to a monitoring center. In such a system that transmits live video images between multiple locations, the audience is not always near the representation apparatus (display) while the system is in operation. However, the present embodiment allows for the encoding/decoding at a lower resolution, etc., when there is no audience in the immediate vicinity of the representation apparatus (display), thus enabling efficient processing of images." *See* paras. [0048]-[0051].

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	"While assessment part 42A in the first embodiment makes an assessment based only on viewing distance D, assessment part 42A in the present embodiment uses viewing distance D and viewing angle θ to make an assessment as mentioned above. Then, encoding controller 23 controls the content of the video-image encoding process performed by capturer 21 and encoder 22 according to the instructions from assessment part 42. For example, assessment part 42 gives instructions to encoding controller 23 so as to cause the amount of encoding throughput and the amount of post-encoding data to decrease as viewing distance D increases. For example, assessment part 42A may be configured to give instructions to encoding controller 23 so as to cause the transverse (horizontal) resolution to be lowered as viewing angle θ increases — e.g., so as to use a resolution applied based only on viewing distance D for comparison and multiply it by √3/2 when viewing angle θ is 30° but by 1/2 when viewing angle θ is 60° to obtain the transverse (horizontal) resolution. Incidentally, when detecting the direction of audience 60 relative to representation apparatus 50 three-dimensionally (i.e., when including the elevation angle associated with the direction of audience 60 in the measurement), assessment part 42A may be configured to give instructions to encoding controller 23 so as to cause the longitudinal (vertical) resolution to be lowered as the elevation angle increases, for example." *See* paras. [0067]-[0069]. "**(B-2) Operation of the Second Embodiment** The following is an explanation of the image-processing control operation (image-processing control method according to the embodiment) in image communication system 1A, having the configuration described above according to the second embodiment. Figure 6 shows a diagram that illustrates the sequence of the operation involved in the video image processing control in the image communication system 1A.

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	It is assumed, in Figure 6, that the video image data encoded by transmission device 20 is given to receiving device 30A and output from receiving device 30A to representation apparatus 50, and the video image is presented to audience 60 through representation apparatus 50 — from the beginning of the processing. First, sensor 41A measures viewing distance D and viewing angle θ (S201). Next, upon receipt of viewing distance D and viewing angle θ from sensor 41A, assessment part 42A sends out a signal, which controls the content of the encoding according to viewing distance D and viewing angle θ, to transmission device 20 (encoding controller 23) (S202). Upon receipt of the encoding-content control signal from assessment part 42A, encoding controller 23 controls capturer 21 and encoder 22 according to said signal, and subsequently, capturer 21 and encoder 22 continue to encode video images according to that content (S203). In step S203, similar to step S103 in the first embodiment described above, encoding controller 23 may be configured so as to not send a resolution-change instruction to capturer 21 and encoder 22 if it receives the same encoding resolution as the last encoding resolution used. Or, if encoding controller 23 receives a different encoding resolution from the last encoding resolution used, it may send a new encoding resolution to capturer 21 and encoder 22. Also, similar to the case of steps S101 through S103 in the first embodiment, there is no restriction on the timing of executing the process involved in the operation performed in steps S201 to S203." *See* paras. [0070]-[0077]. "**(B-3) Effects of the Second Embodiment** The second embodiment demonstrates the following effects in addition to the effects of the first embodiment:

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	Image communication system 1A takes into account not only viewing distance D but also viewing angle θ to determine the content of the encoding performed by encoder 22. This makes it possible to include viewing angle θ in consideration for the determination of the content of the encoding performed by encoder 22 if viewing distance D is the same, thus making it possible to reduce the amount of throughput associated with the encoding and the amount of post-encoding data more than the first embodiment." *See* paras. [0078]-[0079]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Hatanaka alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[f]. wherein during mirror tracking mode the processor utilizes the angle of the images captured by the camera and applies parametric input for a mapping transformation that changes imaging perspective of the images captured by the camera.	Hatanaka expressly and/or inherently discloses and/or renders obvious wherein during mirror tracking mode the processor utilizes the angle of the images captured by the camera and applies parametric input for a mapping transformation that changes imaging perspective of the images captured by the camera. *See*, *e.g.*, disclosures below. "Representation control part 32 converts the image data decoded by decoder 31 into an image signal of the size that can be displayed on representation apparatus 50 and then provides the image signal of said display size to representation apparatus 50. Representation control part 32 may be installed on the representation apparatus-50 side. Representation control part 32 applicable herein may be any means for converting image data to be displayed into a signal of an image of the size that can be displayed on a display used to output the representation of said image according to the resolution of the image data, doing so in a conventional display device or computer, for example." *See* para. [0027]. "Assessment part 42 provides instructions to encoding controller 23 so as to control the content to be encoded according to viewing distance D measured by sensor 41. Then, encoding controller 23 controls the content of the video-image encoding process

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	performed by capturer 21 and encoder 22 according to the instructions from assessment part 42. For example, assessment part 42 adjusts the content to be encoded in such a way as to reduce the amount of encoding throughput and the amount of post-encoding data as viewing distance D increases. Additionally, assessment part 42 may be configured to adjust the content to be encoded in such a way as to minimize the amount of encoding throughput and the amount of post-encoding data when sensor 41 does not detect any audience 60. For example, suppose video image signals provided by camera 10 are analog signals (e.g., NTSC signals or the like). In this case, when the signal is uploaded to capturer 21 and converted to a digital image at a prescribed resolution, the resolution used in this event may be altered in response to the control provided by encoding controller 23. For example, a resolution in compliance with the instructions from encoding controller 23 may be used for the encoding rendered by encoder 22. Assessment part 42 can also be configured in other ways. For example, it may be configured so as to provide encoding controller 23 with instructions so that encoding controller 23 adjusts the frame rate, quantization step size, compression ratio, etc., according to viewing distance D. It should be noted that there are no restrictions on the method used to adjust the resolution, frame rate, etc., according to viewing distance D. The adjustment may be achieved by means of altering the parameters applied to the codec or changing the codec itself. By way of example, in the present embodiment, it is assumed that assessment part 42 and encoding controller 23 control the resolution of the image encoded by capturer 21 and encoder 22 in such a way that the resolution is lowered as viewing distance D increases." *See* paras. [0037]-[0039]. "**(A-2) Operation of the First Embodiment** The following is an explanation of the image-processing control operation (image-processing control method according to the embodiment) in image communication system 1, having the configuration described above according to the first embodiment.

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	Figure 3 shows a diagram that illustrates the sequence of the operation involved in the video image processing control in the image communication system. In Figure 3, it is assumed that the video image data encoded by transmission device 20 is given to receiving device 30 and output from receiving device 30 to representation apparatus 50, and the video image is presented to audience 60 through representation apparatus 50 — from the beginning of the processing. First, sensor 41 measures viewing distance D (S101). Next, upon receipt of viewing distance D from sensor 41, assessment part 42 sends out a signal, which controls the content to be encoded according to viewing distance D, to transmission device 20 (encoding controller 23) (S102). Upon receipt of the decoding-content control signal from assessment part 42, encoding controller 23 controls capturer 21 and encoder 22 according to said signal, and then capturer 21 and encoder 22 continue to encode video images according to that content (S103). In step S103, encoding controller 23 may be configured so as to not send a resolution-change instruction to capturer 21 and encoder 22 if it receives the same encoding resolution as the last encoding resolution used. Or, if encoding controller 23 receives a different encoding resolution from the last encoding resolution used, it may send a new encoding resolution to capturer 21 and encoder 22. Incidentally, the operation in steps S101 through S103 described above may be repeated continuously or periodically, or according to sensor 41's detection of audience 60's movement. There is no restriction on the timing of executing the process." *See* paras. [0040]-[0047]. "**(A-3) Effects of the First Embodiment** The first embodiment demonstrates the following effects:

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	In capturer 21 and encoder 22, video image data are encoded at the resolution determined by assessment part 42 based on viewing distance D measured by sensor 41. Then, the video image data thus encoded are decoded by decoder 31 and displayed on representation apparatus 50. In this event, the resolution of the video image can be lowered to the extent that the audience cannot recognize the image, thus reducing the amount of encoding throughput. Additionally, the reduction of the amount of post-encoding data makes it possible to reduce the amount of data transmitted from transmission device 20 (encoder 22) to receiving device 30 (decoder 31), thereby reducing the load on the network. Additionally, data encoded at a reduced encoding resolution by encoder 22 is decoded by decoder 31. This makes it possible to reduce the amount of decoding throughput in decoder 31. For example, in a company having multiple offices, image communication system 1 is preferably adopted in a system that transmits live video images between multiple locations, for example, to distribute images of each office's sceneries as captured with a camera to other offices or distribute images of rivers, bays, etc., as captured with surveillance cameras to a monitoring center. In such a system that transmits live video images between multiple locations, the audience is not always near the representation apparatus (display) while the system is in operation. However, the present embodiment allows for the encoding/decoding at a lower resolution, etc., when there is no audience in the immediate vicinity of the representation apparatus (display), thus enabling efficient processing of images." *See* paras. [0048]-[0051]. "While assessment part 42A in the first embodiment makes an assessment based only on viewing distance D, assessment part 42A in the present embodiment uses viewing distance D and viewing angle θ to make an assessment as mentioned above. Then, encoding controller 23 controls the content of the video-image encoding process performed by capturer 21 and encoder 22 according to the instructions from

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	assessment part 42. For example, assessment part 42 gives instructions to encoding controller 23 so as to cause the amount of encoding throughput and the amount of post-encoding data to decrease as viewing distance D increases. For example, assessment part 42A may be configured to give instructions to encoding controller 23 so as to cause the transverse (horizontal) resolution to be lowered as viewing angle θ increases — e.g., so as to use a resolution applied based only on viewing distance D for comparison and multiply it by √3/2 when viewing angle θ is 30° but by 1/2 when viewing angle θ is 60° to obtain the transverse (horizontal) resolution. Incidentally, when detecting the direction of audience 60 relative to representation apparatus 50 three-dimensionally (i.e., when including the elevation angle associated with the direction of audience 60 in the measurement), assessment part 42A may be configured to give instructions to encoding controller 23 so as to cause the longitudinal (vertical) resolution to be lowered as the elevation angle increases, for example." *See* paras. [0067]-[0069]. "**(B-2) Operation of the Second Embodiment** The following is an explanation of the image-processing control operation (image-processing control method according to the embodiment) in image communication system 1A, having the configuration described above according to the second embodiment. Figure 6 shows a diagram that illustrates the sequence of the operation involved in the video image processing control in the image communication system 1A. It is assumed, in Figure 6, that the video image data encoded by transmission device 20 is given to receiving device 30A and output from receiving device 30A to representation apparatus 50, and the video image is presented to audience 60 through representation apparatus 50 — from the beginning of the processing. First, sensor 41A measures viewing distance D and viewing angle θ (S201).

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	Next, upon receipt of viewing distance D and viewing angle θ from sensor 41A, assessment part 42A sends out a signal, which controls the content of the encoding according to viewing distance D and viewing angle θ, to transmission device 20 (encoding controller 23) (S202). Upon receipt of the encoding-content control signal from assessment part 42A, encoding controller 23 controls capturer 21 and encoder 22 according to said signal, and subsequently, capturer 21 and encoder 22 continue to encode video images according to that content (S203). In step S203, similar to step S103 in the first embodiment described above, encoding controller 23 may be configured so as to not send a resolution-change instruction to capturer 21 and encoder 22 if it receives the same encoding resolution as the last encoding resolution used. Or, if encoding controller 23 receives a different encoding resolution from the last encoding resolution used, it may send a new encoding resolution to capturer 21 and encoder 22. Also, similar to the case of steps S101 through S103 in the first embodiment, there is no restriction on the timing of executing the process involved in the operation performed in steps S201 to S203." *See* paras. [0070]-[0077]. "**(B-3) Effects of the Second Embodiment** The second embodiment demonstrates the following effects in addition to the effects of the first embodiment: Image communication system 1A takes into account not only viewing distance D but also viewing angle θ to determine the content of the encoding performed by encoder 22. This makes it possible to include viewing angle θ in consideration for the determination of the content of the encoding performed by encoder 22 if viewing distance D is the same, thus making it possible to reduce the amount of throughput associated with the

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	encoding and the amount of post-encoding data more than the first embodiment." *See* paras. [0078]-[0079]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Hatanaka alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

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Claim 2	
2. The method of claim 1, wherein the mapping transformation comprises a combination of at least two of the following transformations: vertical flips about a vertical axis, a projection transformation, rotation, resize, two-dimensional offset, optic distortion correction, and polynomial mapping on part or entire captured image.	Hatanaka expressly and/or inherently discloses and/or renders obvious wherein the mapping transformation comprises a combination of at least two of the following transformations: vertical flips about a vertical axis, a projection transformation, rotation, resize, two-dimensional offset, optic distortion correction, and polynomial mapping on part or entire captured image. *See*, *e.g.*, disclosures below. "Receiving device 30 — upon receipt of encoded video-image data from transmission device 20 — decodes the data and outputs a video image signal to representation apparatus 50." *See* para. [0020]. "Encoding controller 23 is responsible for controlling the content of the video-image encoding process performed by capturer 21 and encoding controller 22 in response to the control communicated from receiving device 30 (i.e., assessment part 42, which shall be described in a later section). The detailed description of the control provided by encoding controller 23 shall be described in a later section.

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	Next is an explanation of the internal configuration of receiving device 30. Receiving device 30 has decoder 31, representation control part 32, and image-processing control device 40. Decoder 31 decodes the encoded image data provided by transmission device 20 and provides the decoded image data to representation control part 32. Decoder 31 applicable herein may be, for example, a conventional device that can decode video images. Representation control part 32 converts the image data decoded by decoder 31 into an image signal of the size that can be displayed on representation apparatus 50 and then provides the image signal of said display size to representation apparatus 50. Representation control part 32 may be installed on the representation apparatus-50 side. Representation control part 32 applicable herein may be any means for converting image data to be displayed into a signal of an image of the size that can be displayed on a display used to output the representation of said image according to the resolution of the image data, doing so in a conventional display device or computer, for example. The following is an explanation of the configuration of image-processing control device 40. Image-processing control device 40 has sensor 41 and assessment part 42. [0024]-[0028]. "Assessment part 42 provides instructions to encoding controller 23 so as to control the content to be encoded according to viewing distance D measured by sensor 41. Then, encoding controller 23 controls the content of the video-image encoding process performed by capturer 21 and encoder 22 according to the instructions from assessment part 42. For example, assessment part 42 adjusts the content to be encoded in such a way as to reduce the amount of encoding throughput and the amount of post-encoding data as viewing distance D increases. Additionally, assessment part 42 may be configured to adjust the content to be encoded in such a way as to minimize the amount of encoding throughput and the amount of post-encoding data when sensor 41 does not detect any audience 60.

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	For example, suppose video image signals provided by camera 10 are analog signals (e.g., NTSC signals or the like). In this case, when the signal is uploaded to capturer 21 and converted to a digital image at a prescribed resolution, the resolution used in this event may be altered in response to the control provided by encoding controller 23. For example, a resolution in compliance with the instructions from encoding controller 23 may be used for the encoding rendered by encoder 22. Assessment part 42 can also be configured in other ways. For example, it may be configured so as to provide encoding controller 23 with instructions so that encoding controller 23 adjusts the frame rate, quantization step size, compression ratio, etc., according to viewing distance D. It should be noted that there are no restrictions on the method used to adjust the resolution, frame rate, etc., according to viewing distance D. The adjustment may be achieved by means of altering the parameters applied to the codec or changing the codec itself. By way of example, in the present embodiment, it is assumed that assessment part 42 and encoding controller 23 control the resolution of the image encoded by capturer 21 and encoder 22 in such a way that the resolution is lowered as viewing distance D increases." *See* paras. [0037]-[0039]. "**(A-2) Operation of the First Embodiment** The following is an explanation of the image-processing control operation (image-processing control method according to the embodiment) in image communication system 1, having the configuration described above according to the first embodiment. Figure 3 shows a diagram that illustrates the sequence of the operation involved in the video image processing control in the image communication system. In Figure 3, it is assumed that the video image data encoded by transmission device 20 is given to receiving device 30 and output from receiving device 30 to representation apparatus 50, and the video image is presented to audience 60 through representation apparatus 50 — from the beginning of the processing. First, sensor 41 measures viewing distance D (S101).

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	Next, upon receipt of viewing distance D from sensor 41, assessment part 42 sends out a signal, which controls the content to be encoded according to viewing distance D, to transmission device 20 (encoding controller 23) (S102). Upon receipt of the decoding-content control signal from assessment part 42, encoding controller 23 controls capturer 21 and encoder 22 according to said signal, and then capturer 21 and encoder 22 continue to encode video images according to that content (S103). In step S103, encoding controller 23 may be configured so as to not send a resolution-change instruction to capturer 21 and encoder 22 if it receives the same encoding resolution as the last encoding resolution used. Or, if encoding controller 23 receives a different encoding resolution from the last encoding resolution used, it may send a new encoding resolution to capturer 21 and encoder 22. Incidentally, the operation in steps S101 through S103 described above may be repeated continuously or periodically, or according to sensor 41’s detection of audience 60's movement. There is no restriction on the timing of executing the process.” *See* paras. [0040]-[0047]. “**(A-3) Effects of the First Embodiment** The first embodiment demonstrates the following effects: In capturer 21 and encoder 22, video image data are encoded at the resolution determined by assessment part 42 based on viewing distance D measured by sensor 41. Then, the video image data thus encoded are decoded by decoder 31 and displayed on representation apparatus 50. In this event, the resolution of the video image can be lowered to the extent that the audience cannot recognize the image, thus reducing the amount of encoding throughput. Additionally, the reduction of the amount of post-encoding data makes it possible to reduce the amount of data transmitted from

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	transmission device 20 (encoder 22) to receiving device 30 (decoder 31), thereby reducing the load on the network. Additionally, data encoded at a reduced encoding resolution by encoder 22 is decoded by decoder 31. This makes it possible to reduce the amount of decoding throughput in decoder 31. For example, in a company having multiple offices, image communication system 1 is preferably adopted in a system that transmits live video images between multiple locations, for example, to distribute images of each office's sceneries as captured with a camera to other offices or distribute images of rivers, bays, etc., as captured with surveillance cameras to a monitoring center. In such a system that transmits live video images between multiple locations, the audience is not always near the representation apparatus (display) while the system is in operation. However, the present embodiment allows for the encoding/decoding at a lower resolution, etc., when there is no audience in the immediate vicinity of the representation apparatus (display), thus enabling efficient processing of images." *See* paras. [0048]-[0051]. "While assessment part 42A in the first embodiment makes an assessment based only on viewing distance D, assessment part 42A in the present embodiment uses viewing distance D and viewing angle θ to make an assessment as mentioned above. Then, encoding controller 23 controls the content of the video-image encoding process performed by capturer 21 and encoder 22 according to the instructions from assessment part 42. For example, assessment part 42 gives instructions to encoding controller 23 so as to cause the amount of encoding throughput and the amount of post-encoding data to decrease as viewing distance D increases. For example, assessment part 42A may be configured to give instructions to encoding controller 23 so as to cause the transverse (horizontal) resolution to be lowered as viewing angle θ increases — e.g., so as to use a resolution applied based only on viewing distance D for comparison and multiply it by √3/2 when viewing angle θ is 30° but by

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	1/2 when viewing angle θ is 60° to obtain the transverse (horizontal) resolution. Incidentally, when detecting the direction of audience 60 relative to representation apparatus 50 three-dimensionally (i.e., when including the elevation angle associated with the direction of audience 60 in the measurement), assessment part 42A may be configured to give instructions to encoding controller 23 so as to cause the longitudinal (vertical) resolution to be lowered as the elevation angle increases, for example.” *See* paras. [0067]-[0069]. “**(B-2) Operation of the Second Embodiment** The following is an explanation of the image-processing control operation (image-processing control method according to the embodiment) in image communication system 1A, having the configuration described above according to the second embodiment. Figure 6 shows a diagram that illustrates the sequence of the operation involved in the video image processing control in the image communication system 1A. It is assumed, in Figure 6, that the video image data encoded by transmission device 20 is given to receiving device 30A and output from receiving device 30A to representation apparatus 50, and the video image is presented to audience 60 through representation apparatus 50 — from the beginning of the processing. First, sensor 41A measures viewing distance D and viewing angle θ (S201). Next, upon receipt of viewing distance D and viewing angle θ from sensor 41A, assessment part 42A sends out a signal, which controls the content of the encoding according to viewing distance D and viewing angle θ, to transmission device 20 (encoding controller 23) (S202). Upon receipt of the encoding-content control signal from assessment part 42A, encoding controller 23 controls capturer 21 and encoder 22 according to said signal, and

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	subsequently, capturer 21 and encoder 22 continue to encode video images according to that content (S203). In step S203, similar to step S103 in the first embodiment described above, encoding controller 23 may be configured so as to not send a resolution-change instruction to capturer 21 and encoder 22 if it receives the same encoding resolution as the last encoding resolution used. Or, if encoding controller 23 receives a different encoding resolution from the last encoding resolution used, it may send a new encoding resolution to capturer 21 and encoder 22. Also, similar to the case of steps S101 through S103 in the first embodiment, there is no restriction on the timing of executing the process involved in the operation performed in steps S201 to S203." *See* paras. [0070]-[0077]. "**(B-3) Effects of the Second Embodiment** The second embodiment demonstrates the following effects in addition to the effects of the first embodiment: Image communication system 1A takes into account not only viewing distance D but also viewing angle θ to determine the content of the encoding performed by encoder 22. This makes it possible to include viewing angle θ in consideration for the determination of the content of the encoding performed by encoder 22 if viewing distance D is the same, thus making it possible to reduce the amount of throughput associated with the encoding and the amount of post-encoding data more than the first embodiment." *See* paras. [0078]-[0079]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Hatanaka alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

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Claim 3	
3. The method of claim 1, wherein during idle mode the camera continuously sends captured images to the processor, and the user presence is identified by the processor detecting a body part in the images.	Hatanaka expressly and/or inherently discloses and/or renders obvious wherein during idle mode the camera continuously sends captured images to the processor, and the user presence is identified by the processor detecting a body part in the images. *See*, *e.g.*, disclosures below. “This invention pertains to an image communication system as well as an image-processing control device and method. For example, they can be applied to systems that distribute live video images.” *See* para. [0001]. “Consequently, there have been demands for ways to reduce the throughput of image-data-related processing in image communication systems that are configured to encode images on the transmitting side and then -- on the receiving side -- decode the encoded images for display. The image communication system according to the first invention of the present application is an image communication system provided with (1) an encoding means for encoding an image to create the encoded image data, a decoding means for decoding the encoded image data, and a representation output part which outputs the representation of the decoded image to viewers; said image communication system characterized by comprising (2) a viewer detection means for performing detections about the relative position between the above-mentioned representation output part and a viewer(s), and (3) an encoding-content setting means for setting the content of the encoding performed by the above-mentioned encoding means according to the result detected by the above-mentioned viewer detection means. The image-processing control device according to the second invention of the present application is an image-processing control device that controls the content of image-related processing in an image communication system provided with (1) an encoding means for encoding an image to create the encoded image data, a decoding means for

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	decoding the encoded image data, and a representation output part which outputs the representation of the decoded image to viewers; said image-processing control device characterized by comprising (2) a viewer detection means for performing detections about the relative position between the above-mentioned representation output part and a viewer(s), and (3) an encoding-content setting means for setting the content of the encoding performed by the above-mentioned encoding means according to the result detected by the above-mentioned viewer detection means. The image-processing control method according to the second invention of the present application is an image-processing control method used to control the content of image-related processing in an image communication system provided with (1) an encoding means for encoding an image to create the encoded image data, a decoding means for decoding the encoded image data, and a representation output part which outputs the representation of the decoded image to viewers; said image-processing control method characterized by comprising (2) a viewer detection means and an encoding-content setting means, wherein: (3) The above-mentioned viewer detection means performs detections about the relative position between the above-mentioned representation output part and a viewer; and (4) The above-mentioned encoding-content setting means sets the content of the encoding performed by the above-mentioned encoding means, doing so according to the result detected by the above-mentioned viewer detection means. The present inventions make it possible to reduce the throughput of image-data-related processing in an image communication system configured to encode images on the transmitting side and then decode the encoded data on the receiving side to output the representation of the images.

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	Figure 1 shows a block diagram that illustrates the overall configuration of the image communication system and image-processing control device claimed in the first embodiment. Figure 2 shows an illustrative drawing that explains the viewing distance according to the image-processing control device claimed in the first embodiment. Figure 3 shows a flowchart that illustrates the operation of the image-processing control device claimed in the first embodiment. Figure 4 shows a block diagram that illustrates the overall configuration of the image communication system and image-processing control device claimed in the second embodiment. Figure 5 shows an illustrative drawing that explains the viewing distance and viewing angle according to the image-processing control device claimed in the second embodiment. Figure 6 shows a flowchart that illustrates the operation of the image-processing control device claimed in the second embodiment.” *See* paras. [0008]-[0013]. “The following is an explanation of the configuration of image-processing control device 40. Image-processing control device 40 has sensor 41 and assessment part 42. Sensor 41 measures the distance between audience 60 and representation apparatus 50 (hereinafter referred to as "viewing distance D") and provides assessment part 42 with the measurement result. Incidentally, sensor 41 may be placed around representation apparatus 50 so as to measure the distance between representation apparatus 50 and audience 60 and deem the distance thus measured as viewing distance D.” *See* paras. [0028]-[0029].

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	“An example of the method used to measure viewing distance D in sensor 41 may involve the use of, for example, a motion sensor, a wireless IC tag, or the like as described in relation to the “proximity detection means” according to Patent Document 2. Another example of the method used to measure viewing distance D in sensor 41 may involve having audience 60 hold a wireless communication terminal (which, for example, may be built into a terminal used to operate representation apparatus 50, etc., such as a remote control terminal, a mobile phone terminal, or the like) and installing sensor 41 around representation apparatus 50 so that sensor 41 communicates with the above-described wireless communication terminal to thereby measure the distance between the above-described wireless communication terminal and sensor 41, i.e., viewing distance D. The above-described distance between the wireless communication terminal and sensor 41 may be measured based, for example, on the intensity of the signal received or the transmission lag time. Wireless communication between the above-described wireless communication terminal and sensor 41 may be achieved through the use of light, such as radio waves or infrared rays. However, there is no restriction on the communication method insofar as viewing distance D can be measured. Yet another example of the method used to measure viewing distance D in sensor 41 may involve installing multiple motion sensors around representation apparatus 50 and pre-registering the respective viewing distance for each motion sensor so as to recognize the distance of the audience based on which motion sensor has detected the audience. For example, motion sensors may be placed at equal distances from representation apparatus 50 to measure audience distance L. Incidentally, conventional motion sensors can be used as the motion sensors adopted for sensor 41.” *See* paras. [0033]-[0035]. “Assessment part 42 provides instructions to encoding controller 23 so as to control the content to be encoded according to viewing distance D measured by sensor 41. Then, encoding controller 23 controls the content of the video-image encoding process performed by capturer 21 and encoder 22 according to the instructions from assessment part 42. For example, assessment part 42 adjusts the content to be encoded in such a way

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	as to reduce the amount of encoding throughput and the amount of post-encoding data as viewing distance D increases. Additionally, assessment part 42 may be configured to adjust the content to be encoded in such a way as to minimize the amount of encoding throughput and the amount of post-encoding data when sensor 41 does not detect any audience 60.” *See* para. [0037]. “For example, in a company having multiple offices, image communication system 1 is preferably adopted in a system that transmits live video images between multiple locations, for example, to distribute images of each office’s sceneries as captured with a camera to other offices or distribute images of rivers, bays, etc., as captured with surveillance cameras to a monitoring center. In such a system that transmits live video images between multiple locations, the audience is not always near the representation apparatus (display) while the system is in operation. However, the present embodiment allows for the encoding/decoding at a lower resolution, etc., when there is no audience in the immediate vicinity of the representation apparatus (display), thus enabling efficient processing of images.” *See* para. [0051]. “Image-processing control device 40A has sensor 41A and assessment part 42A. As described above, sensor 41 in the first embodiment measures viewing distance D only. However, sensor 41A in the present embodiment differs from sensor 41 in that sensor 41A also measures the direction in which audience 60 is located relative to representation apparatus 50 (hereinafter, the "viewing direction"). Figure 5 shows an illustrative drawing that illustrates an example of viewing distance D (which is the distance between representation apparatus 50 and audience 60) and the audience direction. Figure 5 (a) shows an example of representation apparatus 50 (a display device in this example) in the state in which representation apparatus 50 (a display device) is viewed from the front.

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	Figure 5 (b) shows an illustrative drawing that illustrates examples of viewing distance D, i.e., the distance between representation apparatus 50 and audience 60, and the viewing direction in the state in which representation apparatus 50 shown in Figure 5 (a) is viewed from the top. The method used to measure viewing distance D in sensor 41A is similar to that of the first embodiment. Accordingly, the explanation thereof shall be omitted hereafter Here, sensor 41A uses a line passing through the center of representation apparatus 50 anterior to the representation apparatus 50 as a reference line to determine the viewing direction by measuring the angle formed between the reference line and a straight line formed between the above-described center position and audience 60’s position (hereinafter referred to as "viewing angle θ"), as shown in Figure 5(b). However, the viewing angle may be measured based on a different center position and reference line. In the same way as in the case of viewing distance D, an example of the method used to measure viewing angle θ in sensor 41A may involve the use of, for example, a motion sensor, a wireless IC tag, or the like, as described in relation to the “proximity detection means” according to Patent Document 2, whereby sensor 41A recognizes the positional relationship between audience 60 and representation apparatus 50 to thereby determine viewing angle θ. Figure 5 shows an example of detecting the two-dimensional direction of audience 60 relative to representation apparatus 50. However, sensor 41A may also be configured to detect the direction of audience 60 relative to representation apparatus 50 three-dimensionally (including the elevation angle). For example, by having audience 60 hold a wireless communication terminal (which, for example, may be built into a terminal used to operate representation apparatus 50, etc., such as a remote control terminal, a mobile phone terminal, or the like), it becomes possible for sensor 41A to communicate with the above-described wireless communication terminal so that sensor 41A can determine viewing angle θ by measuring the direction in which a wireless signal (e.g., radio waves, infrared rays, etc.) is acquired from the above-described wireless communication terminal. Wireless communication

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	between the above-described wireless communication terminal and sensor 41 may be achieved through the use of light, such as radio waves or infrared rays. However, there is no restriction on the communication method insofar as viewing angle θ can be measured. Another example of the method used to measure viewing angle θ in sensor 41A may involve installing multiple motion sensors around representation apparatus 50 and pre-registering the viewing angle for each motion sensor so as to recognize the positional relationship between audience 60 and representation apparatus 50 and detect viewing angle θ based on the positional relationship thus recognized. However, there is no restriction on the method used in sensor 41A insofar as viewing angle θ can be measured." *See* paras. [0057]-[0066]. "**(C-1)** In the first embodiment, a sensor detects viewing angle D and thereby determines the content of the encoding performed by the encoder. The second embodiment is illustrated with an example in which viewing distance D and viewing angle θ are detected for the determination of the content of the encoding performed by the encoder. However, only viewing angle θ may be detected for the determination of the content of the encoding performed by the encoder" *See* para. [0081]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Hatanaka alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

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Claim 4	

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4. The method of claim 3, wherein the body part comprises one of legs, face, eyes, and hands.	Hatanaka expressly and/or inherently discloses and/or renders obvious wherein the body part comprises one of legs, face, eyes, and hands. *See*, *e.g.*, disclosures below. "This invention pertains to an image communication system as well as an image-processing control device and method. For example, they can be applied to systems that distribute live video images." *See* para. [0001]. "Consequently, there have been demands for ways to reduce the throughput of image-data-related processing in image communication systems that are configured to encode images on the transmitting side and then -- on the receiving side -- decode the encoded images for display. The image communication system according to the first invention of the present application is an image communication system provided with (1) an encoding means for encoding an image to create the encoded image data, a decoding means for decoding the encoded image data, and a representation output part which outputs the representation of the decoded image to viewers; said image communication system characterized by comprising (2) a viewer detection means for performing detections about the relative position between the above-mentioned representation output part and a viewer(s), and (3) an encoding-content setting means for setting the content of the encoding performed by the above-mentioned encoding means according to the result detected by the above-mentioned viewer detection means. The image-processing control device according to the second invention of the present application is an image-processing control device that controls the content of image-related processing in an image communication system provided with (1) an encoding means for encoding an image to create the encoded image data, a decoding means for decoding the encoded image data, and a representation output part which outputs the representation of the decoded image to viewers; said image-processing control device characterized by comprising (2) a viewer detection means for performing detections about the relative position between the above-mentioned representation output part and a viewer(s), and (3) an encoding-content setting means for setting the content of the

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	encoding performed by the above-mentioned encoding means according to the result detected by the above-mentioned viewer detection means. The image-processing control method according to the second invention of the present application is an image-processing control method used to control the content of image-related processing in an image communication system provided with (1) an encoding means for encoding an image to create the encoded image data, a decoding means for decoding the encoded image data, and a representation output part which outputs the representation of the decoded image to viewers; said image-processing control method characterized by comprising (2) a viewer detection means and an encoding-content setting means, wherein: (3) The above-mentioned viewer detection means performs detections about the relative position between the above-mentioned representation output part and a viewer; and (4) The above-mentioned encoding-content setting means sets the content of the encoding performed by the above-mentioned encoding means, doing so according to the result detected by the above-mentioned viewer detection means. The present inventions make it possible to reduce the throughput of image-data-related processing in an image communication system configured to encode images on the transmitting side and then decode the encoded data on the receiving side to output the representation of the images. Figure 1 shows a block diagram that illustrates the overall configuration of the image communication system and image-processing control device claimed in the first embodiment. Figure 2 shows an illustrative drawing that explains the viewing distance according to the image-processing control device claimed in the first embodiment.

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	Figure 3 shows a flowchart that illustrates the operation of the image-processing control device claimed in the first embodiment. Figure 4 shows a block diagram that illustrates the overall configuration of the image communication system and image-processing control device claimed in the second embodiment. Figure 5 shows an illustrative drawing that explains the viewing distance and viewing angle according to the image-processing control device claimed in the second embodiment. Figure 6 shows a flowchart that illustrates the operation of the image-processing control device claimed in the second embodiment.” *See* paras. [0008]-[0013]. “The following is an explanation of the configuration of image-processing control device 40. Image-processing control device 40 has sensor 41 and assessment part 42. Sensor 41 measures the distance between audience 60 and representation apparatus 50 (hereinafter referred to as "viewing distance D") and provides assessment part 42 with the measurement result. Incidentally, sensor 41 may be placed around representation apparatus 50 so as to measure the distance between representation apparatus 50 and audience 60 and deem the distance thus measured as viewing distance D.” *See* paras. [0028]-[0029]. “An example of the method used to measure viewing distance D in sensor 41 may involve the use of, for example, a motion sensor, a wireless IC tag, or the like as described in relation to the “proximity detection means” according to Patent Document 2. Another example of the method used to measure viewing distance D in sensor 41 may involve having audience 60 hold a wireless communication terminal (which, for

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	example, may be built into a terminal used to operate representation apparatus 50, etc., such as a remote control terminal, a mobile phone terminal, or the like) and installing sensor 41 around representation apparatus 50 so that sensor 41 communicates with the above-described wireless communication terminal to thereby measure the distance between the above-described wireless communication terminal and sensor 41, i.e., viewing distance D. The above-described distance between the wireless communication terminal and sensor 41 may be measured based, for example, on the intensity of the signal received or the transmission lag time. Wireless communication between the above-described wireless communication terminal and sensor 41 may be achieved through the use of light, such as radio waves or infrared rays. However, there is no restriction on the communication method insofar as viewing distance D can be measured. Yet another example of the method used to measure viewing distance D in sensor 41 may involve installing multiple motion sensors around representation apparatus 50 and pre-registering the respective viewing distance for each motion sensor so as to recognize the distance of the audience based on which motion sensor has detected the audience. For example, motion sensors may be placed at equal distances from representation apparatus 50 to measure audience distance L. Incidentally, conventional motion sensors can be used as the motion sensors adopted for sensor 41." *See* paras. [0033]-[0035]. "Assessment part 42 provides instructions to encoding controller 23 so as to control the content to be encoded according to viewing distance D measured by sensor 41. Then, encoding controller 23 controls the content of the video-image encoding process performed by capturer 21 and encoder 22 according to the instructions from assessment part 42. For example, assessment part 42 adjusts the content to be encoded in such a way as to reduce the amount of encoding throughput and the amount of post-encoding data as viewing distance D increases. Additionally, assessment part 42 may be configured to adjust the content to be encoded in such a way as to minimize the amount of encoding throughput and the amount of post-encoding data when sensor 41 does not detect any audience 60." *See* para. [0037].

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	“For example, in a company having multiple offices, image communication system 1 is preferably adopted in a system that transmits live video images between multiple locations, for example, to distribute images of each office’s sceneries as captured with a camera to other offices or distribute images of rivers, bays, etc., as captured with surveillance cameras to a monitoring center. In such a system that transmits live video images between multiple locations, the audience is not always near the representation apparatus (display) while the system is in operation. However, the present embodiment allows for the encoding/decoding at a lower resolution, etc., when there is no audience in the immediate vicinity of the representation apparatus (display), thus enabling efficient processing of images.” *See* para. [0051]. “Image-processing control device 40A has sensor 41A and assessment part 42A. As described above, sensor 41 in the first embodiment measures viewing distance D only. However, sensor 41A in the present embodiment differs from sensor 41 in that sensor 41A also measures the direction in which audience 60 is located relative to representation apparatus 50 (hereinafter, the "viewing direction"). Figure 5 shows an illustrative drawing that illustrates an example of viewing distance D (which is the distance between representation apparatus 50 and audience 60) and the audience direction. Figure 5 (a) shows an example of representation apparatus 50 (a display device in this example) in the state in which representation apparatus 50 (a display device) is viewed from the front. Figure 5 (b) shows an illustrative drawing that illustrates examples of viewing distance D, i.e., the distance between representation apparatus 50 and audience 60, and the viewing direction in the state in which representation apparatus 50 shown in Figure 5 (a) is viewed from the top.

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	The method used to measure viewing distance D in sensor 41A is similar to that of the first embodiment. Accordingly, the explanation thereof shall be omitted hereafter Here, sensor 41A uses a line passing through the center of representation apparatus 50 anterior to the representation apparatus 50 as a reference line to determine the viewing direction by measuring the angle formed between the reference line and a straight line formed between the above-described center position and audience 60’s position (hereinafter referred to as "viewing angle θ"), as shown in Figure 5(b). However, the viewing angle may be measured based on a different center position and reference line. In the same way as in the case of viewing distance D, an example of the method used to measure viewing angle θ in sensor 41A may involve the use of, for example, a motion sensor, a wireless IC tag, or the like, as described in relation to the “proximity detection means” according to Patent Document 2, whereby sensor 41A recognizes the positional relationship between audience 60 and representation apparatus 50 to thereby determine viewing angle θ. Figure 5 shows an example of detecting the two-dimensional direction of audience 60 relative to representation apparatus 50. However, sensor 41A may also be configured to detect the direction of audience 60 relative to representation apparatus 50 three-dimensionally (including the elevation angle). For example, by having audience 60 hold a wireless communication terminal (which, for example, may be built into a terminal used to operate representation apparatus 50, etc., such as a remote control terminal, a mobile phone terminal, or the like), it becomes possible for sensor 41A to communicate with the above-described wireless communication terminal so that sensor 41A can determine viewing angle θ by measuring the direction in which a wireless signal (e.g., radio waves, infrared rays, etc.) is acquired from the above-described wireless communication terminal. Wireless communication between the above-described wireless communication terminal and sensor 41 may be achieved through the use of light, such as radio waves or infrared rays. However, there is no restriction on the communication method insofar as viewing angle θ can be measured.

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	Another example of the method used to measure viewing angle θ in sensor 41A may involve installing multiple motion sensors around representation apparatus 50 and pre-registering the viewing angle for each motion sensor so as to recognize the positional relationship between audience 60 and representation apparatus 50 and detect viewing angle θ based on the positional relationship thus recognized. However, there is no restriction on the method used in sensor 41A insofar as viewing angle θ can be measured." *See* paras. [0057]-[0066]. "**(C-1)** In the first embodiment, a sensor detects viewing angle D and thereby determines the content of the encoding performed by the encoder. The second embodiment is illustrated with an example in which viewing distance D and viewing angle θ are detected for the determination of the content of the encoding performed by the encoder. However, only viewing angle θ may be detected for the determination of the content of the encoding performed by the encoder" *See* para. [0081]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Hatanaka alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

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Claim 5	
5. The method of claim 1, further comprising receiving user input and operating the processor to vary image magnitude or field-of-view of the modified images according to the user input.	Hatanaka expressly and/or inherently discloses and/or renders obvious receiving user input and operating the processor to vary image magnitude or field-of-view of the modified images according to the user input. *See*, *e.g.*, disclosures below.

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	“Receiving device 30 — upon receipt of encoded video-image data from transmission device 20 — decodes the data and outputs a video image signal to representation apparatus 50.” *See* para. [0020]. “Encoding controller 23 is responsible for controlling the content of the video-image encoding process performed by capturer 21 and encoding controller 22 in response to the control communicated from receiving device 30 (i.e., assessment part 42, which shall be described in a later section). The detailed description of the control provided by encoding controller 23 shall be described in a later section. Next is an explanation of the internal configuration of receiving device 30. Receiving device 30 has decoder 31, representation control part 32, and image-processing control device 40. Decoder 31 decodes the encoded image data provided by transmission device 20 and provides the decoded image data to representation control part 32. Decoder 31 applicable herein may be, for example, a conventional device that can decode video images. Representation control part 32 converts the image data decoded by decoder 31 into an image signal of the size that can be displayed on representation apparatus 50 and then provides the image signal of said display size to representation apparatus 50. Representation control part 32 may be installed on the representation apparatus-50 side. Representation control part 32 applicable herein may be any means for converting image data to be displayed into a signal of an image of the size that can be displayed on a display used to output the representation of said image according to the resolution of the image data, doing so in a conventional display device or computer, for example. The following is an explanation of the configuration of image-processing control device 40. Image-processing control device 40 has sensor 41 and assessment part 42. [0024]-[0028].

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	"Assessment part 42 provides instructions to encoding controller 23 so as to control the content to be encoded according to viewing distance D measured by sensor 41. Then, encoding controller 23 controls the content of the video-image encoding process performed by capturer 21 and encoder 22 according to the instructions from assessment part 42. For example, assessment part 42 adjusts the content to be encoded in such a way as to reduce the amount of encoding throughput and the amount of post-encoding data as viewing distance D increases. Additionally, assessment part 42 may be configured to adjust the content to be encoded in such a way as to minimize the amount of encoding throughput and the amount of post-encoding data when sensor 41 does not detect any audience 60. For example, suppose video image signals provided by camera 10 are analog signals (e.g., NTSC signals or the like). In this case, when the signal is uploaded to capturer 21 and converted to a digital image at a prescribed resolution, the resolution used in this event may be altered in response to the control provided by encoding controller 23. For example, a resolution in compliance with the instructions from encoding controller 23 may be used for the encoding rendered by encoder 22. Assessment part 42 can also be configured in other ways. For example, it may be configured so as to provide encoding controller 23 with instructions so that encoding controller 23 adjusts the frame rate, quantization step size, compression ratio, etc., according to viewing distance D. It should be noted that there are no restrictions on the method used to adjust the resolution, frame rate, etc., according to viewing distance D. The adjustment may be achieved by means of altering the parameters applied to the codec or changing the codec itself. By way of example, in the present embodiment, it is assumed that assessment part 42 and encoding controller 23 control the resolution of the image encoded by capturer 21 and encoder 22 in such a way that the resolution is lowered as viewing distance D increases." *See* paras. [0037]-[0039]. "**(A-2) Operation of the First Embodiment**

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	The following is an explanation of the image-processing control operation (image-processing control method according to the embodiment) in image communication system 1, having the configuration described above according to the first embodiment. Figure 3 shows a diagram that illustrates the sequence of the operation involved in the video image processing control in the image communication system. In Figure 3, it is assumed that the video image data encoded by transmission device 20 is given to receiving device 30 and output from receiving device 30 to representation apparatus 50, and the video image is presented to audience 60 through representation apparatus 50 — from the beginning of the processing. First, sensor 41 measures viewing distance D (S101). Next, upon receipt of viewing distance D from sensor 41, assessment part 42 sends out a signal, which controls the content to be encoded according to viewing distance D, to transmission device 20 (encoding controller 23) (S102). Upon receipt of the decoding-content control signal from assessment part 42, encoding controller 23 controls capturer 21 and encoder 22 according to said signal, and then capturer 21 and encoder 22 continue to encode video images according to that content (S103). In step S103, encoding controller 23 may be configured so as to not send a resolution-change instruction to capturer 21 and encoder 22 if it receives the same encoding resolution as the last encoding resolution used. Or, if encoding controller 23 receives a different encoding resolution from the last encoding resolution used, it may send a new encoding resolution to capturer 21 and encoder 22. Incidentally, the operation in steps S101 through S103 described above may be repeated continuously or periodically, or according to sensor 41’s detection of audience 60's

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	movement. There is no restriction on the timing of executing the process." *See* paras. [0040]-[0047]. "**(A-3) Effects of the First Embodiment** The first embodiment demonstrates the following effects: In capturer 21 and encoder 22, video image data are encoded at the resolution determined by assessment part 42 based on viewing distance D measured by sensor 41. Then, the video image data thus encoded are decoded by decoder 31 and displayed on representation apparatus 50. In this event, the resolution of the video image can be lowered to the extent that the audience cannot recognize the image, thus reducing the amount of encoding throughput. Additionally, the reduction of the amount of post-encoding data makes it possible to reduce the amount of data transmitted from transmission device 20 (encoder 22) to receiving device 30 (decoder 31), thereby reducing the load on the network. Additionally, data encoded at a reduced encoding resolution by encoder 22 is decoded by decoder 31. This makes it possible to reduce the amount of decoding throughput in decoder 31. For example, in a company having multiple offices, image communication system 1 is preferably adopted in a system that transmits live video images between multiple locations, for example, to distribute images of each office's sceneries as captured with a camera to other offices or distribute images of rivers, bays, etc., as captured with surveillance cameras to a monitoring center. In such a system that transmits live video images between multiple locations, the audience is not always near the representation apparatus (display) while the system is in operation. However, the present embodiment allows for the encoding/decoding at a lower resolution, etc., when there is no audience in the immediate vicinity of the representation apparatus (display), thus enabling efficient processing of images." *See* paras. [0048]-[0051].

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	"While assessment part 42A in the first embodiment makes an assessment based only on viewing distance D, assessment part 42A in the present embodiment uses viewing distance D and viewing angle θ to make an assessment as mentioned above. Then, encoding controller 23 controls the content of the video-image encoding process performed by capturer 21 and encoder 22 according to the instructions from assessment part 42. For example, assessment part 42 gives instructions to encoding controller 23 so as to cause the amount of encoding throughput and the amount of post-encoding data to decrease as viewing distance D increases. For example, assessment part 42A may be configured to give instructions to encoding controller 23 so as to cause the transverse (horizontal) resolution to be lowered as viewing angle θ increases — e.g., so as to use a resolution applied based only on viewing distance D for comparison and multiply it by √3/2 when viewing angle θ is 30° but by 1/2 when viewing angle θ is 60° to obtain the transverse (horizontal) resolution. Incidentally, when detecting the direction of audience 60 relative to representation apparatus 50 three-dimensionally (i.e., when including the elevation angle associated with the direction of audience 60 in the measurement), assessment part 42A may be configured to give instructions to encoding controller 23 so as to cause the longitudinal (vertical) resolution to be lowered as the elevation angle increases, for example." *See* paras. [0067]-[0069]. "**(B-2) Operation of the Second Embodiment** The following is an explanation of the image-processing control operation (image-processing control method according to the embodiment) in image communication system 1A, having the configuration described above according to the second embodiment. Figure 6 shows a diagram that illustrates the sequence of the operation involved in the video image processing control in the image communication system 1A.

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	It is assumed, in Figure 6, that the video image data encoded by transmission device 20 is given to receiving device 30A and output from receiving device 30A to representation apparatus 50, and the video image is presented to audience 60 through representation apparatus 50 — from the beginning of the processing. First, sensor 41A measures viewing distance D and viewing angle θ (S201). Next, upon receipt of viewing distance D and viewing angle θ from sensor 41A, assessment part 42A sends out a signal, which controls the content of the encoding according to viewing distance D and viewing angle θ, to transmission device 20 (encoding controller 23) (S202). Upon receipt of the encoding-content control signal from assessment part 42A, encoding controller 23 controls capturer 21 and encoder 22 according to said signal, and subsequently, capturer 21 and encoder 22 continue to encode video images according to that content (S203). In step S203, similar to step S103 in the first embodiment described above, encoding controller 23 may be configured so as to not send a resolution-change instruction to capturer 21 and encoder 22 if it receives the same encoding resolution as the last encoding resolution used. Or, if encoding controller 23 receives a different encoding resolution from the last encoding resolution used, it may send a new encoding resolution to capturer 21 and encoder 22. Also, similar to the case of steps S101 through S103 in the first embodiment, there is no restriction on the timing of executing the process involved in the operation performed in steps S201 to S203." *See* paras. [0070]-[0077]. "**(B-3) Effects of the Second Embodiment** The second embodiment demonstrates the following effects in addition to the effects of the first embodiment:

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	Image communication system 1A takes into account not only viewing distance D but also viewing angle θ to determine the content of the encoding performed by encoder 22. This makes it possible to include viewing angle θ in consideration for the determination of the content of the encoding performed by encoder 22 if viewing distance D is the same, thus making it possible to reduce the amount of throughput associated with the encoding and the amount of post-encoding data more than the first embodiment.” *See* paras. [0078]-[0079]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Hatanaka alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

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Claim 6	
6. The method of claim 5, wherein the processor varies the image magnitude or field-of-view mapping to display a partial or full body of the user in the modified images.	Hatanaka expressly and/or inherently discloses and/or renders obvious wherein the processor varies the image magnitude or field-of-view mapping to display a partial or full body of the user in the modified images. *See*, *e.g.*, disclosures below. “Receiving device 30 — upon receipt of encoded video-image data from transmission device 20 — decodes the data and outputs a video image signal to representation apparatus 50.” *See* para. [0020]. “Encoding controller 23 is responsible for controlling the content of the video-image encoding process performed by capturer 21 and encoding controller 22 in response to the control communicated from receiving device 30 (i.e., assessment part 42, which shall

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	be described in a later section). The detailed description of the control provided by encoding controller 23 shall be described in a later section. Next is an explanation of the internal configuration of receiving device 30. Receiving device 30 has decoder 31, representation control part 32, and image-processing control device 40. Decoder 31 decodes the encoded image data provided by transmission device 20 and provides the decoded image data to representation control part 32. Decoder 31 applicable herein may be, for example, a conventional device that can decode video images. Representation control part 32 converts the image data decoded by decoder 31 into an image signal of the size that can be displayed on representation apparatus 50 and then provides the image signal of said display size to representation apparatus 50. Representation control part 32 may be installed on the representation apparatus-50 side. Representation control part 32 applicable herein may be any means for converting image data to be displayed into a signal of an image of the size that can be displayed on a display used to output the representation of said image according to the resolution of the image data, doing so in a conventional display device or computer, for example. The following is an explanation of the configuration of image-processing control device 40. Image-processing control device 40 has sensor 41 and assessment part 42. [0024]-[0028]. "Assessment part 42 provides instructions to encoding controller 23 so as to control the content to be encoded according to viewing distance D measured by sensor 41. Then, encoding controller 23 controls the content of the video-image encoding process performed by capturer 21 and encoder 22 according to the instructions from assessment part 42. For example, assessment part 42 adjusts the content to be encoded in such a way as to reduce the amount of encoding throughput and the amount of post-encoding data as viewing distance D increases. Additionally, assessment part 42 may be configured to adjust the content to be encoded in such a way as to minimize the amount of encoding

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	throughput and the amount of post-encoding data when sensor 41 does not detect any audience 60. For example, suppose video image signals provided by camera 10 are analog signals (e.g., NTSC signals or the like). In this case, when the signal is uploaded to capturer 21 and converted to a digital image at a prescribed resolution, the resolution used in this event may be altered in response to the control provided by encoding controller 23. For example, a resolution in compliance with the instructions from encoding controller 23 may be used for the encoding rendered by encoder 22. Assessment part 42 can also be configured in other ways. For example, it may be configured so as to provide encoding controller 23 with instructions so that encoding controller 23 adjusts the frame rate, quantization step size, compression ratio, etc., according to viewing distance D. It should be noted that there are no restrictions on the method used to adjust the resolution, frame rate, etc., according to viewing distance D. The adjustment may be achieved by means of altering the parameters applied to the codec or changing the codec itself. By way of example, in the present embodiment, it is assumed that assessment part 42 and encoding controller 23 control the resolution of the image encoded by capturer 21 and encoder 22 in such a way that the resolution is lowered as viewing distance D increases." *See* paras. [0037]-[0039]. "**(A-2) Operation of the First Embodiment** The following is an explanation of the image-processing control operation (image-processing control method according to the embodiment) in image communication system 1, having the configuration described above according to the first embodiment. Figure 3 shows a diagram that illustrates the sequence of the operation involved in the video image processing control in the image communication system. In Figure 3, it is assumed that the video image data encoded by transmission device 20 is given to receiving device 30 and output from receiving device 30 to representation

Asserted Claim of the '110 Patent	Exemplary Citations to Hatanaka
	apparatus 50, and the video image is presented to audience 60 through representation apparatus 50 — from the beginning of the processing. First, sensor 41 measures viewing distance D (S101). Next, upon receipt of viewing distance D from sensor 41, assessment part 42 sends out a signal, which controls the content to be encoded according to viewing distance D, to transmission device 20 (encoding controller 23) (S102). Upon receipt of the decoding-content control signal from assessment part 42, encoding controller 23 controls capturer 21 and encoder 22 according to said signal, and then capturer 21 and encoder 22 continue to encode video images according to that content (S103). In step S103, encoding controller 23 may be configured so as to not send a resolution-change instruction to capturer 21 and encoder 22 if it receives the same encoding resolution as the last encoding resolution used. Or, if encoding controller 23 receives a different encoding resolution from the last encoding resolution used, it may send a new encoding resolution to capturer 21 and encoder 22. Incidentally, the operation in steps S101 through S103 described above may be repeated continuously or periodically, or according to sensor 41's detection of audience 60's movement. There is no restriction on the timing of executing the process." *See* paras. [0040]-[0047]. "**(A-3) Effects of the First Embodiment** The first embodiment demonstrates the following effects: In capturer 21 and encoder 22, video image data are encoded at the resolution determined by assessment part 42 based on viewing distance D measured by sensor 41. Then, the video image data thus encoded are decoded by decoder 31 and displayed on representation apparatus 50. In this event, the resolution of the video image can be

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	lowered to the extent that the audience cannot recognize the image, thus reducing the amount of encoding throughput. Additionally, the reduction of the amount of post-encoding data makes it possible to reduce the amount of data transmitted from transmission device 20 (encoder 22) to receiving device 30 (decoder 31), thereby reducing the load on the network. Additionally, data encoded at a reduced encoding resolution by encoder 22 is decoded by decoder 31. This makes it possible to reduce the amount of decoding throughput in decoder 31. For example, in a company having multiple offices, image communication system 1 is preferably adopted in a system that transmits live video images between multiple locations, for example, to distribute images of each office's sceneries as captured with a camera to other offices or distribute images of rivers, bays, etc., as captured with surveillance cameras to a monitoring center. In such a system that transmits live video images between multiple locations, the audience is not always near the representation apparatus (display) while the system is in operation. However, the present embodiment allows for the encoding/decoding at a lower resolution, etc., when there is no audience in the immediate vicinity of the representation apparatus (display), thus enabling efficient processing of images." *See* paras. [0048]-[0051]. "While assessment part 42A in the first embodiment makes an assessment based only on viewing distance D, assessment part 42A in the present embodiment uses viewing distance D and viewing angle θ to make an assessment as mentioned above. Then, encoding controller 23 controls the content of the video-image encoding process performed by capturer 21 and encoder 22 according to the instructions from assessment part 42. For example, assessment part 42 gives instructions to encoding controller 23 so as to cause the amount of encoding throughput and the amount of post-encoding data to decrease as viewing distance D increases.

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	For example, assessment part 42A may be configured to give instructions to encoding controller 23 so as to cause the transverse (horizontal) resolution to be lowered as viewing angle θ increases — e.g., so as to use a resolution applied based only on viewing distance D for comparison and multiply it by √3/2 when viewing angle θ is 30° but by 1/2 when viewing angle θ is 60° to obtain the transverse (horizontal) resolution. Incidentally, when detecting the direction of audience 60 relative to representation apparatus 50 three-dimensionally (i.e., when including the elevation angle associated with the direction of audience 60 in the measurement), assessment part 42A may be configured to give instructions to encoding controller 23 so as to cause the longitudinal (vertical) resolution to be lowered as the elevation angle increases, for example." *See* paras. [0067]-[0069]. "**(B-2) Operation of the Second Embodiment** The following is an explanation of the image-processing control operation (image-processing control method according to the embodiment) in image communication system 1A, having the configuration described above according to the second embodiment. Figure 6 shows a diagram that illustrates the sequence of the operation involved in the video image processing control in the image communication system 1A. It is assumed, in Figure 6, that the video image data encoded by transmission device 20 is given to receiving device 30A and output from receiving device 30A to representation apparatus 50, and the video image is presented to audience 60 through representation apparatus 50 — from the beginning of the processing. First, sensor 41A measures viewing distance D and viewing angle θ (S201). Next, upon receipt of viewing distance D and viewing angle θ from sensor 41A, assessment part 42A sends out a signal, which controls the content of the encoding according to viewing distance D and viewing angle θ, to transmission device 20 (encoding controller 23) (S202).

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	Upon receipt of the encoding-content control signal from assessment part 42A, encoding controller 23 controls capturer 21 and encoder 22 according to said signal, and subsequently, capturer 21 and encoder 22 continue to encode video images according to that content (S203). In step S203, similar to step S103 in the first embodiment described above, encoding controller 23 may be configured so as to not send a resolution-change instruction to capturer 21 and encoder 22 if it receives the same encoding resolution as the last encoding resolution used. Or, if encoding controller 23 receives a different encoding resolution from the last encoding resolution used, it may send a new encoding resolution to capturer 21 and encoder 22. Also, similar to the case of steps S101 through S103 in the first embodiment, there is no restriction on the timing of executing the process involved in the operation performed in steps S201 to S203." *See* paras. [0070]-[0077]. "**(B-3) Effects of the Second Embodiment** The second embodiment demonstrates the following effects in addition to the effects of the first embodiment: Image communication system 1A takes into account not only viewing distance D but also viewing angle θ to determine the content of the encoding performed by encoder 22. This makes it possible to include viewing angle θ in consideration for the determination of the content of the encoding performed by encoder 22 if viewing distance D is the same, thus making it possible to reduce the amount of throughput associated with the encoding and the amount of post-encoding data more than the first embodiment." *See* paras. [0078]-[0079]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Hatanaka alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of

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	Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the ’110 Patent	Exemplary Citations to Hatanaka
Claim 10	
10. The method of claim 1, further comprising operating the processor to augment the modified images by overlaying virtual objects on a user's image appearing within the modified images.	Hatanaka expressly and/or inherently discloses and/or renders obvious operating the processor to augment the modified images by overlaying virtual objects on a user's image appearing within the modified images. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Hatanaka alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the ’110 Patent	Exemplary Citations to Hatanaka
Claim 11	
11. The method of claim 1, further comprising operating the processor to transmit the modified image over a network.	Hatanaka expressly and/or inherently discloses and/or renders obvious operating the processor to transmit the modified image over a network. *See*, *e.g.*, disclosures below. “Camera 10 captures video images and provides signals representing the captured video images to transmission device 20. Camera 10 may be a conventional CCD camera or video camera. There is no restriction on the type of the camera. It should be noted that while images captured by camera 10 may be video or still images, video images are used in the first embodiment to illustrate images captured by camera 10.

Asserted Claim of the '110 Patent	Exemplary Citations to Hatanaka
	Transmission device 20 encodes video image signals provided by camera 10 and provides the encoded video image data to receiving device 30. Communication between transmission device 20 and receiving device 30 may be achieved via a network such as the Internet or a public telephone network, or it may be achieved through a direct connection. There is no restriction on the method of communication." *See* paras. [0018]-[0019]. "Another example of the method used to measure viewing distance D in sensor 41 may involve having audience 60 hold a wireless communication terminal (which, for example, may be built into a terminal used to operate representation apparatus 50, etc., such as a remote control terminal, a mobile phone terminal, or the like) and installing sensor 41 around representation apparatus 50 so that sensor 41 communicates with the above-described wireless communication terminal to thereby measure the distance between the above-described wireless communication terminal and sensor 41, i.e., viewing distance D. The above-described distance between the wireless communication terminal and sensor 41 may be measured based, for example, on the intensity of the signal received or the transmission lag time. Wireless communication between the above-described wireless communication terminal and sensor 41 may be achieved through the use of light, such as radio waves or infrared rays. However, there is no restriction on the communication method insofar as viewing distance D can be measured." *See* para. [0034]. "In the same way as in the case of viewing distance D, an example of the method used to measure viewing angle θ in sensor 41A may involve the use of, for example, a motion sensor, a wireless IC tag, or the like, as described in relation to the "proximity detection means" according to Patent Document 2, whereby sensor 41A recognizes the positional relationship between audience 60 and representation apparatus 50 to thereby determine viewing angle θ. Figure 5 shows an example of detecting the two-dimensional direction of audience 60 relative to representation apparatus 50. However, sensor 41A may also be configured to detect the direction of audience 60 relative to representation apparatus 50 three-dimensionally (including the elevation angle).

Asserted Claim of the '110 Patent	Exemplary Citations to Hatanaka
	For example, by having audience 60 hold a wireless communication terminal (which, for example, may be built into a terminal used to operate representation apparatus 50, etc., such as a remote control terminal, a mobile phone terminal, or the like), it becomes possible for sensor 41A to communicate with the above-described wireless communication terminal so that sensor 41A can determine viewing angle θ by measuring the direction in which a wireless signal (e.g., radio waves, infrared rays, etc.) is acquired from the above-described wireless communication terminal. Wireless communication between the above-described wireless communication terminal and sensor 41 may be achieved through the use of light, such as radio waves or infrared rays. However, there is no restriction on the communication method insofar as viewing angle θ can be measured." *See* paras. [0064]-[0065]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Hatanaka alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '110 Patent	Exemplary Citations to Hatanaka
Claim 12	
12. The method of claim 1, further comprising displaying the modified image on a remote screen for video telepresence.	Hatanaka expressly and/or inherently discloses and/or renders obvious displaying the modified image on a remote screen for video telepresence. *See*, *e.g.*, disclosures below. "Camera 10 captures video images and provides signals representing the captured video images to transmission device 20. Camera 10 may be a conventional CCD camera or video camera. There is no restriction on the type of the camera. It should be noted that while images captured by camera 10 may be video or still images, video images are used in the first embodiment to illustrate images captured by camera 10.

Asserted Claim of the '110 Patent	Exemplary Citations to Hatanaka
	Transmission device 20 encodes video image signals provided by camera 10 and provides the encoded video image data to receiving device 30. Communication between transmission device 20 and receiving device 30 may be achieved via a network such as the Internet or a public telephone network, or it may be achieved through a direct connection. There is no restriction on the method of communication." *See* paras. [0018]-[0019]. "Another example of the method used to measure viewing distance D in sensor 41 may involve having audience 60 hold a wireless communication terminal (which, for example, may be built into a terminal used to operate representation apparatus 50, etc., such as a remote control terminal, a mobile phone terminal, or the like) and installing sensor 41 around representation apparatus 50 so that sensor 41 communicates with the above-described wireless communication terminal to thereby measure the distance between the above-described wireless communication terminal and sensor 41, i.e., viewing distance D. The above-described distance between the wireless communication terminal and sensor 41 may be measured based, for example, on the intensity of the signal received or the transmission lag time. Wireless communication between the above-described wireless communication terminal and sensor 41 may be achieved through the use of light, such as radio waves or infrared rays. However, there is no restriction on the communication method insofar as viewing distance D can be measured." *See* para. [0034]. "In the same way as in the case of viewing distance D, an example of the method used to measure viewing angle θ in sensor 41A may involve the use of, for example, a motion sensor, a wireless IC tag, or the like, as described in relation to the "proximity detection means" according to Patent Document 2, whereby sensor 41A recognizes the positional relationship between audience 60 and representation apparatus 50 to thereby determine viewing angle θ. Figure 5 shows an example of detecting the two-dimensional direction of audience 60 relative to representation apparatus 50. However, sensor 41A may also be configured to detect the direction of audience 60 relative to representation apparatus 50 three-dimensionally (including the elevation angle).

Asserted Claim of the '110 Patent	Exemplary Citations to Hatanaka
	For example, by having audience 60 hold a wireless communication terminal (which, for example, may be built into a terminal used to operate representation apparatus 50, etc., such as a remote control terminal, a mobile phone terminal, or the like), it becomes possible for sensor 41A to communicate with the above-described wireless communication terminal so that sensor 41A can determine viewing angle θ by measuring the direction in which a wireless signal (e.g., radio waves, infrared rays, etc.) is acquired from the above-described wireless communication terminal. Wireless communication between the above-described wireless communication terminal and sensor 41 may be achieved through the use of light, such as radio waves or infrared rays. However, there is no restriction on the communication method insofar as viewing angle θ can be measured." *See* paras. [0064]-[0065]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Hatanaka alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '110 Patent	Exemplary Citations to Hatanaka
Claim 16	
16. The method of claim 1, wherein the processor operates on the images from the camera to generate background segmentation, and replaces segments on the images by replacement segments.	Hatanaka expressly and/or inherently discloses and/or renders obvious wherein the processor operates on the images from the camera to generate background segmentation, and replaces segments on the images by replacement segments. *See*, *e.g.*, disclosures below. "However, the device described in Patent Document 1 poses a problem because merely lowering the encoding resolution without taking into account the distance between the audience and the representation apparatus does not resolve the issue that the encoding is performed at the same resolution regardless of whether the audience looks at the

Asserted Claim of the '110 Patent	Exemplary Citations to Hatanaka
	representation apparatus from a distance or at close range, meaning that the processing load on the encoder remains higher than necessary. With the device described in Patent Document 2, the processing load on the encoder also remains higher than necessary because said device uses the distance between the audience and the representation apparatus as a criterion for the processing performed to make the identification of images projected on a representation apparatus difficult, although such processing with a conventional technology allows for communications with less psychological burdens." *See* paras. [0006]-[0007]. "Representation control part 32 converts the image data decoded by decoder 31 into an image signal of the size that can be displayed on representation apparatus 50 and then provides the image signal of said display size to representation apparatus 50. Representation control part 32 may be installed on the representation apparatus-50 side. Representation control part 32 applicable herein may be any means for converting image data to be displayed into a signal of an image of the size that can be displayed on a display used to output the representation of said image according to the resolution of the image data, doing so in a conventional display device or computer, for example." *See* para. [0027]. "Assessment part 42 provides instructions to encoding controller 23 so as to control the content to be encoded according to viewing distance D measured by sensor 41. Then, encoding controller 23 controls the content of the video-image encoding process performed by capturer 21 and encoder 22 according to the instructions from assessment part 42. For example, assessment part 42 adjusts the content to be encoded in such a way as to reduce the amount of encoding throughput and the amount of post-encoding data as viewing distance D increases. Additionally, assessment part 42 may be configured to adjust the content to be encoded in such a way as to minimize the amount of encoding throughput and the amount of post-encoding data when sensor 41 does not detect any audience 60.

Asserted Claim of the '110 Patent	Exemplary Citations to Hatanaka
	For example, suppose video image signals provided by camera 10 are analog signals (e.g., NTSC signals or the like). In this case, when the signal is uploaded to capturer 21 and converted to a digital image at a prescribed resolution, the resolution used in this event may be altered in response to the control provided by encoding controller 23. For example, a resolution in compliance with the instructions from encoding controller 23 may be used for the encoding rendered by encoder 22. Assessment part 42 can also be configured in other ways. For example, it may be configured so as to provide encoding controller 23 with instructions so that encoding controller 23 adjusts the frame rate, quantization step size, compression ratio, etc., according to viewing distance D. It should be noted that there are no restrictions on the method used to adjust the resolution, frame rate, etc., according to viewing distance D. The adjustment may be achieved by means of altering the parameters applied to the codec or changing the codec itself. By way of example, in the present embodiment, it is assumed that assessment part 42 and encoding controller 23 control the resolution of the image encoded by capturer 21 and encoder 22 in such a way that the resolution is lowered as viewing distance D increases." *See* paras. [0037]-[0039]. "**(A-2) Operation of the First Embodiment** The following is an explanation of the image-processing control operation (image-processing control method according to the embodiment) in image communication system 1, having the configuration described above according to the first embodiment. Figure 3 shows a diagram that illustrates the sequence of the operation involved in the video image processing control in the image communication system. In Figure 3, it is assumed that the video image data encoded by transmission device 20 is given to receiving device 30 and output from receiving device 30 to representation apparatus 50, and the video image is presented to audience 60 through representation apparatus 50 — from the beginning of the processing. First, sensor 41 measures viewing distance D (S101).

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	Next, upon receipt of viewing distance D from sensor 41, assessment part 42 sends out a signal, which controls the content to be encoded according to viewing distance D, to transmission device 20 (encoding controller 23) (S102). Upon receipt of the decoding-content control signal from assessment part 42, encoding controller 23 controls capturer 21 and encoder 22 according to said signal, and then capturer 21 and encoder 22 continue to encode video images according to that content (S103). In step S103, encoding controller 23 may be configured so as to not send a resolution-change instruction to capturer 21 and encoder 22 if it receives the same encoding resolution as the last encoding resolution used. Or, if encoding controller 23 receives a different encoding resolution from the last encoding resolution used, it may send a new encoding resolution to capturer 21 and encoder 22. Incidentally, the operation in steps S101 through S103 described above may be repeated continuously or periodically, or according to sensor 41’s detection of audience 60's movement. There is no restriction on the timing of executing the process.” *See* paras. [0040]-[0047]. “**(A-3) Effects of the First Embodiment** The first embodiment demonstrates the following effects: In capturer 21 and encoder 22, video image data are encoded at the resolution determined by assessment part 42 based on viewing distance D measured by sensor 41. Then, the video image data thus encoded are decoded by decoder 31 and displayed on representation apparatus 50. In this event, the resolution of the video image can be lowered to the extent that the audience cannot recognize the image, thus reducing the amount of encoding throughput. Additionally, the reduction of the amount of post-encoding data makes it possible to reduce the amount of data transmitted from

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	transmission device 20 (encoder 22) to receiving device 30 (decoder 31), thereby reducing the load on the network. Additionally, data encoded at a reduced encoding resolution by encoder 22 is decoded by decoder 31. This makes it possible to reduce the amount of decoding throughput in decoder 31. For example, in a company having multiple offices, image communication system 1 is preferably adopted in a system that transmits live video images between multiple locations, for example, to distribute images of each office's sceneries as captured with a camera to other offices or distribute images of rivers, bays, etc., as captured with surveillance cameras to a monitoring center. In such a system that transmits live video images between multiple locations, the audience is not always near the representation apparatus (display) while the system is in operation. However, the present embodiment allows for the encoding/decoding at a lower resolution, etc., when there is no audience in the immediate vicinity of the representation apparatus (display), thus enabling efficient processing of images." *See* paras. [0048]-[0051]. "While assessment part 42A in the first embodiment makes an assessment based only on viewing distance D, assessment part 42A in the present embodiment uses viewing distance D and viewing angle θ to make an assessment as mentioned above. Then, encoding controller 23 controls the content of the video-image encoding process performed by capturer 21 and encoder 22 according to the instructions from assessment part 42. For example, assessment part 42 gives instructions to encoding controller 23 so as to cause the amount of encoding throughput and the amount of post-encoding data to decrease as viewing distance D increases. For example, assessment part 42A may be configured to give instructions to encoding controller 23 so as to cause the transverse (horizontal) resolution to be lowered as viewing angle θ increases — e.g., so as to use a resolution applied based only on viewing distance D for comparison and multiply it by √3/2 when viewing angle θ is 30° but by

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	1/2 when viewing angle θ is 60° to obtain the transverse (horizontal) resolution. Incidentally, when detecting the direction of audience 60 relative to representation apparatus 50 three-dimensionally (i.e., when including the elevation angle associated with the direction of audience 60 in the measurement), assessment part 42A may be configured to give instructions to encoding controller 23 so as to cause the longitudinal (vertical) resolution to be lowered as the elevation angle increases, for example." *See* paras. [0067]-[0069]. "**(B-2) Operation of the Second Embodiment** The following is an explanation of the image-processing control operation (image-processing control method according to the embodiment) in image communication system 1A, having the configuration described above according to the second embodiment. Figure 6 shows a diagram that illustrates the sequence of the operation involved in the video image processing control in the image communication system 1A. It is assumed, in Figure 6, that the video image data encoded by transmission device 20 is given to receiving device 30A and output from receiving device 30A to representation apparatus 50, and the video image is presented to audience 60 through representation apparatus 50 — from the beginning of the processing. First, sensor 41A measures viewing distance D and viewing angle θ (S201). Next, upon receipt of viewing distance D and viewing angle θ from sensor 41A, assessment part 42A sends out a signal, which controls the content of the encoding according to viewing distance D and viewing angle θ, to transmission device 20 (encoding controller 23) (S202). Upon receipt of the encoding-content control signal from assessment part 42A, encoding controller 23 controls capturer 21 and encoder 22 according to said signal, and

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	subsequently, capturer 21 and encoder 22 continue to encode video images according to that content (S203). In step S203, similar to step S103 in the first embodiment described above, encoding controller 23 may be configured so as to not send a resolution-change instruction to capturer 21 and encoder 22 if it receives the same encoding resolution as the last encoding resolution used. Or, if encoding controller 23 receives a different encoding resolution from the last encoding resolution used, it may send a new encoding resolution to capturer 21 and encoder 22. Also, similar to the case of steps S101 through S103 in the first embodiment, there is no restriction on the timing of executing the process involved in the operation performed in steps S201 to S203." *See* paras. [0070]-[0077]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Hatanaka alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '110 Patent	Exemplary Citations to Hatanaka
Claim 17	
17. The method of claim 16, wherein the replacement segments comprise virtual background or background that was captured in a different setting.	Hatanaka expressly and/or inherently discloses and/or renders obvious wherein the replacement segments comprise virtual background or background that was captured in a different setting. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Hatanaka alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover

Asserted Claim of the ’110 Patent	Exemplary Citations to Hatanaka
	document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

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Exhibit B-06: Invalidity of U.S. Patent No. 8,982,110 in view of *Smart Makeup Mirror: Computer-Augmented Mirror to Aid Makeup Application*, Iwabuchi et al. ("Iwabuchi")

This chart is subject to all reservations, objections, and disclaimers in Defendants' Invalidity Contentions and any amendment, supplement, or modification thereof, which are incorporated herein by reference in their entirety.

Iwabuchi[1] was published on July 24, 2009 and thus is available as prior art to U.S. Patent No. 8,982,110 (the "'110 Patent") under at least 35 U.S.C. §§ 102(a) and (b).

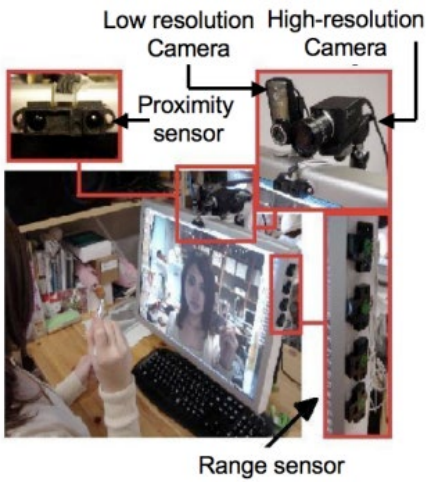
Iwabuchi anticipates the Asserted Claims of the '110 Patent. To the extent it is found Iwabuchi does not expressly disclose certain limitations in the Asserted Claims, such limitations are at least implicitly or inherently disclosed. Moreover, to the extent it is found that Iwabuchi does not anticipate the Asserted Claims, Iwabuchi renders obvious the Asserted Claims, either alone or in combination with other prior art identified in the cover pleading or herein, and/or in combination with the general knowledge of a person having ordinary skill in the art.

In these contentions, Defendants have relied in part on Plaintiff's Infringement Contentions. In those contentions, Plaintiff appears to pursue overly broad claim constructions in an effort to assert infringement where none exists, and to accuse products that do not infringe the claims. Defendants' assertion that a particular limitation is disclosed by a prior art reference and/or is disclosed in a particular manner may be based in part on Plaintiff's apparent claim interpretations. In relying on Plaintiff's apparent claim interpretations, Defendants do not admit that Plaintiff's apparent claim interpretations are supportable or proper or that the claim limitations in question are definite or otherwise amenable to construction.

Defendants have endeavored to provide as much detail as possible in these contentions and, in doing so, have exceeded the level of detail required. The inclusion of specific details in some areas is not a concession that such details are required or that the omission of similar details in other areas is a defect. These citations to portions of any reference in this chart are exemplary only. Defendants will rely on the entirety of the references cited in this chart to show that the Asserted Claims are invalid.

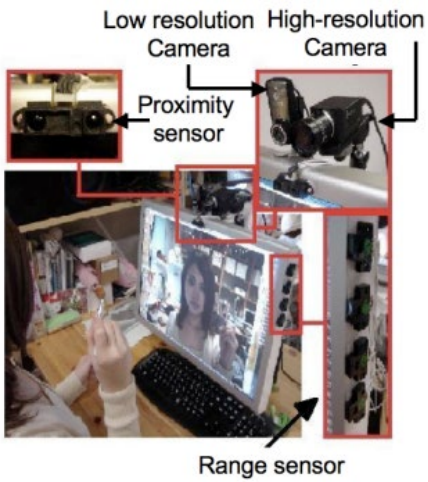
[1] Eriko Iwabuchi et al., *Smart Makeup Mirror: Computer-Augmented Mirror to Aid Makeup Application*, Human-Computer Interaction. Interacting in Various Application Domains, 495-503 (2009).

Asserted Claim of the '110 Patent	Exemplary Citations to Iwabuchi
Claim 1	
1[pre]. A computerized method for operating a display system, the display system having a camera, a monitor, and a processor, the method comprising:	To the extent the preamble is limiting, Iwabuchi expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. "Figure 1 shows the over view of the proposed system. As part of this system, we place a high-resolution camera (Point Grey Research, Grasshopper, with IEEE-1394b connection, 1624 x 1224 pixels, 30 fps) above the computer display. The camera is trained on the woman, and a mirror image of the woman is shown on the screen; thus, the device functions and assists the woman in applying makeup effectively while looking at her image. There are some researches that use a standard-definition TV camera and display images as a mirror would [2][3]. In the proposed system, we use a high-resolution camera in order to enable practicable makeup application In order to realize the functions described later in the paper, we processed the images captured by the camera. We set up a low-resolution camera (Logicool, Qcam Pro for Notebooks, in a 320 x 240 pixel mode, 30 fps) for such image processing. We used OpenCV in the image data processing and FlyCapture for the controlling the high-resolution camera. These cameras are connected to a PC (Gateway GT5092j) with Windows Vista OS. Moreover, we set up an infra red range sensor and a proximity sensor for performing the following functions. These devices are controlled with a microcomputer, and communicate with the PC program through serial connection." *See* "2. Smart Makeup Mirror" at page 496.

Asserted Claim of the '110 Patent	Exemplary Citations to Iwabuchi
	 **Fig. 1.** Overview of Smart Makeup Mirror *See* "2. Smart Makeup Mirror" at page 496. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Iwabuchi alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[a]. operating the camera to generate a stream of images of the user;	Iwabuchi expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. "In this paper, we present a system that aids people in wearing makeup easily and make the process enjoyable. We call the proposed system the "Smart Makeup Mirror", which is an electronic dressing table that facilitates the process of makeup application. In this system, we place a high-resolution camera above a computer display and have added some functions such as "Automatic zoom to a specific part of the face", "Display the

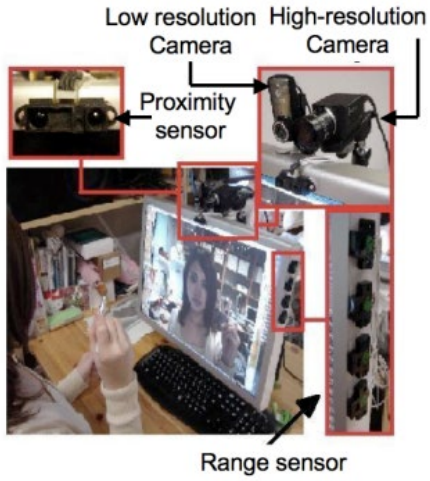
Asserted Claim of the '110 Patent	Exemplary Citations to Iwabuchi
	face from various angles", "Simulation of lighting conditions", and "Internet voting on better makeup results" to facilitate the makeup application process. People who use this device for applying makeup will obtain highly satisfactory results, while enjoying the process." *See* "Abstract" at page 495. "Figure 1 shows the over view of the proposed system. As part of this system, we place a high-resolution camera (Point Grey Research, Grasshopper, with IEEE-1394b connection, 1624 x 1224 pixels, 30 fps) above the computer display. The camera is trained on the woman, and a mirror image of the woman is shown on the screen; thus, the device functions and assists the woman in applying makeup effectively while looking at her image. There are some researches that use a standard-definition TV camera and display images as a mirror would [2][3]. In the proposed system, we use a high-resolution camera in order to enable practicable makeup application In order to realize the functions described later in the paper, we processed the images captured by the camera. We set up a low-resolution camera (Logicool, Qcam Pro for Notebooks, in a 320 x 240 pixel mode, 30 fps) for such image processing. We used OpenCV in the image data processing and FlyCapture for the controlling the high-resolution camera. These cameras are connected to a PC (Gateway GT5092j) with Windows Vista OS. Moreover, we set up an infra red range sensor and a proximity sensor for performing the following functions. These devices are controlled with a microcomputer, and communicate with the PC program through serial connection." *See* "2. Smart Makeup Mirror" at page 496. "Using this system, users apply makeup while looking at the computer display where an image of the user's face is captured by the high-resolution camera is displayed. This configuration is slightly different from a realistic mirror because the user's gaze is not aligned with the image, because the camera takes pictures from the top of the display. The response of the image may be delayed because of computation. Further, the resolution is lower than that of a realistic mirror, and the image may be out of focus

Asserted Claim of the '110 Patent	Exemplary Citations to Iwabuchi
	where a user moves considerably from the focusing position of the camera. These differences may obstruct the makeup application process. The purpose of this research is to implement an artificial mirror with functions that cannot be achieved by using a realistic mirror in order to compensate for the abovementioned differences." *See* "2. Makeup Support Function" at pages 496-497. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Iwabuchi alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[b]. operating the processor to detect the presence of the user in the stream of image;	Iwabuchi expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. "Moreover, we set up an infra red range sensor and a proximity sensor for performing the following functions. These devices are controlled with a microcomputer, and communicate with the PC program through serial connection." *See* "2. Smart Makeup Mirror" at page 496.

Asserted Claim of the ’110 Patent	Exemplary Citations to Iwabuchi
	 **Fig. 1.** Overview of Smart Makeup Mirror *See* “2. Smart Makeup Mirror” at page 496. “During the makeup application process, we usually bring our face close to the mirror in order to ensure that our makeup is satisfactory and to check the makeup near certain face parts such as the eyes and the mouth. This is a critical part of the makeup application process, is frequently needed, and is often the most troublesome as it requires a strenuous and awkward posture. For this purpose, we developed an automatic zoom function in the proposed system for zooming at a particular at part of the face. When a user brings the makeup tool, with an attached color marker (a small green sticky label), near her eyes, the camera recognizes the marker, zooms in, and switches to an enlarged image of the eye. In order to detect the color marker, it is not practical to use the high-resolution camera image because the processing time will increase significantly and the response will be unacceptable: moreover, the accuracy of position detection achieved by the high-resolution camera is not required. Therefore, we use an additional low-resolution camera

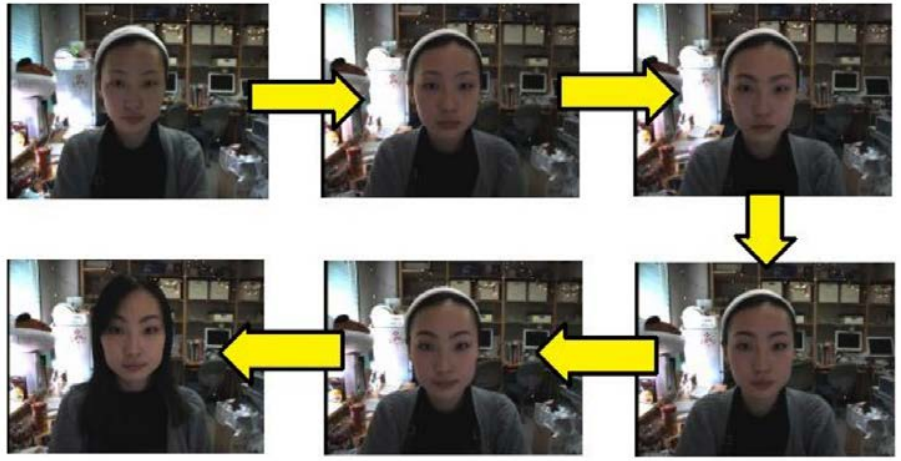
Asserted Claim of the ’110 Patent	Exemplary Citations to Iwabuchi
	for recognizing markers. This enables users to apply makeup without having to physically approach the display.” *See* “3.1 Automatic Zoom and Pan” at page 497. “In order to decrease the difficulty in applying makeup to the upper eyelid, we carefully observed users when they applied makeup to the eyelid. When they applied makeup to the upper eyelid using a mirror, they wanted to see their face from below. For this purpose, they raised their head and lowered their line of vision. (Fig. 5 left) Conversely, when they applied makeup to the lower eyelid, they lowered their head and glanced upward (Fig. 5 right). In the prototype system, the image is displayed at the upper part of the display: therefore, users felt that it was easier to apply makeup to the lower eyelid than to the upper eyelid.  **Fig. 5.** Application of makeup to upper eyelid (left) and lower eyelid (right) This problem could be solved by changing the display position of the image according to the makeup activity to the lower and upper eyelids. Thus we have implemented a function that displays a magnified image of the eyes at the upper part of the display when the user applies makeup to the upper eyelid, and displays the magnified image at the lower part of the display when the user applies makeup to the lower eyelid. The user’s activity of applying makeup to the upper or lower eyelids is detected by means of computer vision through the low-resolution camera. Thus, users easily apply makeup not

Asserted Claim of the '110 Patent	Exemplary Citations to Iwabuchi
	only to the lower eyelid but also to the upper eyelid." *See* "5 Adjusting Position of Display" at pages 501-502. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Iwabuchi alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[c]. operating the processor to apply adaptive transformation mapping to the stream of images captured by the camera to generate modified images that appear to be captured from a different point of view of the camera's actual point of view; and	Iwabuchi expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. "Figure 1 shows the over view of the proposed system. As part of this system, we place a high-resolution camera (Point Grey Research, Grasshopper, with IEEE-1394b connection, 1624 x 1224 pixels, 30 fps) above the computer display. The camera is trained on the woman, and a mirror image of the woman is shown on the screen; thus, the device functions and assists the woman in applying makeup effectively while looking at her image. There are some researches that use a standard-definition TV camera and display images as a mirror would [2][3]. In the proposed system, we use a high-resolution camera in order to enable practicable makeup application In order to realize the functions described later in the paper, we processed the images captured by the camera. We set up a low-resolution camera (Logicool, Qcam Pro for Notebooks, in a 320 x 240 pixel mode, 30 fps) for such image processing. We used OpenCV in the image data processing and FlyCapture for the controlling the high-resolution camera. These cameras are connected to a PC (Gateway GT5092j) with Windows Vista OS. Moreover, we set up an infra red range sensor and a proximity sensor for performing the following functions. These devices are controlled with a microcomputer, and

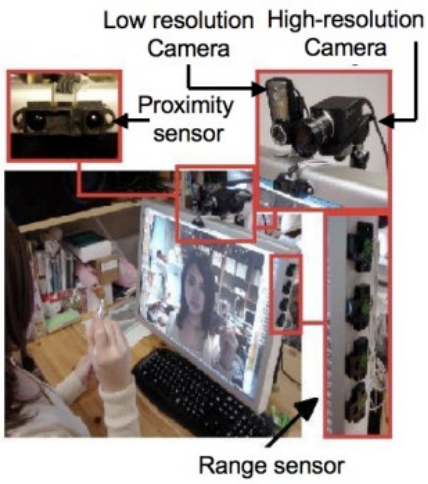
Asserted Claim of the '110 Patent	Exemplary Citations to Iwabuchi
	communicate with the PC program through serial connection." *See* "Smart Makeup Mirror" at page 496.  **Fig. 1.** Overview of Smart Makeup Mirror *See* "Smart Makeup Mirror" at page 496. "Using this system, users apply makeup while looking at the computer display where an image of the user's face is captured by the high-resolution camera is displayed. This configuration is slightly different from a realistic mirror because the user's gaze is not aligned with the image, because the camera takes pictures from the top of the display. The response of the image may be delayed because of computation. Further, the resolution is lower than that of a realistic mirror, and the image may be out of focus where a user moves considerably from the focusing position of the camera. These differences may obstruct the makeup application process. The purpose of this research is to implement an artificial mirror with functions that cannot be achieved by using a realistic mirror in order to compensate for the abovementioned differences.

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	In order to estimate the influence of the abovementioned differences on the makeup application process, we applied makeup using an early-stage prototype of our electronic mirror. The following observations were made. • Satisfactory makeup application using the electronic mirror is generally possible. • However, a function that enables gaze alignment is required. " *See* "3 Makeup Support Function" at page 496-97. "During the makeup application process, we usually bring our face close to the mirror in order to ensure that our makeup is satisfactory and to check the makeup near certain face parts such as the eyes and the mouth. This is a critical part of the makeup application process, is frequently needed, and is often the most troublesome as it requires a strenuous and awkward posture. For this purpose, we developed an automatic zoom function in the proposed system for zooming at a particular at part of the face. When a user brings the makeup tool, with an attached color marker (a small green sticky label), near her eyes, the camera recognizes the marker, zooms in, and switches to an enlarged image of the eye. In order to detect the color marker, it is not practical to use the high-resolution camera image because the processing time will increase significantly and the response will be unacceptable: moreover, the accuracy of position detection achieved by the high-resolution camera is not required. Therefore, we use an additional low-resolution camera for recognizing markers. This enables users to apply makeup without having to physically approach the display." *See* "3.1 Automatic Zoom and Pan" at page 497. "We developed a 'magnifying glass function' in order to provide finishing touches to the makeup application process, thereby improving the quality of the applied makeup. The proposed system uses an infrared range sensor to measure the distance between the camera and the face. Further, the magnification rate of the display image can be increased/decreased by simply and slightly approaching/leaving the display. A similar

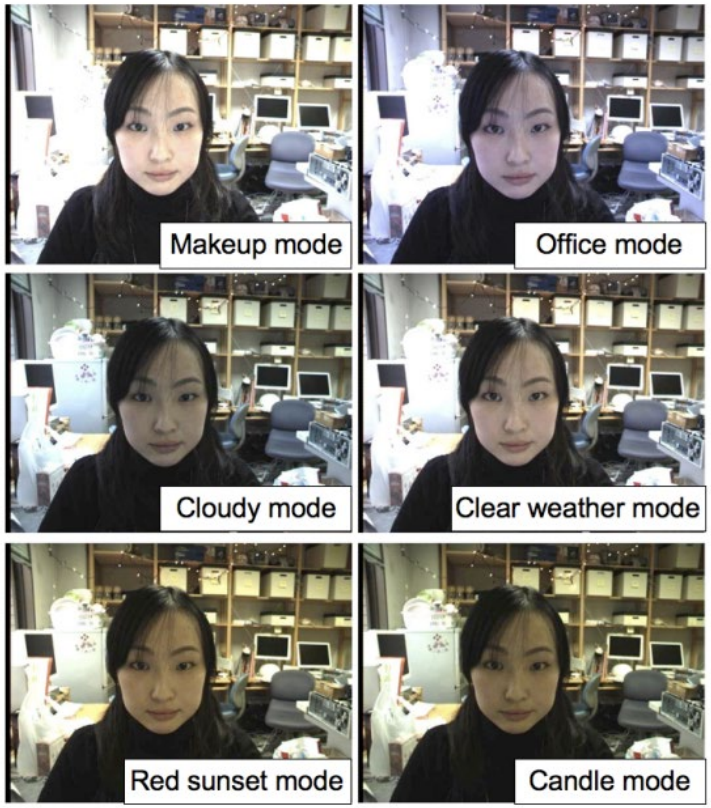
Asserted Claim of the '110 Patent	Exemplary Citations to Iwabuchi
	technique was recently used for a document browser [5]." *See* "3.2 Intuitive Magnification Rate Control" at pages 497-498. "A professional makeup artist will always recommend checking a person's appearance from the viewpoint of another person standing in front, with the help of a left and right reversing mirror (the reversal mirror) [4]. The impression of the hairstyle: the shape of the eyebrow, eyes, and lips: and the positions of moles are different, when the face is seen in a reversal mirror. Therefore, we added this functionality to the proposed system, enabling the system to as display the image captured by the camera as a left and right reversing mirror would." *See* "3.3 Left and Right Reversing Mirror" at page 498. "In everyday life, the face is observed not only from the front but also from the side, from the bottom, and in the diagonal direction. Thus, while applying makeup, we must inspect the face from various angles. In the proposed system, the camera captures the image of our face and displays it for several seconds. By looking at that picture, we can inspect the makeup on the face from various angles. As a result, it is possible for us to check our profile and our view from the back, which is not possible to observe in a conventional mirror. When a user captures her face while she is looking at the camera, she can check the gaze-aligned view of her face that a conventional mirror always provides." *See* "3.4 Profile Check" at page 498. "It is usual that to apply makeup in a place that is as bright as possible. However, the makeup of a user and hence her appearance may appear different under different lighting sources such as sunlight, fluorescent lamps, and incandescent lamps. This system simulates the lighting conditions depending on the surroundings. (Fig.2) The lighting conditions are makeup mode, office mode, cloudy mode, clear weather mode, red sunset mode, and candle mode. The selected lighting mode is displayed in the title bar of the interface and can be confirmed easily." *See* "3.5 Lighting Mode" at page 498.

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	 **Fig. 3.** Steps from "no makeup" to :full makeup and hair arrangement." *See* "4.1 Test by the Author" at page 500. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Iwabuchi alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[d]. displaying the modified images on the monitor;	Iwabuchi expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. "In this paper, we present a system that aids people in wearing makeup easily and make the process enjoyable. We call the proposed system the "Smart Makeup Mirror", which is an electronic dressing table that facilitates the process of makeup application. In this system, we place a high-resolution camera above a computer display and have added some functions such as "Automatic zoom to a specific part of the face", "Display the face from various angles", "Simulation of lighting conditions", and "Internet voting on

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	better makeup results" to facilitate the makeup application process. People who use this device for applying makeup will obtain highly satisfactory results, while enjoying the process." *See* "Abstract" at page 495. "Figure 1 shows the over view of the proposed system. As part of this system, we place a high-resolution camera (Point Grey Research, Grasshopper, with IEEE-1394b connection, 1624 x 1224 pixels, 30 fps) above the computer display. The camera is trained on the woman, and a mirror image of the woman is shown on the screen; thus, the device functions and assists the woman in applying makeup effectively while looking at her image. There are some researches that use a standard-definition TV camera and display images as a mirror would [2][3]. In the proposed system, we use a high-resolution camera in order to enable practicable makeup application In order to realize the functions described later in the paper, we processed the images captured by the camera. We set up a low-resolution camera (Logicool, Qcam Pro for Notebooks, in a 320 x 240 pixel mode, 30 fps) for such image processing. We used OpenCV in the image data processing and FlyCapture for the controlling the high-resolution camera. These cameras are connected to a PC (Gateway GT5092j) with Windows Vista OS. Moreover, we set up an infra red range sensor and a proximity sensor for performing the following functions. These devices are controlled with a microcomputer, and communicate with the PC program through serial connection." *See* "Smart Makeup Mirror" at page 496.

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	 **Fig. 1.** Overview of Smart Makeup Mirror *See* “Smart Makeup Mirror” at page 496. “Using this system, users apply makeup while looking at the computer display where an image of the user’s face is captured by the high-resolution camera is displayed. This configuration is slightly different from a realistic mirror because the user’s gaze is not aligned with the image, because the camera takes pictures from the top of the display. The response of the image may be delayed because of computation. Further, the resolution is lower than that of a realistic mirror, and the image may be out of focus where a user moves considerably from the focusing position of the camera. These differences may obstruct the makeup application process. The purpose of this research is to implement an artificial mirror with functions that cannot be achieved by using a realistic mirror in order to compensate for the abovementioned differences.

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	In order to estimate the influence of the abovementioned differences on the makeup application process, we applied makeup using an early-stage prototype of our electronic mirror. The following observations were made. • Satisfactory makeup application using the electronic mirror is generally possible. • However, a function that enables gaze alignment is required. When a user tries to see an enlarged view of her face and comes considerably close to the camera, the face image gets blurred as the camera does not have an auto-focus mechanism. From the above observations, we conclude that at least two additional functions are required to make the electronic mirror as effective as a realistic mirror in the makeup application process. One is to capture and display the user's face from the front, and the other is to enlarge this image for ease of use. The details of these functions are explained in the following sections." *See* "3 Makeup Support Function" at pages 496-497. "When we change cosmetics, tools, or the method of makeup, it is difficult to find differences in the face between how our face looked with the old makeup and how it looks with the new makeup. Moreover, it is also difficult to see our own face objectively in a conventional mirror, because we usually hold a good expression in front of the mirror. The smart makeup mirror allows us to save the image being displayed to a computer file with a particular file name and date. By using this function, we capture an image of our face after applying makeup. This will help us to accurately compare the color, brightness, or texture that suits our face by capturing an image every time in the same environment." *See* "3.6 Makeup Log" at 498.

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	 **Fig. 2.** Differences in the face appearance in different lighting modes *See* “3.6 Makeup Log” at 499. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Iwabuchi alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of

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	Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[e]. wherein the different point of view corresponds to an image taken from a different angle and a different distance than the actual images captured by the camera; and	Iwabuchi expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. "In everyday life, the face is observed not only from the front but also from the side, from the bottom, and in the diagonal direction. Thus, while applying makeup, we must inspect the face from various angles. In the proposed system, the camera captures the image of our face and displays it for several seconds. By looking at that picture, we can inspect the makeup on the face from various angles. As a result, it is possible for us to check our profile and our view from the back, which is not possible to observe in a conventional mirror. When a user captures her face while she is looking at the camera, she can check the gaze-aligned view of her face that a conventional mirror always provides." *See* "3.4 Profile Check" at page 498. "During the makeup application process, we usually bring our face close to the mirror in order to ensure that our makeup is satisfactory and to check the makeup near certain face parts such as the eyes and the mouth. This is a critical part of the makeup application process, is frequently needed, and is often the most troublesome as it re quires a strenuous and awkward posture. For this purpose, we developed an automatic zoom function in the proposed system for zooming at a particular at part of the face. When a user brings the makeup tool, with an attached color marker (a small green sticky label), near her eyes, the camera recognizes the marker, zooms in, and switches to an enlarged image of the eye. In order to detect the color marker, it is not practical to use the high-resolution camera image because the processing time will increase significantly and the response will be unacceptable: moreover, the accuracy of position detection achieved by the high-resolution camera is not required. Therefore, we use an additional low-resolution camera

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	for recognizing markers. This enables users to apply makeup without having to physically approach the display." *See* "3.1 Automatic Zoom and Pan" at page 497. "We developed a 'magnifying glass function' in order to provide finishing touches to the makeup application process, thereby improving the quality of the applied makeup. The proposed system uses an infrared range sensor to measure the distance between the camera and the face. Further, the magnification rate of the display image can be increased/decreased by simply and slightly approaching/leaving the display. A similar technique was recently used for a document browser [5]." *See* "3.2 Intuitive Magnification Rate Control" at pages 497-498. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Iwabuchi alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[f]. wherein during mirror tracking mode the processor utilizes the angle of the images captured by the camera and applies parametric input for a mapping transformation that changes imaging perspective of the images captured by the camera.	Iwabuchi expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. "In everyday life, the face is observed not only from the front but also from the side, from the bottom, and in the diagonal direction. Thus, while applying makeup, we must inspect the face from various angles. In the proposed system, the camera captures the image of our face and displays it for several seconds. By looking at that picture, we can inspect the makeup on the face from various angles. As a result, it is possible for us to check our profile and our view from the back, which is not possible to observe in a conventional mirror. When a user captures her face while she is looking at the camera, she can check the gaze-aligned view of her face that a conventional mirror always provides." *See* "3.4 Profile Check" at page 498. "During the makeup application process, we usually bring our face close to the mirror in order to ensure that our makeup is satisfactory and to check the makeup near certain face

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	parts such as the eyes and the mouth. This is a critical part of the makeup application process, is frequently needed, and is often the most troublesome as it re quires a strenuous and awkward posture. For this purpose, we developed an automatic zoom function in the proposed system for zooming at a particular at part of the face. When a user brings the makeup tool, with an attached color marker (a small green sticky label), near her eyes, the camera recognizes the marker, zooms in, and switches to an enlarged image of the eye. In order to detect the color marker, it is not practical to use the high-resolution camera image because the processing time will increase significantly and the response will be unacceptable: moreover, the accuracy of position detection achieved by the high-resolution camera is not required. Therefore, we use an additional low-resolution camera for recognizing markers. This enables users to apply makeup without having to physically approach the display.” *See* “3.1 Automatic Zoom and Pan” at page 497. “We developed a ‘magnifying glass function’ in order to provide finishing touches to the makeup application process, thereby improving the quality of the applied makeup. The proposed system uses an infrared range sensor to measure the distance between the camera and the face. Further, the magnification rate of the display image can be increased/decreased by simply and slightly approaching/leaving the display. A similar technique was recently used for a document browser [5].” *See* “3.2 Intuitive Magnification Rate Control” at pages 497-498. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Iwabuchi alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

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Claim 2	
2. The method of claim 1, wherein the mapping transformation comprises a combination of at least two of the following transformations: vertical flips about a vertical axis, a projection transformation, rotation, resize, two-dimensional offset, optic distortion correction, and polynomial mapping on part or entire captured image.	Iwabuchi expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. "When a user tries to see an enlarged view of her face and comes considerably close to the camera, the face image gets blurred as the camera does not have an auto-focus mechanism. From the above observations, we conclude that at least two additional functions are required to make the electronic mirror as effective as a realistic mirror in the makeup application process. One is to capture and display the user's face from the front, and the other is to enlarge this image for ease of use. The details of these functions are explained in the following sections." *See* "3 Makeup Support Function" at page 497. "During the makeup application process, we usually bring our face close to the mirror in order to ensure that our makeup is satisfactory and to check the makeup near certain face parts such as the eyes and the mouth. This is a critical part of the makeup application process, is frequently needed, and is often the most troublesome as it re quires a strenuous and awkward posture. For this purpose, we developed an automatic zoom function in the proposed system for zooming at a particular at part of the face. When a user brings the makeup tool, with an attached color marker (a small green sticky label), near her eyes, the camera recognizes the marker, zooms in, and switches to an enlarged image of the eye. In order to detect the color marker, it is not practical to use the high-resolution camera image because the processing time will increase significantly and the response will be unacceptable: moreover, the accuracy of position detection achieved by the high-resolution camera is not required. Therefore, we use an additional low-resolution camera for recognizing markers. This enables users to apply makeup without having to physically approach the display." *See* "3.1 Automatic Zoom and Pan" at page 497. "We developed a 'magnifying glass function' in order to provide finishing touches to the makeup application process, thereby improving the quality of the applied makeup. The

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	proposed system uses an infrared range sensor to measure the distance between the camera and the face. Further, the magnification rate of the display image can be increased/decreased by simply and slightly approaching/leaving the display. A similar technique was recently used for a document browser [5].” *See* “3.2 Intuitive Magnification Rate Control” at pages 497-498. “A professional makeup artist will always recommend checking a person’s appearance from the viewpoint of another person standing in front, with the help of a left and right reversing mirror (the reversal mirror) [4]. The impression of the hairstyle: the shape of the eyebrow, eyes, and lips: and the positions of moles are different, when the face is seen in a reversal mirror. Therefore, we added this functionality to the proposed system, enabling the system to as display the image captured by the camera as a left and right reversing mirror would.” *See* “3.3 Left and Right Reversing Mirror” at page 498. “We have carried out an evaluation test (Fig. 4). Two women (age: 23 and 25 years) participated in the test. They are students in our laboratory and familiar with how to operate a computer. They applied eye shadow, eye liner, eye blowing out, mascara, lipstick, and blush on. The results are given below: … • They found the left and right reversing mirror function useful for checking of their appearance.” *See* “4.2 Test by Ordinary Women” at page 500. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Iwabuchi alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

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Claim 3	
3. The method of claim 1, wherein during idle mode the camera continuously sends captured images to the processor, and the user presence is identified by the processor detecting a body part in the images.	Iwabuchi expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. "Moreover, we set up an infra red range sensor and a proximity sensor for performing the following functions. These devices are controlled with a microcomputer, and communicate with the PC program through serial connection." *See* "2. Smart Makeup Mirror" at page 496.  **Fig. 1.** Overview of Smart Makeup Mirror *See* "2. Smart Makeup Mirror" at page 496. "During the makeup application process, we usually bring our face close to the mirror in order to ensure that our makeup is satisfactory and to check the makeup near certain face parts such as the eyes and the mouth. This is a critical part of the makeup application process, is frequently needed, and is often the most troublesome as it requires a strenuous and awkward posture. For this purpose, we developed an automatic zoom function in the

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	proposed system for zooming at a particular at part of the face. When a user brings the makeup tool, with an attached color marker (a small green sticky label), near her eyes, the camera recognizes the marker, zooms in, and switches to an enlarged image of the eye. In order to detect the color marker, it is not practical to use the high-resolution camera image because the processing time will increase significantly and the response will be unacceptable: moreover, the accuracy of position detection achieved by the high-resolution camera is not required. Therefore, we use an additional low-resolution camera for recognizing markers. This enables users to apply makeup without having to physically approach the display." *See* "3.1 Automatic Zoom and Pan" at page 497. "In order to decrease the difficulty in applying makeup to the upper eyelid, we carefully observed users when they applied makeup to the eyelid. When they applied makeup to the upper eyelid using a mirror, they wanted to see their face from below. For this purpose, they raised their head and lowered their line of vision. (Fig. 5 left) Conversely, when they applied makeup to the lower eyelid, they lowered their head and glanced upward (Fig. 5 right). In the prototype system, the image is displayed at the upper part of the display: therefore, users felt that it was easier to apply makeup to the lower eyelid than to the upper eyelid.

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	 **Fig. 5.** Application of makeup to upper eyelid (left) and lower eyelid (right) This problem could be solved by changing the display position of the image according to the makeup activity to the lower and upper eyelids. Thus we have implemented a function that displays a magnified image of the eyes at the upper part of the display when the user applies makeup to the upper eyelid, and displays the magnified image at the lower part of the display when the user applies makeup to the lower eyelid. The user’s activity of applying makeup to the upper or lower eyelids is detected by means of computer vision through the low-resolution camera. Thus, users easily apply makeup not only to the lower eyelid but also to the upper eyelid.” *See* “5 Adjusting Position of Display” at pages 501-502. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Iwabuchi alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

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Claim 4	
4. The method of claim 3, wherein the body part comprises one of legs, face, eyes, and hands.	Iwabuchi expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. "Moreover, we set up an infra red range sensor and a proximity sensor for performing the following functions. These devices are controlled with a microcomputer, and communicate with the PC program through serial connection." *See* "2. Smart Makeup Mirror" at page 496.  **Fig. 1.** Overview of Smart Makeup Mirror *See* "2. Smart Makeup Mirror" at page 496. "During the makeup application process, we usually bring our face close to the mirror in order to ensure that our makeup is satisfactory and to check the makeup near certain face parts such as the eyes and the mouth. This is a critical part of the makeup application process, is frequently needed, and is often the most troublesome as it requires a strenuous and awkward posture. For this purpose, we developed an automatic zoom function in the

Asserted Claim of the ’110 Patent	Exemplary Citations to Iwabuchi
	proposed system for zooming at a particular at part of the face. When a user brings the makeup tool, with an attached color marker (a small green sticky label), near her eyes, the camera recognizes the marker, zooms in, and switches to an enlarged image of the eye. In order to detect the color marker, it is not practical to use the high-resolution camera image because the processing time will increase significantly and the response will be unacceptable: moreover, the accuracy of position detection achieved by the high-resolution camera is not required. Therefore, we use an additional low-resolution camera for recognizing markers. This enables users to apply makeup without having to physically approach the display.” *See* “3.1 Automatic Zoom and Pan” at page 497. “In order to decrease the difficulty in applying makeup to the upper eyelid, we carefully observed users when they applied makeup to the eyelid. When they applied makeup to the upper eyelid using a mirror, they wanted to see their face from below. For this purpose, they raised their head and lowered their line of vision. (Fig. 5 left) Conversely, when they applied makeup to the lower eyelid, they lowered their head and glanced upward (Fig. 5 right). In the prototype system, the image is displayed at the upper part of the display: therefore, users felt that it was easier to apply makeup to the lower eyelid than to the upper eyelid.

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	 **Fig. 5.** Application of makeup to upper eyelid (left) and lower eyelid (right) This problem could be solved by changing the display position of the image according to the makeup activity to the lower and upper eyelids. Thus we have implemented a function that displays a magnified image of the eyes at the upper part of the display when the user applies makeup to the upper eyelid, and displays the magnified image at the lower part of the display when the user applies makeup to the lower eyelid. The user’s activity of applying makeup to the upper or lower eyelids is detected by means of computer vision through the low-resolution camera. Thus, users easily apply makeup not only to the lower eyelid but also to the upper eyelid.” *See* “5 Adjusting Position of Display” at pages 501-502. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Iwabuchi alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

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Claim 5	
5. The method of claim 1, further comprising receiving user input and operating the processor to vary image magnitude or field-of-view of the modified images according to the user input.	Iwabuchi expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. "When a user tries to see an enlarged view of her face and comes considerably close to the camera, the face image gets blurred as the camera does not have an auto-focus mechanism. From the above observations, we conclude that at least two additional functions are required to make the electronic mirror as effective as a realistic mirror in the makeup application process. One is to capture and display the user's face from the front, and the other is to enlarge this image for ease of use. The details of these functions are explained in the following sections." *See* "3 Makeup Support Function" at page 497. "During the makeup application process, we usually bring our face close to the mirror in order to ensure that our makeup is satisfactory and to check the makeup near certain face parts such as the eyes and the mouth. This is a critical part of the makeup application process, is frequently needed, and is often the most troublesome as it re quires a strenuous and awkward posture. For this purpose, we developed an automatic zoom function in the proposed system for zooming at a particular at part of the face. When a user brings the makeup tool, with an attached color marker (a small green sticky label), near her eyes, the camera recognizes the marker, zooms in, and switches to an enlarged image of the eye. In order to detect the color marker, it is not practical to use the high-resolution camera image because the processing time will increase significantly and the response will be unacceptable: moreover, the accuracy of position detection achieved by the high-resolution camera is not required. Therefore, we use an additional low-resolution camera for recognizing markers. This enables users to apply makeup without having to physically approach the display." *See* "3.1 Automatic Zoom and Pan" at page 497. "We developed a 'magnifying glass function' in order to provide finishing touches to the makeup application process, thereby improving the quality of the applied makeup. The

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	proposed system uses an infrared range sensor to measure the distance between the camera and the face. Further, the magnification rate of the display image can be increased/decreased by simply and slightly approaching/leaving the display. A similar technique was recently used for a document browser [5].” *See* “3.2 Intuitive Magnification Rate Control” at pages 497-498. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Iwabuchi alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the ’110 Patent	Exemplary Citations to Iwabuchi
Claim 6	
6. The method of claim 5, wherein the processor varies the image magnitude or field-of-view mapping to display a partial or full body of the user in the modified images.	Iwabuchi expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. “When a user tries to see an enlarged view of her face and comes considerably close to the camera, the face image gets blurred as the camera does not have an auto-focus mechanism. From the above observations, we conclude that at least two additional functions are required to make the electronic mirror as effective as a realistic mirror in the makeup application process. One is to capture and display the user’s face from the front, and the other is to enlarge this image for ease of use. The details of these functions are explained in the following sections.” *See* “3 Makeup Support Function” at page 497. “During the makeup application process, we usually bring our face close to the mirror in order to ensure that our makeup is satisfactory and to check the makeup near certain face parts such as the eyes and the mouth. This is a critical part of the makeup application process, is frequently needed, and is often the most troublesome as it re quires a

Asserted Claim of the '110 Patent	Exemplary Citations to Iwabuchi
	strenuous and awkward posture. For this purpose, we developed an automatic zoom function in the proposed system for zooming at a particular at part of the face. When a user brings the makeup tool, with an attached color marker (a small green sticky label), near her eyes, the camera recognizes the marker, zooms in, and switches to an enlarged image of the eye. In order to detect the color marker, it is not practical to use the high-resolution camera image because the processing time will increase significantly and the response will be unacceptable: moreover, the accuracy of position detection achieved by the high-resolution camera is not required. Therefore, we use an additional low-resolution camera for recognizing markers. This enables users to apply makeup without having to physically approach the display." *See* "3.1 Automatic Zoom and Pan" at page 497. "We developed a 'magnifying glass function' in order to provide finishing touches to the makeup application process, thereby improving the quality of the applied makeup. The proposed system uses an infrared range sensor to measure the distance between the camera and the face. Further, the magnification rate of the display image can be increased/decreased by simply and slightly approaching/leaving the display. A similar technique was recently used for a document browser [5]." *See* "3.2 Intuitive Magnification Rate Control" at pages 497-498. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Iwabuchi alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '110 Patent	Exemplary Citations to Iwabuchi
Claim 10	

Asserted Claim of the '110 Patent	Exemplary Citations to Iwabuchi
10. The method of claim 1, further comprising operating the processor to augment the modified images by overlaying virtual objects on a user's image appearing within the modified images.	Iwabuchi expressly and/or inherently discloses and/or renders obvious operating the processor to augment the modified images by overlaying virtual objects on a user's image appearing within the modified images. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Iwabuchi alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '110 Patent	Exemplary Citations to Iwabuchi
Claim 11	
11. The method of claim 1, further comprising operating the processor to transmit the modified image over a network.	Iwabuchi expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. "By using the makeup log function, a user can capture an image of her face after applying makeup. Therefore, she can accurately compare the color, brightness, or texture that suits her face by capturing an image every time in the same environment. However, it is not sufficient to just find the makeup method suited to the user. Even if a user thinks that the one of the makeup results is suitable for her, other people may not think so. Then, we have developed a web page function that the user's friends can use to judge whether the makeup suits the user (Fig. 6).

Asserted Claim of the ’110 Patent	Exemplary Citations to Iwabuchi
	 **Fig. 6.** Web page where users’ friends can vote “The picture of a face after applying makeup is open to the public on a web page that is password protected. The page shows pictures of a user’s face in a favorable order. User’s friends who are given the password can change the order of pictures with the arrow buttons on the page. They can arrange better pictures above worse pictures. By using this web page, a user can get useful opinions from her friends in an anonymous manner. This page would provide objective opinions on her makeup.” *See* “6 Internet Voting” at pages 502-503. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Iwabuchi alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of

Asserted Claim of the ’110 Patent	Exemplary Citations to Iwabuchi
	Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the ’110 Patent	Exemplary Citations to Iwabuchi
Claim 12	
12. The method of claim 1, further comprising displaying the modified image on a remote screen for video telepresence.	Iwabuchi expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. “By using the makeup log function, a user can capture an image of her face after applying makeup. Therefore, she can accurately compare the color, brightness, or texture that suits her face by capturing an image every time in the same environment. However, it is not sufficient to just find the makeup method suited to the user. Even if a user thinks that the one of the makeup results is suitable for her, other people may not think so. Then, we have developed a web page function that the user’s friends can use to judge whether the makeup suits the user (Fig. 6).

Asserted Claim of the ’110 Patent	Exemplary Citations to Iwabuchi
	 **Fig. 6.** Web page where users’ friends can vote The picture of a face after applying makeup is open to the public on a web page that is password protected. The page shows pictures of a user’s face in a favorable order. User’s friends who are given the password can change the order of pictures with the arrow buttons on the page. They can arrange better pictures above worse pictures. By using this web page, a user can get useful opinions from her friends in an anonymous manner. This page would provide objective opinions on her makeup.” *See* “6 Internet Voting” at pages 502-503. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Iwabuchi alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of

Asserted Claim of the ’110 Patent	Exemplary Citations to Iwabuchi
	Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the ’110 Patent	Exemplary Citations to Iwabuchi
Claim 16	
16. The method of claim 1, wherein the processor operates on the images from the camera to generate background segmentation, and replaces segments on the images by replacement segments.	Iwabuchi expressly and/or inherently discloses and/or renders obvious wherein the processor operates on the images from the camera to generate background segmentation, and replaces segments on the images by replacement segments. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Iwabuchi alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the ’110 Patent	Exemplary Citations to Iwabuchi
Claim 17	
17. The method of claim 16, wherein the replacement segments comprise virtual background or background that was captured in a different setting.	Iwabuchi expressly and/or inherently discloses and/or renders obvious wherein the replacement segments comprise virtual background or background that was captured in a different setting. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Iwabuchi alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Exhibit B-07: Invalidity of U.S. Patent No. 8,982,110 in view of U.S. Patent Pub. No. 2008/0297589 ("Kurtz")

This chart is subject to all reservations, objections, and disclaimers in Defendants' Invalidity Contentions and any amendment, supplement, or modification thereof, which are incorporated herein by reference in their entirety.

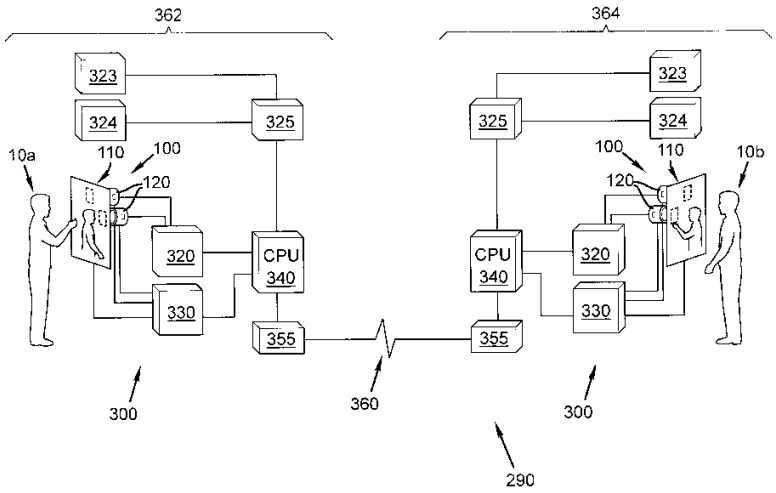
Kurtz was originally filed May 31, 2007 and published on December 4, 2008, and thus is available as prior art to U.S. Patent No. 8,982,110 (the "'110 Patent") under at least 35 U.S.C. §§ 102(a), (b), and (e).

Kurtz anticipates the Asserted Claims of the '110 Patent. To the extent it is found Kurtz does not expressly disclose certain limitations in the Asserted Claims, such limitations are at least implicitly or inherently disclosed. Moreover, to the extent it is found that Kurtz does not anticipate the Asserted Claims, Kurtz renders obvious the Asserted Claims, either alone or in combination with other prior art identified in the cover pleading or herein, and/or in combination with the general knowledge of a person having ordinary skill in the art.

In these contentions, Defendants have relied in part on Plaintiff's Infringement Contentions. In those contentions, Plaintiff appears to pursue overly broad claim constructions in an effort to assert infringement where none exists, and to accuse products that do not infringe the claims. Defendants' assertion that a particular limitation is disclosed by a prior art reference and/or is disclosed in a particular manner may be based in part on Plaintiff's apparent claim interpretations. In relying on Plaintiff's apparent claim interpretations, Defendants do not admit that Plaintiff's apparent claim interpretations are supportable or proper or that the claim limitations in question are definite or otherwise amenable to construction.

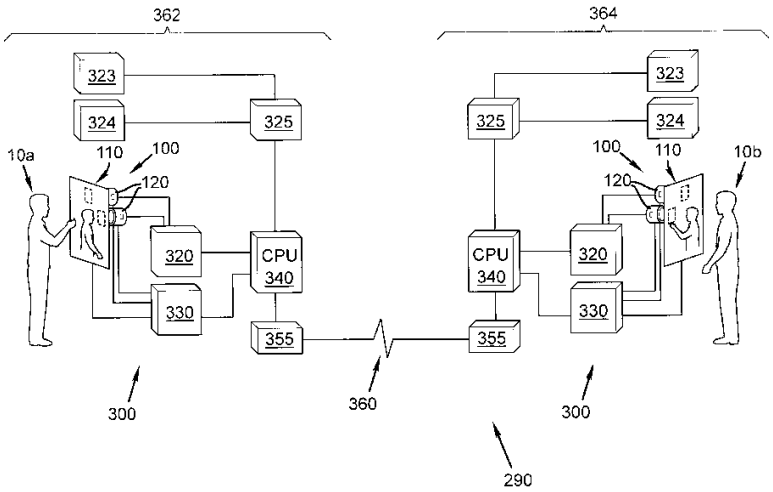
Defendants have endeavored to provide as much detail as possible in these contentions and, in doing so, have exceeded the level of detail required. The inclusion of specific details in some areas is not a concession that such details are required or that the omission of similar details in other areas is a defect. These citations to portions of any reference in this chart are exemplary only. Defendants will rely on the entirety of the references cited in this chart to show that the Asserted Claims are invalid.

Asserted Claim of the '110 Patent	Exemplary Citations to Kurtz
Claim 1	
1[pre]. A computerized method for operating a display system, the display system having a camera, a monitor, and a processor, the method comprising:	To the extent the preamble is limiting, Kurtz expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. "The block diagram of FIG. 1 shows one embodiment of such a two-way video communications system 290 having a video communication device 300 located at a local site and a video communication device 300 at a remote site. In the illustrated embodiment, communication devices 300 have an electronic imaging device 100, including a display 110 and an image capture device 120 for communication between a viewer 10 a at a first site 362 and a viewer 10 b at a second site 364. Each device 300 manages the capture, processing, transmission or receipt of video images across a network 360, subject to handshake protocols, privacy protocols, and bandwidth constraints. The network 360, which can be supported by remote servers (not shown), connects two sites 362 and 364, each of which has a system 300. Each viewer 10 a, 10 b has an electronic imaging device 100 comprising a display 110 with one or more image capture devices 120. A computer (or control logic processor (CPU)) 340 coordinates control of an image processor 320 and a system controller 330 that provides display driver and image capture control functions. System controller 330 can be integrated into computer 340 or not as desired. Computer 340 is nominally located locally, at a communication device 300 located at a given site for example local site 362, but some portions of functions can be located remotely at a remote server in system 290 or at a communication device 300 at remote site 364. Controller 330 can provide commands to an image capture device 120, controlling the camera view angle, focus, or other characteristics. A communications controller 355 acts as interface to a communication channel, such as a wireless or wired network channel, for transferring image and other data from one site to the other." *See* para. [0042].

Asserted Claim of the '110 Patent	Exemplary Citations to Kurtz
	 FIG. 1 *See* Fig. 1. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Kurtz alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[a]. operating the camera to generate a stream of images of the user;	Kurtz expressly and/or inherently discloses and/or renders obvious operating the camera to generate a stream of images of the user. *See*, *e.g.*, disclosures below. "Video communication systems and methods for communicating between an individual in a local environment, and a remote viewer in a remote environment are provided. The system has an image

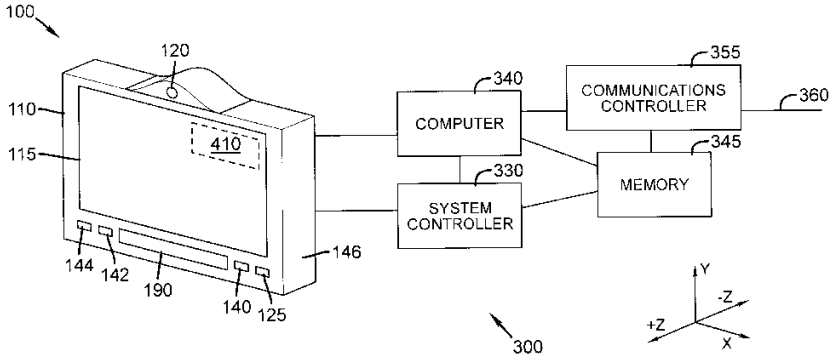
Asserted Claim of the '110 Patent	Exemplary Citations to Kurtz
	display device; at least one image capture device which acquires video images for fields of view of a local environment, and any individuals therein; an audio system having an audio emission device and an audio capture device; a computer, which includes a contextual interface having a gaze adapting process, and image processor; and a communication controller which transmits and receives video images of the local environment and the remote environment, and data regarding video scene characteristics thereof across a network between the local environment and the remote environment; wherein the gaze adapting process identifies video scene characteristics of the local environment indicative of eye gaze image capture and altering the video images when the characteristics are indicative." *See* Abstract. "The block diagram of FIG. 1 shows one embodiment of such a two-way video communications system 290 having a video communication device 300 located at a local site and a video communication device 300 at a remote site. In the illustrated embodiment, communication devices 300 have an electronic imaging device 100, including a display 110 and an image capture device 120 for communication between a viewer 10 a at a first site 362 and a viewer 10 b at a second site 364. Each device 300 manages the capture, processing, transmission or receipt of video images across a network 360, subject to handshake protocols, privacy protocols, and bandwidth constraints. The network 360, which can be supported by remote servers (not shown), connects two sites 362 and 364, each of which has a system 300. Each viewer 10 a, 10 b has an electronic imaging device 100 comprising a display 110 with one or more image capture devices 120. A computer (or control logic processor (CPU)) 340 coordinates control of an image processor 320 and a system controller 330 that provides display driver and image capture control functions. System controller 330 can be integrated into computer 340 or not as desired. Computer 340 is nominally located locally, at a communication device 300 located at a given site for example local site 362, but some portions of functions can be located remotely at a remote server in system 290 or at a communication device 300 at remote site 364. Controller 330 can provide commands to an image capture device 120, controlling the camera view angle, focus, or other characteristics. A communications controller 355 acts as interface to a communication channel, such as a wireless or wired network channel, for transferring image and other data from one site to the other.

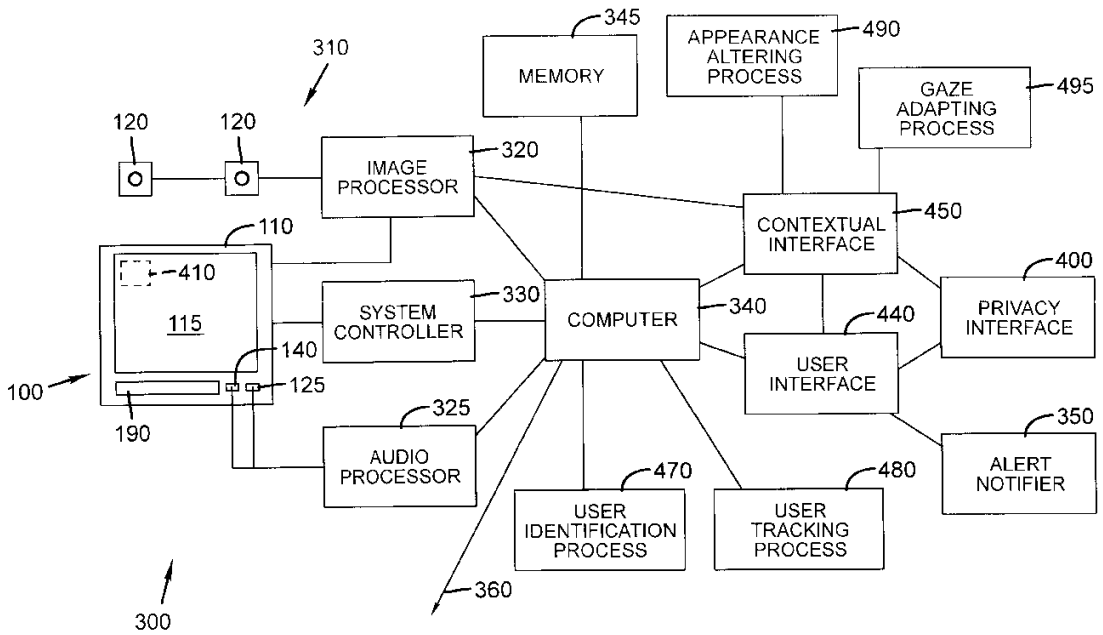
Asserted Claim of the '110 Patent	Exemplary Citations to Kurtz
	"The two-way video communication system 290 is intended to advantageously support video conferencing or video-telephony, particularly from one residential location to another. During a video communication event (600), comprising one or more video scenes (620), a system typically transmits both local video signals and local audio signals to the remote site and receives remote video and remote audio signals from the remote site. As would be expected, a local viewer 10 a at a first site 362 is able to see a remote viewer 10 b (located at a second site 364) as an image displayed locally on display 110, thereby enhancing human interaction for teleconferencing. Image processor 320 can provide a number of functions to facilitate two-way communication, including improving the quality of image capture at the first site 362, improving the quality of images displayed at the local display 110, and handling the data for remote communication (by improving the image quality, data compression, encryption, etc.). It must be noted that FIG. 1 shows a general arrangement of components that serve an embodiment. Image capture devices 120 and display 110 can be assembled into a single frame or housing (not shown) as part of the integration for device 300. This device housing can also include other components for device 300 at site 362 or 364, such as image processor 320, communications controller 355, computer 340, and system controller 330." *See* paras. [0042]-[0043].

Asserted Claim of the '110 Patent	Exemplary Citations to Kurtz
	 *FIG. 1* *See* Fig. 1. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Kurtz alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[b]. operating the processor to detect the presence of the user in the stream of image;	Kurtz expressly and/or inherently discloses and/or renders obvious operating the processor to detect the presence of the user in the stream of image. *See*, *e.g.*, disclosures below. "FIGS. 3A and 3B then illustrate the architecture for one embodiment of a video communication device 300 having an electronic imaging device 100. FIG. 3A, in particular, expands upon the

Asserted Claim of the '110 Patent	Exemplary Citations to Kurtz
	construction of the electronic imaging device 100, which is shown as including an image capture device 120 and an image display device (display 110), having a screen 115. The computer 340, system controller 330, data storage 345, and communications controller 355 can be assembled within the housing 146, or located separately, and be connected wirelessly or via wires to an electronic imaging device 100 . . . The electronic imaging device 100 can also include a motion detector 142 and an ambient light detector 140, as separate devices that can be integrated within the housing 146 of the electronic imaging device 100. It is also possible that the ambient light sensing functions can be supported directly by an image capture device 120, without having a separate dedicated sensor (ambient light detector 140). Likewise, an image capture device 120 and a microphone 144 may support the motion detection functions, without having a separated dedicated sensor (motion detector 142)." *See* para. [0046]. "By comparison, FIG. 3B particularly expands upon the design of the system electronics portion of the video communications device 300. One subsystem therein is the image capture system 310, which includes image capture devices 120 and image processor 320 . . . The computer 340 also is linked to a user tracking process 480, which can be an algorithm operated within the computer 340, using motion detection data acquired from a motion detector 142. Likewise, the computer 340 can access a user identification process 470, which again can be an algorithm operated within the computer 340. Similarly, the computer can access a gaze adaptive process 495, which can include both a gaze correction process and a gaze tracking process (or algorithms). The memory or data storage 345 can be one or more devices, including a computer hard drive or a flash drive, and can contain a frame buffer to hold a number of video frames, to support ongoing video image data analysis and adjustment . . . The user interface 440 can also include a cue-based interface, which can be a portion of the contextual interface 450. The cue-based interface essentially observes cues, including speech commands, voice cues (intonation, pitch, etc.), gestures, body pose, and other interpretive cues, and then derives or determines responsive actions for the video communication system 300." *See* para. [0047]. "Additionally, these interface controls 190 can provide or enable control of an image capture device 120, relative to zooming, panning, tilting, and other camera type functions. In particular, the interface controls 190 can also include automated functionality, for example, using a user

Asserted Claim of the '110 Patent	Exemplary Citations to Kurtz
	identification process 470 and a user tracking process 480 to direct image acquisition by one or more image capture devices 120, such that the video communications system 300 provides a seamless and graceful experience for the users 10." *See* para. [0048] "In another example of gaze tracking as a gesture interface, the contextual interface 450 detects that the user 10 a moves laterally or changes pose while looking at the display screen 115. This is similar to the circumstance where an individual looks out a window, and shifts their view to "look around the corner". For example, as shown in FIG. 12A, user 10 is looking at a screen 115 of a display 110 of a video communication device 300. The user 10 is shown looking at a video scene having two children and a dog, where the dog is at the scene periphery, and is partially cut off. If the user 10 wanted to see the dog better, and the display screen 115 was a window, then the user could shift their viewpoint as if too look out the window. The user's head and face 25, if not their body 50 are shifting to an alternate pose to provide a new view. The device 300 can detect this change of pose or position and change the scene orientation and position, for example, as suggested in FIG. 12B, where the peripheral image content is adjusted towards screen center. Effectively, the contextual interface 450 changes the image capture at the remote site 364 so that the portion of the field of view 420 captured at the remote site 364 moves laterally as well, such that the image displayed at the local site 362 changes in a way that is similar to that experienced when looking through a window." *See* para. [0150].

Asserted Claim of the ’110 Patent	Exemplary Citations to Kurtz
	 *FIG. 3A*

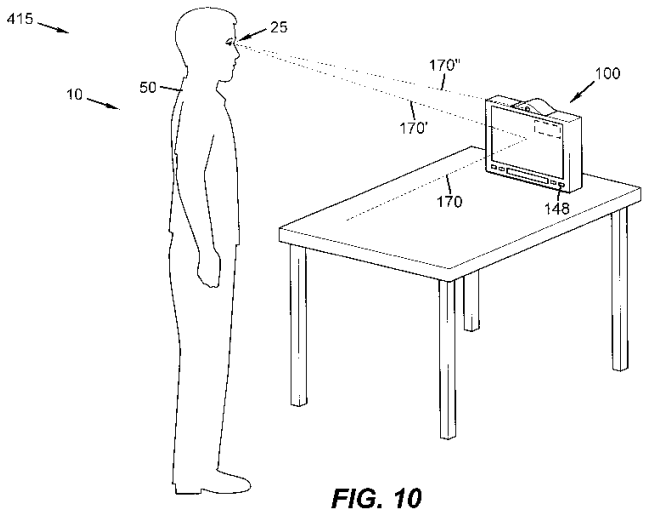
Asserted Claim of the '110 Patent	Exemplary Citations to Kurtz
	 ***FIG. 3B*** *See* Figs. 3A-B. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Kurtz alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and

Asserted Claim of the '110 Patent	Exemplary Citations to Kurtz
	Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[c]. operating the processor to apply adaptive transformation mapping to the stream of images captured by the camera to generate modified images that appear to be captured from a different point of view of the camera's actual point of view; and	Kurtz expressly and/or inherently discloses and/or renders obvious operating the processor to apply adaptive transformation mapping to the stream of images captured by the camera to generate modified images that appear to be captured from a different point of view of the camera's actual point of view. *See*, *e.g.*, disclosures below. "Wherein the gaze adapting process uses a scene analysis algorithm to identify video scene characteristics of the local environment indicative of eye gaze image capture; and wherein the gaze adapting process alters image capture or image processing of the video images of the local individual when the characteristics are indicative of eye gaze image capture, so as to provide eye-contact video images to the remote viewer wherein the eyes of the local individual appear to be looking at the eyes of the remote viewer in the remote environment and in a manner consistent with the video scene characteristics for both the local environment and remote environments." *See* para. [0019]. "The computer 340 also is linked to a user tracking process 480, which can be an algorithm operated within the computer 340, using motion detection data acquired from a motion detector 142. Likewise, the computer 340 can access a user identification process 470, which again can be an algorithm operated within the computer 340. Similarly, the computer can access a gaze adaptive process 495, which can include both a gaze correction process and a gaze tracking process (or algorithms). The memory or data storage 345 can be one or more devices, including a computer hard drive or a flash drive, and can contain a frame buffer to hold a number of video frames, to support ongoing video image data analysis and adjustment." *See* para. [0047]. "Additionally, these interface controls 190 can provide or enable control of an image capture device 120, relative to zooming, panning, tilting, and other camera type functions. In particular, the interface controls 190 can also include automated functionality, for example, using a user identification process 470 and a user tracking process 480 to direct image acquisition by one or

Asserted Claim of the '110 Patent	Exemplary Citations to Kurtz
	more image capture devices 120, such that the video communications system 300 provides a seamless and graceful experience for the users 10." *See* para. [0048]. "It is noted that a camera lens with optical zoom capabilities is typically equipped with several internal moving lens groups. The device 300 can also apply the user tracking process 480, to lock onto and track a local user 10 a around within the local environment 415, as bounded by the image field of view 420." *See* para. [0073]. "Likewise, the geometry and issues for eye contact image display can be considered in greater depth. Considering again FIG. 10, the image of a remote user is to be displayed on display 110 to a local user 10 (much as in FIG. 4C, scene 620). The typical video-conferencing systems would present this image with direct-on centered view, such that a user 10 positioned along optical axis 170 would observe the remote user with the sensation of eye-to-eye contact. However, as shown in FIG. 10, the user 10 (particularly their face 25) may not be situated along optical axis 170, and therefore the displayed image of the remote user would not appear to be looking towards the face of user 10. As a method to compensate for this issue, the video communication device 300 can utilize an algorithm to estimate direction or location of a user 10 in their local environment 415 relative to a display 110. In particular, this algorithm would determine the angular direction or location of the users face (tracking pose) or eyes (eye-tracking) in three-dimensional space relative to display (or center thereof) 110. The video communication device 300 can utilize a variety of techniques, including stereo camera imaging or optical or sonar/audio based range finding and mapping to determine the location of the user 10. In some instances, the image processor 320 can then apply a gaze adapting process 495 to the images of the remote user to be shown on display 110, to change the appearance of their eyes, to have their image appear to be looking at the user 10. For example, the eye gaze appearance altering approach of the Andersson '376 disclosure can be applied to the pupil and eyelid image data to have the remote viewer appear to be looking in an appropriate direction (which may be straight ahead (optical axis 170))." *See* para. [0139]. "However, while people can look laterally (side to side) or longitudinally (up or down) by mere eye movements, in general these off axis eye positions are not sustained, and an individual's head pose quickly adjusts towards the area of interest, with the eyes returning to center. Thus, a more

Asserted Claim of the '110 Patent	Exemplary Citations to Kurtz
	extensive gaze adaptation, involving at least head pose, can be required to provide satisfactory eye contact image display. For example, the image of the remote user may need to be tilted and pivoted to have them appear to be looking at the local users . . . The images are altered to correct for head-pose alteration and eye-gaze direction, to create the perception of eye contact for the images viewed by the remote viewer." *See* para. [0140]. "As can now be appreciated, eye gaze corrected residential video communications can be beset with dynamic geometry and context issues that effect both eye gaze related image capture (how and when to obtain an eye contact image of a local user for remote display) and eye gaze related image display (relative to the direction and manner of image alteration of the remote viewer's eye gaze, to have it be best seen locally). As described, eye gaze correction can simultaneously depend on user positioning and context at both the local and remote sites. This is partially shown by FIG. 7D, which depicts the interactions of two video communications devices 300 of a video communication system 290 during a video communication event 600. To address this, during a video scene 620, communication event analysis 655 uses scene analysis algorithms with context rules to examine the local video scene characteristics relative to a variety of factors, including gaze metrics (amount of head or eye motion, rate of movement, direction or pose to camera 120), field of view, personal cues (including behavior or speech), and video context (event classification), to determine whether eye gaze image capture or correction is appropriate. For example, if a local user 10 a is engaged in a purposeful event, context rules would indicate that directed eye gaze is likely needed, supported by a range of gaze metrics. Whereas, if a local participant is involved in large group event, and glances at the display 110, without particularly communicating with a remote viewer, then directed eye gaze is not likely needed. Generally, the gaze context rules can anticipate that as the capture field of view is decreased and directed to fewer individuals, then the sensitivity and need for directed eye gaze image capture or correction increases. Even in such situations, the scene analysis algorithm can assess, for example using pose angle estimations and trigger or threshold levels, whether a local user 10 a is intending to look at a display 110 to communicate directly with the remote viewer. These pose angle estimates can be obtained from a gaze tracking process, which follows the gaze direction of a viewer to observe where a person's attention is focused. While it is desirable to track the actual movement of the eyes, it is frequently sufficient to infer the gaze direction from the head pose, as described in "Model-Based Head Pose Estimation

Asserted Claim of the '110 Patent	Exemplary Citations to Kurtz
	for Air-Traffic Controllers", by Xavier L. C. Brolly, Constantinos Stratelos and Jeffrey B. Mulligan (published at ICIP 2003, the IEEE Conference on Image Processing). "The eye-gaze correction scene analysis algorithm can use a set of eye-gaze context rules to associate the sensitivity (using triggers or threshold levels) or need for eye gaze correction with the video context for a current video scene, including event classification and capture field of view. These context rules can define a range of variation for the participant gaze metrics or characteristics indicative of eye gaze image capture based upon the current video context. Likewise, the context rules can define a range of gaze metrics indicative of remote scene characteristics that will affect eye gaze image display. As with the prior uses of scene analysis algorithms, the gaze analysis process can calculate current gaze metrics and associated gaze confidence values as statistical quality assessment metrics. The current gaze metrics can then be compared to the range of gaze metrics expected for participants in the current video scene. If the contextual interface 450, via communication event analysis concludes with high gaze direction confidence values that gaze directed image capture or image processing of a local user is appropriate, then the gaze adapting process 495 can provide direction to the cameras 120 to adjust image capture (camera selection and settings (zoom, pan, and tilt)) to acquire images for eye contact viewing for the remote viewer. The gaze adapting process 495 can also provide input to the image processor 320, via scene capture management 650, to alter the captured images as necessary to provide eye contact image video imagery for the remote viewer." *See* paras. [0143]-[0144].

Asserted Claim of the '110 Patent	Exemplary Citations to Kurtz
	 FIG. 10 *See* Fig. 10. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Kurtz alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[d]. displaying the modified images on the monitor;	Kurtz expressly and/or inherently discloses and/or renders obvious displaying the modified images on the monitor. *See*, *e.g.*, disclosures below. "Wherein the gaze adapting process uses a scene analysis algorithm to identify video scene characteristics of the local environment indicative of eye gaze image capture; and wherein the gaze

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	adapting process alters image capture or image processing of the video images of the local individual when the characteristics are indicative of eye gaze image capture, so as to provide eye-contact video images to the remote viewer wherein the eyes of the local individual appear to be looking at the eyes of the remote viewer in the remote environment and in a manner consistent with the video scene characteristics for both the local environment and remote environments." See para. [0019]. ""Likewise, the geometry and issues for eye contact image display can be considered in greater depth. Considering again FIG. 10, the image of a remote user is to be displayed on display 110 to a local user 10 (much as in FIG. 4C, scene 620). The typical video-conferencing systems would present this image with direct-on centered view, such that a user 10 positioned along optical axis 170 would observe the remote user with the sensation of eye-to-eye contact. However, as shown in FIG. 10, the user 10 (particularly their face 25) may not be situated along optical axis 170, and therefore the displayed image of the remote user would not appear to be looking towards the face of user 10. As a method to compensate for this issue, the video communication device 300 can utilize an algorithm to estimate direction or location of a user 10 in their local environment 415 relative to a display 110. In particular, this algorithm would determine the angular direction or location of the users face (tracking pose) or eyes (eye-tracking) in three-dimensional space relative to display (or center thereof) 110. The video communication device 300 can utilize a variety of techniques, including stereo camera imaging or optical or sonar/audio based range finding and mapping to determine the location of the user 10. In some instances, the image processor 320 can then apply a gaze adapting process 495 to the images of the remote user to be shown on display 110, to change the appearance of their eyes, to have their image appear to be looking at the user 10." *See* para. [0139]. "As can now be appreciated, eye gaze corrected residential video communications can be beset with dynamic geometry and context issues that effect both eye gaze related image capture (how and when to obtain an eye contact image of a local user for remote display) and eye gaze related image display (relative to the direction and manner of image alteration of the remote viewer's eye gaze, to have it be best seen locally). As described, eye gaze correction can simultaneously depend on user positioning and context at both the local and remote sites. This is partially shown by FIG.

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	7D, which depicts the interactions of two video communications devices 300 of a video communication system 290 during a video communication event 600. To address this, during a video scene 620, communication event analysis 655 uses scene analysis algorithms with context rules to examine the local video scene characteristics relative to a variety of factors, including gaze metrics (amount of head or eye motion, rate of movement, direction or pose to camera 120), field of view, personal cues (including behavior or speech), and video context (event classification), to determine whether eye gaze image capture or correction is appropriate. For example, if a local user 10 a is engaged in a purposeful event, context rules would indicate that directed eye gaze is likely needed, supported by a range of gaze metrics. Whereas, if a local participant is involved in large group event, and glances at the display 110, without particularly communicating with a remote viewer, then directed eye gaze is not likely needed. Generally, the gaze context rules can anticipate that as the capture field of view is decreased and directed to fewer individuals, then the sensitivity and need for directed eye gaze image capture or correction increases. Even in such situations, the scene analysis algorithm can assess, for example using pose angle estimations and trigger or threshold levels, whether a local user 10 a is intending to look at a display 110 to communicate directly with the remote viewer. These pose angle estimates can be obtained from a gaze tracking process, which follows the gaze direction of a viewer to observe where a person's attention is focused. While it is desirable to track the actual movement of the eyes, it is frequently sufficient to infer the gaze direction from the head pose, as described in "Model-Based Head Pose Estimation for Air-Traffic Controllers", by Xavier L. C. Brolly, Constantinos Stratelos and Jeffrey B. Mulligan (published at ICIP 2003, the IEEE Conference on Image Processing). "The eye-gaze correction scene analysis algorithm can use a set of eye-gaze context rules to associate the sensitivity (using triggers or threshold levels) or need for eye gaze correction with the video context for a current video scene, including event classification and capture field of view. These context rules can define a range of variation for the participant gaze metrics or characteristics indicative of eye gaze image capture based upon the current video context. Likewise, the context rules can define a range of gaze metrics indicative of remote scene characteristics that will affect eye gaze image display. As with the prior uses of scene analysis algorithms, the gaze analysis process can calculate current gaze metrics and associated gaze confidence values as statistical quality assessment metrics. The current gaze metrics can then be compared to the range of gaze

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	metrics expected for participants in the current video scene. If the contextual interface 450, via communication event analysis concludes with high gaze direction confidence values that gaze directed image capture or image processing of a local user is appropriate, then the gaze adapting process 495 can provide direction to the cameras 120 to adjust image capture (camera selection and settings (zoom, pan, and tilt)) to acquire images for eye contact viewing for the remote viewer. The gaze adapting process 495 can also provide input to the image processor 320, via scene capture management 650, to alter the captured images as necessary to provide eye contact image video imagery for the remote viewer." *See* paras. [0143]-[0144]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Kurtz alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[e]. wherein the different point of view corresponds to an image taken from a different angle and a different distance than the actual images captured by the camera; and	Kurtz expressly and/or inherently discloses and/or renders obvious wherein the different point of view corresponds to an image taken from a different angle and a different distance than the actual images captured by the camera. *See*, *e.g.*, disclosures below. "Wherein the gaze adapting process uses a scene analysis algorithm to identify video scene characteristics of the local environment indicative of eye gaze image capture; and wherein the gaze adapting process alters image capture or image processing of the video images of the local individual when the characteristics are indicative of eye gaze image capture, so as to provide eye-contact video images to the remote viewer wherein the eyes of the local individual appear to be looking at the eyes of the remote viewer in the remote environment and in a manner consistent with the video scene characteristics for both the local environment and remote environments." See para. [0019]. ""Likewise, the geometry and issues for eye contact image display can be considered in greater depth. Considering again FIG. 10, the image of a remote user is to be displayed on display 110 to a local user 10 (much as in FIG. 4C, scene 620). The typical video-conferencing systems would

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	present this image with direct-on centered view, such that a user 10 positioned along optical axis 170 would observe the remote user with the sensation of eye-to-eye contact. However, as shown in FIG. 10, the user 10 (particularly their face 25) may not be situated along optical axis 170, and therefore the displayed image of the remote user would not appear to be looking towards the face of user 10. As a method to compensate for this issue, the video communication device 300 can utilize an algorithm to estimate direction or location of a user 10 in their local environment 415 relative to a display 110. In particular, this algorithm would determine the angular direction or location of the users face (tracking pose) or eyes (eye-tracking) in three-dimensional space relative to display (or center thereof) 110. The video communication device 300 can utilize a variety of techniques, including stereo camera imaging or optical or sonar/audio based range finding and mapping to determine the location of the user 10. In some instances, the image processor 320 can then apply a gaze adapting process 495 to the images of the remote user to be shown on display 110, to change the appearance of their eyes, to have their image appear to be looking at the user 10." *See* para. [0139]. "As can now be appreciated, eye gaze corrected residential video communications can be beset with dynamic geometry and context issues that effect both eye gaze related image capture (how and when to obtain an eye contact image of a local user for remote display) and eye gaze related image display (relative to the direction and manner of image alteration of the remote viewer's eye gaze, to have it be best seen locally). As described, eye gaze correction can simultaneously depend on user positioning and context at both the local and remote sites. This is partially shown by FIG. 7D, which depicts the interactions of two video communications devices 300 of a video communication system 290 during a video communication event 600. To address this, during a video scene 620, communication event analysis 655 uses scene analysis algorithms with context rules to examine the local video scene characteristics relative to a variety of factors, including gaze metrics (amount of head or eye motion, rate of movement, direction or pose to camera 120), field of view, personal cues (including behavior or speech), and video context (event classification), to determine whether eye gaze image capture or correction is appropriate. For example, if a local user 10 a is engaged in a purposeful event, context rules would indicate that directed eye gaze is likely needed, supported by a range of gaze metrics. Whereas, if a local participant is involved in large group event, and glances at the display 110, without particularly communicating with a remote

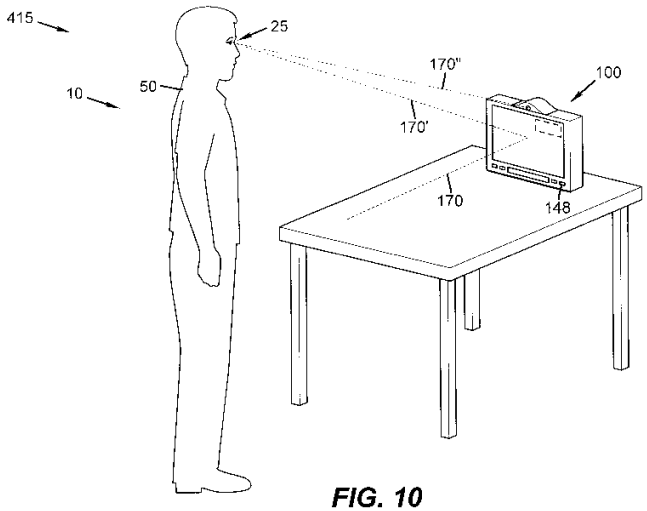
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	viewer, then directed eye gaze is not likely needed. Generally, the gaze context rules can anticipate that as the capture field of view is decreased and directed to fewer individuals, then the sensitivity and need for directed eye gaze image capture or correction increases. Even in such situations, the scene analysis algorithm can assess, for example using pose angle estimations and trigger or threshold levels, whether a local user 10 a is intending to look at a display 110 to communicate directly with the remote viewer. These pose angle estimates can be obtained from a gaze tracking process, which follows the gaze direction of a viewer to observe where a person's attention is focused. While it is desirable to track the actual movement of the eyes, it is frequently sufficient to infer the gaze direction from the head pose, as described in "Model-Based Head Pose Estimation for Air-Traffic Controllers", by Xavier L. C. Brolly, Constantinos Stratelos and Jeffrey B. Mulligan (published at ICIP 2003, the IEEE Conference on Image Processing). "The eye-gaze correction scene analysis algorithm can use a set of eye-gaze context rules to associate the sensitivity (using triggers or threshold levels) or need for eye gaze correction with the video context for a current video scene, including event classification and capture field of view. These context rules can define a range of variation for the participant gaze metrics or characteristics indicative of eye gaze image capture based upon the current video context. Likewise, the context rules can define a range of gaze metrics indicative of remote scene characteristics that will affect eye gaze image display. As with the prior uses of scene analysis algorithms, the gaze analysis process can calculate current gaze metrics and associated gaze confidence values as statistical quality assessment metrics. The current gaze metrics can then be compared to the range of gaze metrics expected for participants in the current video scene. If the contextual interface 450, via communication event analysis concludes with high gaze direction confidence values that gaze directed image capture or image processing of a local user is appropriate, then the gaze adapting process 495 can provide direction to the cameras 120 to adjust image capture (camera selection and settings (zoom, pan, and tilt)) to acquire images for eye contact viewing for the remote viewer. The gaze adapting process 495 can also provide input to the image processor 320, via scene capture management 650, to alter the captured images as necessary to provide eye contact image video imagery for the remote viewer." *See* paras. [0143]-[0144].

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	This limitation would have been obvious to a person of ordinary skill in the art based on (1) Kurtz alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[f]. wherein during mirror tracking mode the processor utilizes the angle of the images captured by the camera and applies parametric input for a mapping transformation that changes imaging perspective of the images captured by the camera.	Kurtz expressly and/or inherently discloses and/or renders obvious wherein during mirror tracking mode the processor utilizes the angle of the images captured by the camera and applies parametric input for a mapping transformation that changes imaging perspective of the images captured by the camera. *See*, *e.g.*, disclosures below. "Wherein the gaze adapting process uses a scene analysis algorithm to identify video scene characteristics of the local environment indicative of eye gaze image capture; and wherein the gaze adapting process alters image capture or image processing of the video images of the local individual when the characteristics are indicative of eye gaze image capture, so as to provide eye-contact video images to the remote viewer wherein the eyes of the local individual appear to be looking at the eyes of the remote viewer in the remote environment and in a manner consistent with the video scene characteristics for both the local environment and remote environments." *See* para. [0019]. "The computer 340 also is linked to a user tracking process 480, which can be an algorithm operated within the computer 340, using motion detection data acquired from a motion detector 142. Likewise, the computer 340 can access a user identification process 470, which again can be an algorithm operated within the computer 340. Similarly, the computer can access a gaze adaptive process 495, which can include both a gaze correction process and a gaze tracking process (or algorithms). The memory or data storage 345 can be one or more devices, including a computer hard drive or a flash drive, and can contain a frame buffer to hold a number of video frames, to support ongoing video image data analysis and adjustment." *See* para. [0047]. "Additionally, these interface controls 190 can provide or enable control of an image capture device 120, relative to zooming, panning, tilting, and other camera type functions. In particular,

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	the interface controls 190 can also include automated functionality, for example, using a user identification process 470 and a user tracking process 480 to direct image acquisition by one or more image capture devices 120, such that the video communications system 300 provides a seamless and graceful experience for the users 10.” *See* para. [0048]. “It is noted that a camera lens with optical zoom capabilities is typically equipped with several internal moving lens groups. The device 300 can also apply the user tracking process 480, to lock onto and track a local user 10 a around within the local environment 415, as bounded by the image field of view 420.” *See* para. [0073]. “Likewise, the geometry and issues for eye contact image display can be considered in greater depth. Considering again FIG. 10, the image of a remote user is to be displayed on display 110 to a local user 10 (much as in FIG. 4C, scene 620). The typical video-conferencing systems would present this image with direct-on centered view, such that a user 10 positioned along optical axis 170 would observe the remote user with the sensation of eye-to-eye contact. However, as shown in FIG. 10, the user 10 (particularly their face 25) may not be situated along optical axis 170, and therefore the displayed image of the remote user would not appear to be looking towards the face of user 10. As a method to compensate for this issue, the video communication device 300 can utilize an algorithm to estimate direction or location of a user 10 in their local environment 415 relative to a display 110. In particular, this algorithm would determine the angular direction or location of the users face (tracking pose) or eyes (eye-tracking) in three-dimensional space relative to display (or center thereof) 110. The video communication device 300 can utilize a variety of techniques, including stereo camera imaging or optical or sonar/audio based range finding and mapping to determine the location of the user 10. In some instances, the image processor 320 can then apply a gaze adapting process 495 to the images of the remote user to be shown on display 110, to change the appearance of their eyes, to have their image appear to be looking at the user 10. For example, the eye gaze appearance altering approach of the Andersson '376 disclosure can be applied to the pupil and eyelid image data to have the remote viewer appear to be looking in an appropriate direction (which may be straight ahead (optical axis 170)).” *See* para. [0139].

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	"However, while people can look laterally (side to side) or longitudinally (up or down) by mere eye movements, in general these off axis eye positions are not sustained, and an individual's head pose quickly adjusts towards the area of interest, with the eyes returning to center. Thus, a more extensive gaze adaptation, involving at least head pose, can be required to provide satisfactory eye contact image display. For example, the image of the remote user may need to be tilted and pivoted to have them appear to be looking at the local users . . . The images are altered to correct for head-pose alteration and eye-gaze direction, to create the perception of eye contact for the images viewed by the remote viewer." *See* para. [0140]. "As can now be appreciated, eye gaze corrected residential video communications can be beset with dynamic geometry and context issues that effect both eye gaze related image capture (how and when to obtain an eye contact image of a local user for remote display) and eye gaze related image display (relative to the direction and manner of image alteration of the remote viewer's eye gaze, to have it be best seen locally). As described, eye gaze correction can simultaneously depend on user positioning and context at both the local and remote sites. This is partially shown by FIG. 7D, which depicts the interactions of two video communications devices 300 of a video communication system 290 during a video communication event 600. To address this, during a video scene 620, communication event analysis 655 uses scene analysis algorithms with context rules to examine the local video scene characteristics relative to a variety of factors, including gaze metrics (amount of head or eye motion, rate of movement, direction or pose to camera 120), field of view, personal cues (including behavior or speech), and video context (event classification), to determine whether eye gaze image capture or correction is appropriate. For example, if a local user 10 a is engaged in a purposeful event, context rules would indicate that directed eye gaze is likely needed, supported by a range of gaze metrics. Whereas, if a local participant is involved in large group event, and glances at the display 110, without particularly communicating with a remote viewer, then directed eye gaze is not likely needed. Generally, the gaze context rules can anticipate that as the capture field of view is decreased and directed to fewer individuals, then the sensitivity and need for directed eye gaze image capture or correction increases. Even in such situations, the scene analysis algorithm can assess, for example using pose angle estimations and trigger or threshold levels, whether a local user 10 a is intending to look at a display 110 to communicate directly with the remote viewer. These pose angle estimates can be obtained from a gaze tracking

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	process, which follows the gaze direction of a viewer to observe where a person's attention is focused. While it is desirable to track the actual movement of the eyes, it is frequently sufficient to infer the gaze direction from the head pose, as described in "Model-Based Head Pose Estimation for Air-Traffic Controllers", by Xavier L. C. Brolly, Constantinos Stratelos and Jeffrey B. Mulligan (published at ICIP 2003, the IEEE Conference on Image Processing). "The eye-gaze correction scene analysis algorithm can use a set of eye-gaze context rules to associate the sensitivity (using triggers or threshold levels) or need for eye gaze correction with the video context for a current video scene, including event classification and capture field of view. These context rules can define a range of variation for the participant gaze metrics or characteristics indicative of eye gaze image capture based upon the current video context. Likewise, the context rules can define a range of gaze metrics indicative of remote scene characteristics that will affect eye gaze image display. As with the prior uses of scene analysis algorithms, the gaze analysis process can calculate current gaze metrics and associated gaze confidence values as statistical quality assessment metrics. The current gaze metrics can then be compared to the range of gaze metrics expected for participants in the current video scene. If the contextual interface 450, via communication event analysis concludes with high gaze direction confidence values that gaze directed image capture or image processing of a local user is appropriate, then the gaze adapting process 495 can provide direction to the cameras 120 to adjust image capture (camera selection and settings (zoom, pan, and tilt)) to acquire images for eye contact viewing for the remote viewer. The gaze adapting process 495 can also provide input to the image processor 320, via scene capture management 650, to alter the captured images as necessary to provide eye contact image video imagery for the remote viewer." *See* paras. [0143]-[0144].

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	 ***FIG. 10*** *See* Fig. 10. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Kurtz alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

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Claim 2	
2. The method of claim 1, wherein the mapping transformation comprises a combination of at least two of the following transformations: vertical flips about a vertical axis, a projection transformation, rotation, resize, two-dimensional offset, optic distortion correction, and polynomial mapping on part or entire captured image.	Kurtz expressly and/or inherently discloses and/or renders obvious wherein the mapping transformation comprises a combination of at least two of the following transformations: vertical flips about a vertical axis, a projection transformation, rotation, resize, two-dimensional offset, optic distortion correction, and polynomial mapping on part or entire captured image. *See, e.g.*, disclosures below. "The field of view captured by the camera can be optimized, by both mechanical movement (pan, tilt, and zoom) and image cropping, to follow and frame an individual in their environment." *See* para. [0010]. "Thereafter, if the person speaking continues to speak or becomes silent for a predetermined time period, the system operates to adjust the camera setting to display other participants in sequence who are not speaking, or it zooms out the camera by a specified amount to include all participants. The system is also configured to capture a new person entering or an existing participant exiting the videoconference session." *See* para. [0013]. "Additionally, these interface controls 190 can provide or enable control of an image capture device 120, relative to zooming, panning, tilting, and other camera type functions. In particular, the interface controls 190 can also include automated functionality, for example, using a user identification process 470 and a user tracking process 480 to direct image acquisition by one or more image capture devices 120, such that the video communications system 300 provides a seamless and graceful experience for the users 10." *See* para. [0048]. "The reduction of the field of view 420 can be attained via the image processor 320, which can crop and zoom in the images for outgoing transmission across a network 360. However, at some point, the resulting image quality (particularly the resolution) obtained by electronic zooming will be sufficiently reduced that use of optical zooming or a NFOV image capture device 120 (or the combination thereof) will be appropriate. It is

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	noted that a camera lens with optical zoom capabilities is typically equipped with several internal moving lens groups. The device 300 can also apply the user tracking process 480, to lock onto and track a local user 10 a around within the local environment 415, as bounded by the image field of view 420." *See* para. [0049]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Kurtz alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

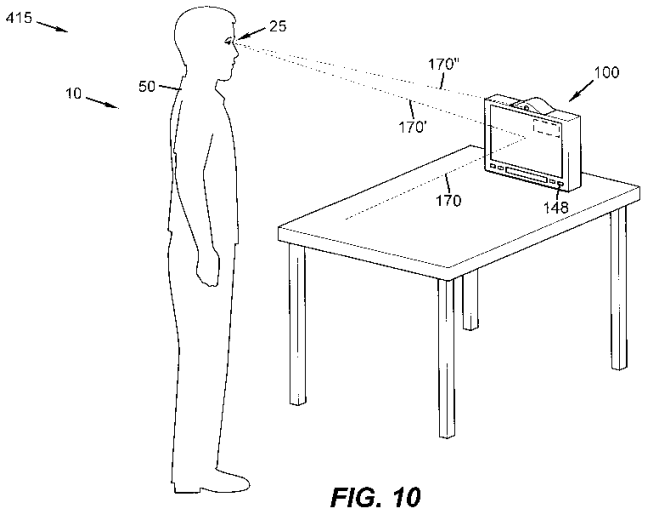
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Claim 3	
3. The method of claim 1, wherein during idle mode the camera continuously sends captured images to the processor, and the user presence is identified by the processor detecting a body part in the images.	Kurtz expressly and/or inherently discloses and/or renders obvious wherein during idle mode the camera continuously sends captured images to the processor, and the user presence is identified by the processor detecting a body part in the images. *See*, *e.g.*, disclosures below. "Thereafter, if the person speaking continues to speak or becomes silent for a predetermined time period, the system operates to adjust the camera setting to display other participants in sequence who are not speaking, or it zooms out the camera by a specified amount to include all participants. The system is also configured to capture a new person entering or an existing participant exiting the videoconference session." *See* para. [0013]. "Wherein the gaze adapting process uses a scene analysis algorithm to identify video scene characteristics of the local environment indicative of eye gaze image capture; and wherein the gaze adapting process alters image capture or image processing of the video images of the local individual when the characteristics are indicative of eye gaze image

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	capture, so as to provide eye-contact video images to the remote viewer wherein the eyes of the local individual appear to be looking at the eyes of the remote viewer in the remote environment and in a manner consistent with the video scene characteristics for both the local environment and remote environments.” *See* para. [0019]. “The computer 340 also is linked to a user tracking process 480, which can be an algorithm operated within the computer 340, using motion detection data acquired from a motion detector 142. Likewise, the computer 340 can access a user identification process 470, which again can be an algorithm operated within the computer 340. Similarly, the computer can access a gaze adaptive process 495, which can include both a gaze correction process and a gaze tracking process (or algorithms). The memory or data storage 345 can be one or more devices, including a computer hard drive or a flash drive, and can contain a frame buffer to hold a number of video frames, to support ongoing video image data analysis and adjustment.” *See* para. [0047]. “As another aspect, in using the video communication device 300 in the residential environment, and particularly with a family, it can be advantageous for the device 300 to recognize individual identities using identity classification as cues to define a video context and an appropriate video capture mode. As mentioned previously, the device 300 can be provided with a user identification process 470 that can use face recognition, voice recognition, biometrics (such as fingerprints), or other techniques, either individually, or in combination to recognize the identity of individuals within the capture field of view. As an example, in the case of the family setting, a device 300 can be programmed with facial images of family members. The device 300 could be operated through an initial set-up process, in which good facial images of each of the family members (users 10) living within a residence are captured by the device 300. The supporting face recognition process can initiate image processing and analysis algorithms to determine whether the captured facial image is sufficient, relative to lighting and pose, for robust identification on an ongoing basis.” *See* para. [0085]. “Likewise, the geometry and issues for eye contact image display can be considered in greater depth. Considering again FIG. 10, the image of a remote user is to be displayed

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	on display 110 to a local user 10 (much as in FIG. 4C, scene 620). The typical video-conferencing systems would present this image with direct-on centered view, such that a user 10 positioned along optical axis 170 would observe the remote user with the sensation of eye-to-eye contact. However, as shown in FIG. 10, the user 10 (particularly their face 25) may not be situated along optical axis 170, and therefore the displayed image of the remote user would not appear to be looking towards the face of user 10. As a method to compensate for this issue, the video communication device 300 can utilize an algorithm to estimate direction or location of a user 10 in their local environment 415 relative to a display 110. In particular, this algorithm would determine the angular direction or location of the users face (tracking pose) or eyes (eye-tracking) in three-dimensional space relative to display (or center thereof) 110. The video communication device 300 can utilize a variety of techniques, including stereo camera imaging or optical or sonar/audio based range finding and mapping to determine the location of the user 10. In some instances, the image processor 320 can then apply a gaze adapting process 495 to the images of the remote user to be shown on display 110, to change the appearance of their eyes, to have their image appear to be looking at the user 10. For example, the eye gaze appearance altering approach of the Andersson '376 disclosure can be applied to the pupil and eyelid image data to have the remote viewer appear to be looking in an appropriate direction (which may be straight ahead (optical axis 170)).” *See* para. [0139]. “However, while people can look laterally (side to side) or longitudinally (up or down) by mere eye movements, in general these off axis eye positions are not sustained, and an individual's head pose quickly adjusts towards the area of interest, with the eyes returning to center. Thus, a more extensive gaze adaptation, involving at least head pose, can be required to provide satisfactory eye contact image display. For example, the image of the remote user may need to be tilted and pivoted to have them appear to be looking at the local users . . . The images are altered to correct for head-pose alteration and eye-gaze direction, to create the perception of eye contact for the images viewed by the remote viewer.” *See* para. [0140]. “As can now be appreciated, eye gaze corrected residential video communications can be beset with dynamic geometry and context issues that effect both eye gaze related

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	image capture (how and when to obtain an eye contact image of a local user for remote display) and eye gaze related image display (relative to the direction and manner of image alteration of the remote viewer's eye gaze, to have it be best seen locally). As described, eye gaze correction can simultaneously depend on user positioning and context at both the local and remote sites. This is partially shown by FIG. 7D, which depicts the interactions of two video communications devices 300 of a video communication system 290 during a video communication event 600. To address this, during a video scene 620, communication event analysis 655 uses scene analysis algorithms with context rules to examine the local video scene characteristics relative to a variety of factors, including gaze metrics (amount of head or eye motion, rate of movement, direction or pose to camera 120), field of view, personal cues (including behavior or speech), and video context (event classification), to determine whether eye gaze image capture or correction is appropriate. For example, if a local user 10 a is engaged in a purposeful event, context rules would indicate that directed eye gaze is likely needed, supported by a range of gaze metrics. Whereas, if a local participant is involved in large group event, and glances at the display 110, without particularly communicating with a remote viewer, then directed eye gaze is not likely needed. Generally, the gaze context rules can anticipate that as the capture field of view is decreased and directed to fewer individuals, then the sensitivity and need for directed eye gaze image capture or correction increases. Even in such situations, the scene analysis algorithm can assess, for example using pose angle estimations and trigger or threshold levels, whether a local user 10 a is intending to look at a display 110 to communicate directly with the remote viewer. These pose angle estimates can be obtained from a gaze tracking process, which follows the gaze direction of a viewer to observe where a person's attention is focused. While it is desirable to track the actual movement of the eyes, it is frequently sufficient to infer the gaze direction from the head pose, as described in “Model-Based Head Pose Estimation for Air-Traffic Controllers”, by Xavier L. C. Brolly, Constantinos Stratelos and Jeffrey B. Mulligan (published at ICIP 2003, the IEEE Conference on Image Processing). “The eye-gaze correction scene analysis algorithm can use a set of eye-gaze context rules to associate the sensitivity (using triggers or threshold levels) or need for eye gaze

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	correction with the video context for a current video scene, including event classification and capture field of view. These context rules can define a range of variation for the participant gaze metrics or characteristics indicative of eye gaze image capture based upon the current video context. Likewise, the context rules can define a range of gaze metrics indicative of remote scene characteristics that will affect eye gaze image display. As with the prior uses of scene analysis algorithms, the gaze analysis process can calculate current gaze metrics and associated gaze confidence values as statistical quality assessment metrics. The current gaze metrics can then be compared to the range of gaze metrics expected for participants in the current video scene. If the contextual interface 450, via communication event analysis concludes with high gaze direction confidence values that gaze directed image capture or image processing of a local user is appropriate, then the gaze adapting process 495 can provide direction to the cameras 120 to adjust image capture (camera selection and settings (zoom, pan, and tilt)) to acquire images for eye contact viewing for the remote viewer. The gaze adapting process 495 can also provide input to the image processor 320, via scene capture management 650, to alter the captured images as necessary to provide eye contact image video imagery for the remote viewer." *See* paras. [0143]-[0144].

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	 FIG. 10 *See* Fig. 10. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Kurtz alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

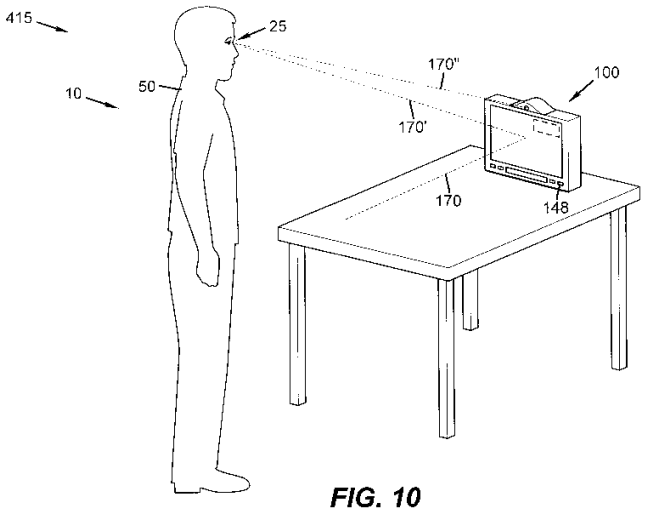
Asserted Claim of the ’110 Patent	Exemplary Citations to Kurtz
Claim 4	

Asserted Claim of the '110 Patent	Exemplary Citations to Kurtz
4. The method of claim 3, wherein the body part comprises one of legs, face, eyes, and hands.	Kurtz expressly and/or inherently discloses and/or renders obvious wherein the body part comprises one of legs, face, eyes, and hands. *See*, *e.g.*, disclosures below. "Wherein the gaze adapting process uses a scene analysis algorithm to identify video scene characteristics of the local environment indicative of eye gaze image capture; and wherein the gaze adapting process alters image capture or image processing of the video images of the local individual when the characteristics are indicative of eye gaze image capture, so as to provide eye-contact video images to the remote viewer wherein the eyes of the local individual appear to be looking at the eyes of the remote viewer in the remote environment and in a manner consistent with the video scene characteristics for both the local environment and remote environments." *See* para. [0019]. "The computer 340 also is linked to a user tracking process 480, which can be an algorithm operated within the computer 340, using motion detection data acquired from a motion detector 142. Likewise, the computer 340 can access a user identification process 470, which again can be an algorithm operated within the computer 340. Similarly, the computer can access a gaze adaptive process 495, which can include both a gaze correction process and a gaze tracking process (or algorithms). The memory or data storage 345 can be one or more devices, including a computer hard drive or a flash drive, and can contain a frame buffer to hold a number of video frames, to support ongoing video image data analysis and adjustment." *See* para. [0047]. "As another aspect, in using the video communication device 300 in the residential environment, and particularly with a family, it can be advantageous for the device 300 to recognize individual identities using identity classification as cues to define a video context and an appropriate video capture mode. As mentioned previously, the device 300 can be provided with a user identification process 470 that can use face recognition, voice recognition, biometrics (such as fingerprints), or other techniques, either individually, or in combination to recognize the identity of individuals within the capture field of view. As an example, in the case of the family setting, a device 300 can be programmed with facial images of family members. The device 300 could be operated through an initial set-up process, in which good facial images of each of the family

Asserted Claim of the ’110 Patent	Exemplary Citations to Kurtz
	members (users 10) living within a residence are captured by the device 300. The supporting face recognition process can initiate image processing and analysis algorithms to determine whether the captured facial image is sufficient, relative to lighting and pose, for robust identification on an ongoing basis.” *See* para. [0085]. “Likewise, the geometry and issues for eye contact image display can be considered in greater depth. Considering again FIG. 10, the image of a remote user is to be displayed on display 110 to a local user 10 (much as in FIG. 4C, scene 620). The typical video-conferencing systems would present this image with direct-on centered view, such that a user 10 positioned along optical axis 170 would observe the remote user with the sensation of eye-to-eye contact. However, as shown in FIG. 10, the user 10 (particularly their face 25) may not be situated along optical axis 170, and therefore the displayed image of the remote user would not appear to be looking towards the face of user 10. As a method to compensate for this issue, the video communication device 300 can utilize an algorithm to estimate direction or location of a user 10 in their local environment 415 relative to a display 110. In particular, this algorithm would determine the angular direction or location of the users face (tracking pose) or eyes (eye-tracking) in three-dimensional space relative to display (or center thereof) 110. The video communication device 300 can utilize a variety of techniques, including stereo camera imaging or optical or sonar/audio based range finding and mapping to determine the location of the user 10. In some instances, the image processor 320 can then apply a gaze adapting process 495 to the images of the remote user to be shown on display 110, to change the appearance of their eyes, to have their image appear to be looking at the user 10. For example, the eye gaze appearance altering approach of the Andersson '376 disclosure can be applied to the pupil and eyelid image data to have the remote viewer appear to be looking in an appropriate direction (which may be straight ahead (optical axis 170)).” *See* para. [0139]. “However, while people can look laterally (side to side) or longitudinally (up or down) by mere eye movements, in general these off axis eye positions are not sustained, and an individual's head pose quickly adjusts towards the area of interest, with the eyes returning to center. Thus, a more extensive gaze adaptation, involving at least head pose, can be required to provide satisfactory eye contact image display. For example, the

Asserted Claim of the ’110 Patent	Exemplary Citations to Kurtz
	image of the remote user may need to be tilted and pivoted to have them appear to be looking at the local users . . . The images are altered to correct for head-pose alteration and eye-gaze direction, to create the perception of eye contact for the images viewed by the remote viewer.” *See* para. [0140]. “As can now be appreciated, eye gaze corrected residential video communications can be beset with dynamic geometry and context issues that effect both eye gaze related image capture (how and when to obtain an eye contact image of a local user for remote display) and eye gaze related image display (relative to the direction and manner of image alteration of the remote viewer's eye gaze, to have it be best seen locally). As described, eye gaze correction can simultaneously depend on user positioning and context at both the local and remote sites. This is partially shown by FIG. 7D, which depicts the interactions of two video communications devices 300 of a video communication system 290 during a video communication event 600. To address this, during a video scene 620, communication event analysis 655 uses scene analysis algorithms with context rules to examine the local video scene characteristics relative to a variety of factors, including gaze metrics (amount of head or eye motion, rate of movement, direction or pose to camera 120), field of view, personal cues (including behavior or speech), and video context (event classification), to determine whether eye gaze image capture or correction is appropriate. For example, if a local user 10 a is engaged in a purposeful event, context rules would indicate that directed eye gaze is likely needed, supported by a range of gaze metrics. Whereas, if a local participant is involved in large group event, and glances at the display 110, without particularly communicating with a remote viewer, then directed eye gaze is not likely needed. Generally, the gaze context rules can anticipate that as the capture field of view is decreased and directed to fewer individuals, then the sensitivity and need for directed eye gaze image capture or correction increases. Even in such situations, the scene analysis algorithm can assess, for example using pose angle estimations and trigger or threshold levels, whether a local user 10 a is intending to look at a display 110 to communicate directly with the remote viewer. These pose angle estimates can be obtained from a gaze tracking process, which follows the gaze direction of a viewer to observe where a person's attention is focused. While it is desirable to track the actual

Asserted Claim of the '110 Patent	Exemplary Citations to Kurtz
	movement of the eyes, it is frequently sufficient to infer the gaze direction from the head pose, as described in "Model-Based Head Pose Estimation for Air-Traffic Controllers", by Xavier L. C. Brolly, Constantinos Stratelos and Jeffrey B. Mulligan (published at ICIP 2003, the IEEE Conference on Image Processing). "The eye-gaze correction scene analysis algorithm can use a set of eye-gaze context rules to associate the sensitivity (using triggers or threshold levels) or need for eye gaze correction with the video context for a current video scene, including event classification and capture field of view. These context rules can define a range of variation for the participant gaze metrics or characteristics indicative of eye gaze image capture based upon the current video context. Likewise, the context rules can define a range of gaze metrics indicative of remote scene characteristics that will affect eye gaze image display. As with the prior uses of scene analysis algorithms, the gaze analysis process can calculate current gaze metrics and associated gaze confidence values as statistical quality assessment metrics. The current gaze metrics can then be compared to the range of gaze metrics expected for participants in the current video scene. If the contextual interface 450, via communication event analysis concludes with high gaze direction confidence values that gaze directed image capture or image processing of a local user is appropriate, then the gaze adapting process 495 can provide direction to the cameras 120 to adjust image capture (camera selection and settings (zoom, pan, and tilt)) to acquire images for eye contact viewing for the remote viewer. The gaze adapting process 495 can also provide input to the image processor 320, via scene capture management 650, to alter the captured images as necessary to provide eye contact image video imagery for the remote viewer." *See* paras. [0143]-[0144].

Asserted Claim of the ’110 Patent	Exemplary Citations to Kurtz
	 FIG. 10 *See* Fig. 10. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Kurtz alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the ’110 Patent	Exemplary Citations to Kurtz
Claim 5	

Asserted Claim of the '110 Patent	Exemplary Citations to Kurtz
5. The method of claim 1, further comprising receiving user input and operating the processor to vary image magnitude or field-of-view of the modified images according to the user input.	Kurtz expressly and/or inherently discloses and/or renders obvious receiving user input and operating the processor to vary image magnitude or field-of-view of the modified images according to the user input. *See*, *e.g.*, disclosures below. "As an example, FIG. 4C depicts a video communication event 600 occurring in a local environment 415 involving a local individual (user 10 a). In a first video scene or video interaction (620), a user 10 a is sitting at a table, looking at a display 110 where an image of a remote user 10 b is displayed. If, for example, users 10 a and 10 b are engaged in a purposeful conversation regarding serious concerns, then the image field of view 420 may be relatively narrow. As the communication event continues, the participating users (10 a and 10 b) may relax, and transition into a more spontaneous event, where a wider image field of view 420 may be more appropriate. Such a scenario is depicted in FIG. 4C, where user 10 a goes from a sitting position in a first video scene 620 to a more relaxed behavior in a second video scene 620′. In general, in the present invention, it is intended that the contextual interface 450 of video communication device 300 will manage the human interactive operation of the device 300 through transitions in scene content, particularly when the device 300 is operating automatically." *See* para. [0072]. The scenario depicted in FIG. 4C illustrates one common use case scenario that can be anticipated for device 300. Alternately, there are many use case scenarios where the communication event may be initially more relaxed and spontaneous, and the initial image capture field of view 420 will be relatively wide. Thus, it can be anticipated that the default settings for camera control at the beginning of many communication events will have a WFOV image capture device 120 capture imagery for all or most of its image capture field of view 420. As a result, a remote user 10 b will at least initially observe a local user 10 a in the larger context of their local environment 415. As a typical communication event continues, either a local user 10 a or a remote user 10 b may desire the image capture to be closed in on localized activity (a NFOV) within the local environment 415. For example, the remote user 10 b make seek to have the direction of narrow field image capture change from an initial NFOV 420 to an alternate NFOV 420 (for example, from the table to the children, as depicted in FIG. 4B). Either the local user 10 a or the remote user 10 b can initiate this transition, using interface controls 190. As

Asserted Claim of the '110 Patent	Exemplary Citations to Kurtz
	the video capture transition occurs, a local user 10 a will be able to observe the outgoing transmitted imagery on the split screen image 410. The privacy interface 400 can also enable the local user 10 a to decline or modify requests by a remote user 10 b to capture a localized field of view 420. The reduction of the field of view 420 can be attained via the image processor 320, which can crop and zoom in the images for outgoing transmission across a network 360. However, at some point, the resulting image quality (particularly the resolution) obtained by electronic zooming will be sufficiently reduced that use of optical zooming or a NFOV image capture device 120 (or the combination thereof) will be appropriate. It is noted that a camera lens with optical zoom capabilities is typically equipped with several internal moving lens groups. The device 300 can also apply the user tracking process 480, to lock onto and track a local user 10 a around within the local environment 415, as bounded by the image field of view 420." *See* para. [0072]. "Further complications arise when an individual enters (or leaves) the field of view of a local environment 415 during an ongoing communication event. In the instance that a local user 10 (particularly the only local user at the moment) leaves the local environment, the device 300 can adapt to this transition in the local image content. For example, the device 300 can modify the subsequent video capture to be either a WFOV [wide field of view] image or a NFOV [narrow field of view] image. As one option, these image capture transitions (changes in participating individuals or their activities) can be provided by direct user input. Alternately, the device 300 can transition the image capture according to prior user-established settings. As another option, the device 300 can transmit paused imagery or alternate imagery of other than the local environment 415, until the local user 10 returns. The video communication device 300 also needs to adapt to the circumstance that an additional individual enters the field of view. As before, a local user 10 who is previously engaged in a communication event will typically be aware of the arrival of an additional individual. This prior local user 10 can, for example, then control the device 300 to expand (reduce, or re-direct) the image field of view 420 to include (or exclude) the new individual." *See* para. [0075]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Kurtz alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the

Asserted Claim of the ’110 Patent	Exemplary Citations to Kurtz
	teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the ’110 Patent	Exemplary Citations to Kurtz
Claim 6	
6. The method of claim 5, wherein the processor varies the image magnitude or field-of-view mapping to display a partial or full body of the user in the modified images.	Kurtz expressly and/or inherently discloses and/or renders obvious wherein the processor varies the image magnitude or field-of-view mapping to display a partial or full body of the user in the modified images. *See*, *e.g.*, disclosures below. “As an example, FIG. 4C depicts a video communication event 600 occurring in a local environment 415 involving a local individual (user 10 a). In a first video scene or video interaction (620), a user 10 a is sitting at a table, looking at a display 110 where an image of a remote user 10 b is displayed. If, for example, users 10 a and 10 b are engaged in a purposeful conversation regarding serious concerns, then the image field of view 420 may be relatively narrow. As the communication event continues, the participating users (10 a and 10 b) may relax, and transition into a more spontaneous event, where a wider image field of view 420 may be more appropriate. Such a scenario is depicted in FIG. 4C, where user 10 a goes from a sitting position in a first video scene 620 to a more relaxed behavior in a second video scene 620′. In general, in the present invention, it is intended that the contextual interface 450 of video communication device 300 will manage the human interactive operation of the device 300 through transitions in scene content, particularly when the device 300 is operating automatically.” *See* para. [0072]. The scenario depicted in FIG. 4C illustrates one common use case scenario that can be anticipated for device 300. Alternately, there are many use case scenarios where the communication event may be initially more relaxed and spontaneous, and the initial image capture field of view 420 will be relatively wide. Thus, it can be anticipated that the default settings for camera control at the beginning of many communication events

Asserted Claim of the '110 Patent	Exemplary Citations to Kurtz
	will have a WFOV image capture device 120 capture imagery for all or most of its image capture field of view 420. As a result, a remote user 10 b will at least initially observe a local user 10 a in the larger context of their local environment 415. As a typical communication event continues, either a local user 10 a or a remote user 10 b may desire the image capture to be closed in on localized activity (a NFOV) within the local environment 415. For example, the remote user 10 b make seek to have the direction of narrow field image capture change from an initial NFOV 420 to an alternate NFOV 420 (for example, from the table to the children, as depicted in FIG. 4B). Either the local user 10 a or the remote user 10 b can initiate this transition, using interface controls 190. As the video capture transition occurs, a local user 10 a will be able to observe the outgoing transmitted imagery on the split screen image 410. The privacy interface 400 can also enable the local user 10 a to decline or modify requests by a remote user 10 b to capture a localized field of view 420. The reduction of the field of view 420 can be attained via the image processor 320, which can crop and zoom in the images for outgoing transmission across a network 360. However, at some point, the resulting image quality (particularly the resolution) obtained by electronic zooming will be sufficiently reduced that use of optical zooming or a NFOV image capture device 120 (or the combination thereof) will be appropriate. It is noted that a camera lens with optical zoom capabilities is typically equipped with several internal moving lens groups. The device 300 can also apply the user tracking process 480, to lock onto and track a local user 10 a around within the local environment 415, as bounded by the image field of view 420." *See* para. [0072]. "Further complications arise when an individual enters (or leaves) the field of view of a local environment 415 during an ongoing communication event. In the instance that a local user 10 (particularly the only local user at the moment) leaves the local environment, the device 300 can adapt to this transition in the local image content. For example, the device 300 can modify the subsequent video capture to be either a WFOV [wide field of view] image or a NFOV [narrow field of view] image. As one option, these image capture transitions (changes in participating individuals or their activities) can be provided by direct user input. Alternately, the device 300 can transition the image capture according to prior user-established settings. As another option, the device 300 can transmit paused imagery or alternate imagery of other than the local environment

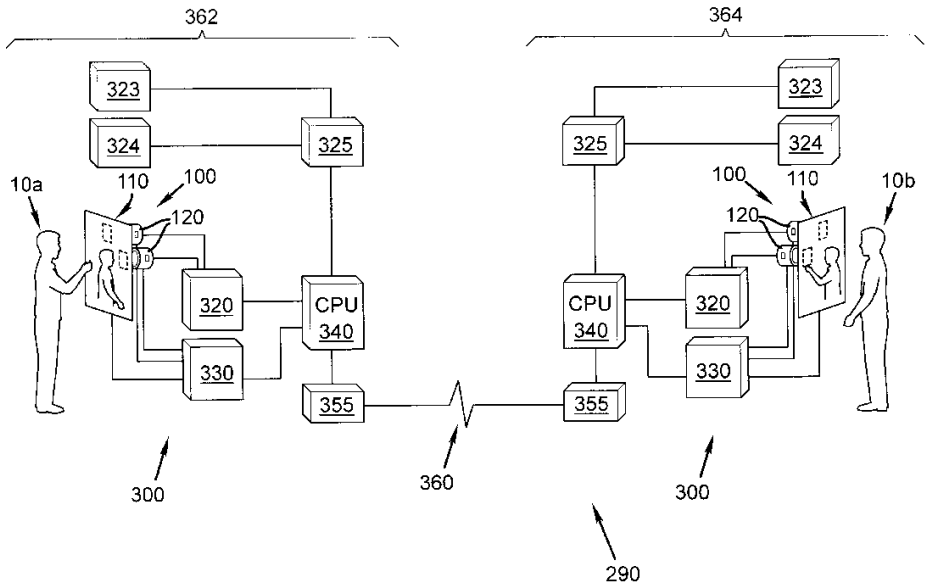
Asserted Claim of the '110 Patent	Exemplary Citations to Kurtz
	415, until the local user 10 returns. The video communication device 300 also needs to adapt to the circumstance that an additional individual enters the field of view. As before, a local user 10 who is previously engaged in a communication event will typically be aware of the arrival of an additional individual. This prior local user 10 can, for example, then control the device 300 to expand (reduce, or re-direct) the image field of view 420 to include (or exclude) the new individual." *See* para. [0075]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Kurtz alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '110 Patent	Exemplary Citations to Kurtz
Claim 10	
10. The method of claim 1, further comprising operating the processor to augment the modified images by overlaying virtual objects on a user's image appearing within the modified images.	Kurtz expressly and/or inherently discloses and/or renders obvious operating the processor to augment the modified images by overlaying virtual objects on a user's image appearing within the modified images. *See*, *e.g.*, disclosures below. "Users 10 may also desire to change the appearance of their local environment 415 in other ways. For example, the appearance altering interface 490 can be used to change the illumination, for example to simulate black lighting. Likewise, users 10 may desire that the appearance altering interface 490 have capabilities to extract the images of the users from their local environment, and substitute in an alternate virtual environment (for example, a beach). The virtual environment images can be still images or video and the images can be stored as a library of virtual environment images in the device or obtained from other sites over a network. It can also be anticipated that some users 10 may potentially also desire that the appearance altering interface 490 have capabilities to alter personal appearance, relative to their skin, hair, clothing, or other aspects. For

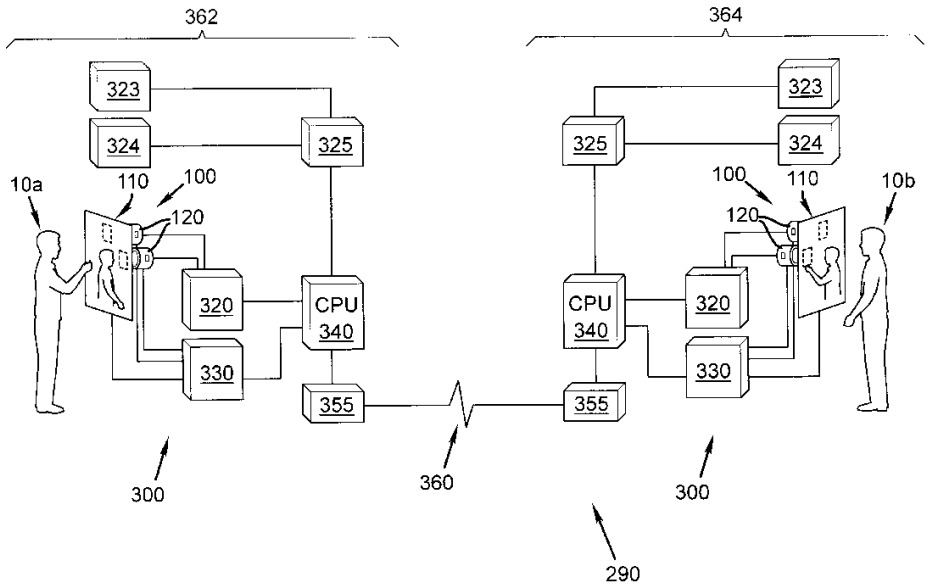
Asserted Claim of the '110 Patent	Exemplary Citations to Kurtz
	example, a user 10 may have the video communication device 300; through the appearance altering interface 490 of the contextual interface 450, for cosmetic reasons, change the appearance of their face 25, hair 40, or color of clothes. In such instances, it can be useful to use a reference image 460 of the user 10, in addition to current images of the same user 10, to create these effects. A comparable process can also be provided for altering the voice characteristics of the users 10." *See* para. [0123]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Kurtz alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '110 Patent	Exemplary Citations to Kurtz
Claim 11	
11. The method of claim 1, further comprising operating the processor to transmit the modified image over a network.	Kurtz expressly and/or inherently discloses and/or renders obvious operating the processor to transmit the modified image over a network. *See*, *e.g.*, disclosures below. "The block diagram of FIG. 1 shows one embodiment of such a two-way video communications system 290 having a video communication device 300 located at a local site and a video communication device 300 at a remote site. In the illustrated embodiment, communication devices 300 have an electronic imaging device 100, including a display 110 and an image capture device 120 for communication between a viewer 10 a at a first site 362 and a viewer 10 b at a second site 364. Each device 300 manages the capture, processing, transmission or receipt of video images across a network 360, subject to handshake protocols, privacy protocols, and bandwidth constraints. The network 360, which can be supported by remote servers (not shown), connects two sites 362 and 364, each of which has a system 300. Each viewer 10 a, 10 b has an electronic imaging device 100 comprising a display 110 with one or more image

Asserted Claim of the ’110 Patent	Exemplary Citations to Kurtz
	capture devices 120. A computer (or control logic processor (CPU)) 340 coordinates control of an image processor 320 and a system controller 330 that provides display driver and image capture control functions. System controller 330 can be integrated into computer 340 or not as desired. Computer 340 is nominally located locally, at a communication device 300 located at a given site for example local site 362, but some portions of functions can be located remotely at a remote server in system 290 or at a communication device 300 at remote site 364. Controller 330 can provide commands to an image capture device 120, controlling the camera view angle, focus, or other characteristics. A communications controller 355 acts as interface to a communication channel, such as a wireless or wired network channel, for transferring image and other data from one site to the other.” *See* para. [0042].

Asserted Claim of the ’110 Patent	Exemplary Citations to Kurtz
	 FIG. 1 *See*. Fig. 1. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Kurtz alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '110 Patent	Exemplary Citations to Kurtz
Claim 12	
12. The method of claim 1, further comprising displaying the modified image on a remote screen for video telepresence.	Kurtz expressly and/or inherently discloses and/or renders obvious displaying the modified image on a remote screen for video telepresence. *See*, *e.g.*, disclosures below. "The block diagram of FIG. 1 shows one embodiment of such a two-way video communications system 290 having a video communication device 300 located at a local site and a video communication device 300 at a remote site. In the illustrated embodiment, communication devices 300 have an electronic imaging device 100, including a display 110 and an image capture device 120 for communication between a viewer 10 a at a first site 362 and a viewer 10 b at a second site 364. Each device 300 manages the capture, processing, transmission or receipt of video images across a network 360, subject to handshake protocols, privacy protocols, and bandwidth constraints. The network 360, which can be supported by remote servers (not shown), connects two sites 362 and 364, each of which has a system 300. Each viewer 10 a, 10 b has an electronic imaging device 100 comprising a display 110 with one or more image capture devices 120. A computer (or control logic processor (CPU)) 340 coordinates control of an image processor 320 and a system controller 330 that provides display driver and image capture control functions. System controller 330 can be integrated into computer 340 or not as desired. Computer 340 is nominally located locally, at a communication device 300 located at a given site for example local site 362, but some portions of functions can be located remotely at a remote server in system 290 or at a communication device 300 at remote site 364. Controller 330 can provide commands to an image capture device 120, controlling the camera view angle, focus, or other characteristics. A communications controller 355 acts as interface to a communication channel, such as a wireless or wired network channel, for transferring image and other data from one site to the other." *See* para. [0042].

Asserted Claim of the ’110 Patent	Exemplary Citations to Kurtz
	 FIG. 1 *See*. Fig. 1. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Kurtz alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '110 Patent	Exemplary Citations to Kurtz
Claim 16	
16. The method of claim 1, wherein the processor operates on the images from the camera to generate background segmentation, and replaces segments on the images by replacement segments.	Kurtz expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. "Users 10 may also desire to change the appearance of their local environment 415 in other ways. For example, the appearance altering interface 490 can be used to change the illumination, for example to simulate black lighting. Likewise, users 10 may desire that the appearance altering interface 490 have capabilities to extract the images of the users from their local environment, and substitute in an alternate virtual environment (for example, a beach). The virtual environment images can be still images or video and the images can be stored as a library of virtual environment images in the device or obtained from other sites over a network. It can also be anticipated that some users 10 may potentially also desire that the appearance altering interface 490 have capabilities to alter personal appearance, relative to their skin, hair, clothing, or other aspects. For example, a user 10 may have the video communication device 300; through the appearance altering interface 490 of the contextual interface 450, for cosmetic reasons, change the appearance of their face 25, hair 40, or color of clothes. In such instances, it can be useful to use a reference image 460 of the user 10, in addition to current images of the same user 10, to create these effects. A comparable process can also be provided for altering the voice characteristics of the users 10." *See* para. [0123]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Kurtz alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the ’110 Patent	Exemplary Citations to Kurtz
Claim 17	
17. The method of claim 16, wherein the replacement segments comprise virtual background or background that was captured in a different setting.	Kurtz expressly and/or inherently discloses and/or renders obvious wherein the replacement segments comprise virtual background or background that was captured in a different setting. *See*, *e.g.*, disclosures below. “Users 10 may also desire to change the appearance of their local environment 415 in other ways. For example, the appearance altering interface 490 can be used to change the illumination, for example to simulate black lighting. Likewise, users 10 may desire that the appearance altering interface 490 have capabilities to extract the images of the users from their local environment, and substitute in an alternate virtual environment (for example, a beach). The virtual environment images can be still images or video and the images can be stored as a library of virtual environment images in the device or obtained from other sites over a network. It can also be anticipated that some users 10 may potentially also desire that the appearance altering interface 490 have capabilities to alter personal appearance, relative to their skin, hair, clothing, or other aspects. For example, a user 10 may have the video communication device 300; through the appearance altering interface 490 of the contextual interface 450, for cosmetic reasons, change the appearance of their face 25, hair 40, or color of clothes. In such instances, it can be useful to use a reference image 460 of the user 10, in addition to current images of the same user 10, to create these effects. A comparable process can also be provided for altering the voice characteristics of the users 10.” *See* para. [0123]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Kurtz alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Exhibit B-08: Invalidity of U.S. Patent No. 8,982,110 in view of WO Patent Pub. No. 2006/108279 ("Lizee")

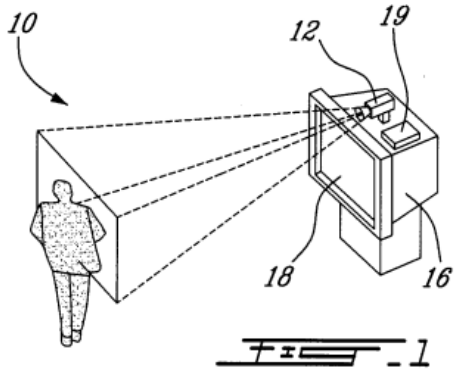
This chart is subject to all reservations, objections, and disclaimers in Defendants' Invalidity Contentions and any amendment, supplement, or modification thereof, which are incorporated herein by reference in their entirety.

Lizee was originally filed April 11, 2006 and published October 19, 2006, and thus is available as prior art to U.S. Patent No. 8,982,110 (the "'110 Patent") under at least 35 U.S.C. §§ 102(a) and (b).

Lizee anticipates the Asserted Claims of the '110 Patent. To the extent it is found Lizee does not expressly disclose certain limitations in the Asserted Claims, such limitations are at least implicitly or inherently disclosed. Moreover, to the extent it is found that Lizee does not anticipate the Asserted Claims, Lizee renders obvious the Asserted Claims, either alone or in combination with other prior art identified in the cover pleading or herein, and/or in combination with the general knowledge of a person having ordinary skill in the art.

In these contentions, Defendants have relied in part on Plaintiff's Infringement Contentions. In those contentions, Plaintiff appears to pursue overly broad claim constructions in an effort to assert infringement where none exists, and to accuse products that do not infringe the claims. Defendants' assertion that a particular limitation is disclosed by a prior art reference and/or is disclosed in a particular manner may be based in part on Plaintiff's apparent claim interpretations. In relying on Plaintiff's apparent claim interpretations, Defendants do not admit that Plaintiff's apparent claim interpretations are supportable or proper or that the claim limitations in question are definite or otherwise amenable to construction.

Defendants have endeavored to provide as much detail as possible in these contentions and, in doing so, have exceeded the level of detail required. The inclusion of specific details in some areas is not a concession that such details are required or that the omission of similar details in other areas is a defect. These citations to portions of any reference in this chart are exemplary only. Defendants will rely on the entirety of the references cited in this chart to show that the Asserted Claims are invalid.

Asserted Claim of the '110 Patent	Exemplary Citations to Lizee
Claim 1	
1[pre]. A computerized method for operating a display system, the display system having a camera, a monitor, and a processor, the method comprising:	To the extent the preamble is limiting, Lizee expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. "Referring to Figure 1, a virtual presence system, generally referred to using the reference numeral 10 and in accordance with an illustrative embodiment of the present invention, will now be presented. The virtual presence system 10 generally comprises an image capture device 12 for capturing images of a user, as in reference 14 of Figure 1A, a display 16 comprising a display screen 18, and a computing device 19 for interpreting the captured images 14 provided by the image capture device 12 and communicating a corresponding image, as in reference 20 of Figure 1B, for display on the screen 18. As a result, the processed image 20, derived from the captured images 14 of the user, is provided on the screen 18 (Figure 1C) and virtually immersed in the virtual environment 22 of the system 10, as illustrated in Figure 1D." *See* para. [0029].  Fig. 1 *See* Fig. 1. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Lizee alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the

Asserted Claim of the '110 Patent	Exemplary Citations to Lizee
	teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[a]. operating the camera to generate a stream of images of the user;	Lizee expressly and/or inherently discloses and/or renders obvious operating the camera to generate a stream of images of the user. *See*, *e.g.*, disclosures below. "Referring to Figure 1, a virtual presence system, generally referred to using the reference numeral 10 and in accordance with an illustrative embodiment of the present invention, will now be presented. The virtual presence system 10 generally comprises an image capture device 12 for capturing images of a user, as in reference 14 of Figure 1A, a display 16 comprising a display screen 18, and a computing device 19 for interpreting the captured images 14 provided by the image capture device 12 and communicating a corresponding image, as in reference 20 of Figure 1B, for display on the screen 18. As a result, the processed image 20, derived from the captured images 14 of the user, is provided on the screen 18 (Figure 1C) and virtually immersed in the virtual environment 22 of the system 10, as illustrated in Figure 1D. "To implement the system, various image capture devices 12 may be considered. For instance, the image capture device may comprise a digital video camera coupled to a screen grabber software or hardware interacting with and/or in the computing device 19, an analog camera providing a continuous video feed to an analog-to-digital (A/D) converter used in conjunction with the computing device 19, as well as any other conventional or specialized imaging device such as infra-red (IR) devices, thermal imaging devices, sonar devices and the like. Other such imaging devices will be apparent to a person of ordinary skill in the art." *See* paras. [0029]-[0030]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Lizee alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of

Asserted Claim of the '110 Patent	Exemplary Citations to Lizee
	Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[b]. operating the processor to detect the presence of the user in the stream of image;	Lizee expressly and/or inherently discloses and/or renders obvious operating the processor to detect the presence of the user in the stream of image. *See*, *e.g.*, disclosures below. "As illustrated by Figures 2A and 2B, the projection 26 is adapted to compensate for the displacement of the user relative to the image capture device 12, which displacement is also used to move the silhouette model 24 in the virtual environment 22. For instance, as the user moves from positions A to E in the real world (Figure 2A), the position of the silhouette model 24 moves from corresponding positions A' to E' in the virtual environment 22 (Figure 2B), yet the size of the silhouette remains the same. Additionally, as the user moves from side to side, the silhouette model 24 can also move accordingly." *See* para. [0040]. "Yet, as illustrated in Figure 2 B, the size of the silhouette model 24 is substantially unchanged. Note however that the shape of the silhouette model 24 may still change if the shape of captured image 14 and silhouette image 20 are changed due to user motion and/or action." *See* para. [0041]. "To position the silhouette model 24 within the virtual environment 22 and to adapt the projection 26 to compensate for the displacement of the user relative to the image capture device 12, an estimate distance of the user from the image capture device 12 is used." *See* para. [0047]. "Alternatively, the user position range may be delimited by the selected virtual camera framing 34. That is, the sensitivity of the system to user motion may be calibrated by selecting a minimal virtual camera framing 34 defined to provide an adequate visualization of the silhouette model 24." *See* para. [0053].

Asserted Claim of the '110 Patent	Exemplary Citations to Lizee
	"For instance, as the system 10 detects a motion of the user, the computing device 19 may be configured to implement various motions and/or displacements of the silhouette model 24 in the virtual environment 22, or again implement various modifications to a visualization thereof from the perspective of the virtual camera 28. For example, user arm, leg, hand, head and body motions may be mapped by corresponding motions of the virtual model 24 in the virtual environment 22. Also, user motions may be used to implement virtual displacements of the virtual model 24 such as a forward displacement, a backward displacement, an orbital displacement, a rotational displacement and a side displacement. Alternatively, user motions may be detected and used to control various virtual camera perspective modifications, which may include moving, rotating, panning, zooming, orbiting and/or dollying the virtual camera relative to the silhouette model 24 and/or the virtual environment." *See* para. [0063] This limitation would have been obvious to a person of ordinary skill in the art based on (1) Lizee alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[c]. operating the processor to apply adaptive transformation mapping to the stream of images captured by the camera to generate modified images that appear to be captured from a different point of view of the camera's actual point of view; and	Lizee expressly and/or inherently discloses and/or renders obvious operating the processor to apply adaptive transformation mapping to the stream of images captured by the camera to generate modified images that appear to be captured from a different point of view of the camera's actual point of view. *See*, *e.g.*, disclosures below. "(As will be discussed further hereinbelow, estimated and/or extrapolated data could be used to enhance visualization of the silhouette model in areas where real-time data is unavailable.)" *See* para. [0048]. "As mentioned hereinabove, the lateral motion of the user may also be used to control actions of the silhouette model 24 and the virtual camera 28 in the virtual environment 22. For instance, when the user moves to the left, the silhouette image 20 will be moved to the left side of the frame 32 thereof. By detecting this lateral displacement, the

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	silhouette model 24 could also be correspondingly displaced in the virtual environment 22. Alternatively, a position or viewpoint of the virtual camera 28 could be moved to reflect a change in the viewing direction of the virtual silhouette 24." *See* para. [0057]. "As such, a person skilled in the art will recognize that the typical camera movements used in 3D software, like zooming and panning can be available with this system 10, as well as other movements such as moving and dollying. To enhance the visualization of the latter two, additional software and hardware algorithms may be used to address various reorientations of the silhouette model 24 and various perspective inconsistencies attributed thereto. "Furthermore, other visual effects may be generated by the motion of the user relative to the image capture device 12. For example, the displacement of the user and/or his position relative to the video capture device 12 may be used in conjunction with state information in the virtual environment 22 to control the position and/or the orientation of the silhouette model 24. For instance, in a game setting, a user moving from the left to the right of the image capture device 12 could instruct a silhouette model 24 to orbit around an object rather than to strictly move from left to right. Alternatively, a user moving three (3) feet to the left could instruct a silhouette model 24 to move four times as much to give the user a feeling of power or speed. "Many other examples may also be considered. For instance, as the system 10 detects a motion of the user, the computing device 19 may be configured to implement various motions and/or displacements of the silhouette model 24 in the virtual environment 22, or again implement various modifications to a visualization thereof from the perspective of the virtual camera 28. For example, user arm, leg, hand, head and body motions may be mapped by corresponding motions of the virtual model 24 in the virtual environment 22. Also, user motions may be used to implement virtual displacements of the virtual model 24 such as a forward displacement, a backward displacement, an orbital displacement, a rotational displacement and a side displacement. Alternatively, user motions may be detected and used to control various virtual camera perspective modifications, which may include moving, rotating, panning, zooming, orbiting and/or

Asserted Claim of the '110 Patent	Exemplary Citations to Lizee
	dollying the virtual camera relative to the silhouette model 24 and/or the virtual environment. A person skilled in the art, namely in the art of video game and virtual reality system development, will understand that such controller mapping features and options used to generate and enhance user immersion, impressions, and experiences may be readily adapted to the system 10 without departing from the general scope and nature of the present disclosure." *See* para. [0061]-[0063]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Lizee alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[d]. displaying the modified images on the monitor;	Lizee expressly and/or inherently discloses and/or renders obvious displaying the modified images on the monitor. *See*, *e.g.*, disclosures below. "With particular reference now to Figures 1C and 1D, the image 20 projected on the screen 18 is illustratively represented by a translucent mirrored silhouette transformation (hereinafter referred to as a silhouette image 20) of the captured image 14. In other words, the captured image 14 is isolated by the computing device 19, inverted from left to right about a vertical axis, and transformed into a translucent silhouette image 20 (Figure 1B) for display on the screen 18 (Figure 1C)." *See* para. [0034]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Lizee alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '110 Patent	Exemplary Citations to Lizee
1[e]. wherein the different point of view corresponds to an image taken from a different angle and a different distance than the actual images captured by the camera; and	Lizee expressly and/or inherently discloses and/or renders obvious wherein the different point of view corresponds to an image taken from a different angle and a different distance than the actual images captured by the camera. *See*, *e.g.*, disclosures below. "As illustrated by Figures 2A and 2B, the projection 26 is adapted to compensate for the displacement of the user relative to the image capture device 12, which displacement is also used to move the silhouette model 24 in the virtual environment 22. For instance, as the user moves from positions A to E in the real world (Figure 2A), the position of the silhouette model 24 moves from corresponding positions A' to E' in the virtual environment 22 (Figure 2B), yet the size of the silhouette remains the same. Additionally, as the user moves from side to side, the silhouette model 24 can also move accordingly. "In Figure 2C, the captured images 14A to 14E and their respective silhouette images 2OA to 2OE are presented for the aforementioned positions A to E in the real world of Figure 2A. As the user moves backward from position A to E, the size of the captured and silhouette images 14 and 20 change within their respective frames 30 and 32. Yet, as illustrated in Figure 2 B, the size of the silhouette model 24 is substantially unchanged. Note however that the shape of the silhouette model 24 may still change if the shape of captured image 14 and silhouette image 20 are changed due to user motion and/or action." *See* paras. [0040]-[0041]. "To position the silhouette model 24 within the virtual environment 22 and to adapt the projection 26 to compensate for the displacement of the user relative to the image capture device 12, an estimate distance of the user from the image capture device 12 is used." *See* para. [0043]. "By implementing such a calculation in the system 10 in real-time for each captured image 12 and corresponding silhouette image 20, or again periodically at a predetermined imaging rate, the position of the user relative to the image capture device 12 may be calculated in real-time. This information can then be used to control the

Asserted Claim of the '110 Patent	Exemplary Citations to Lizee
	position and orientation of the silhouette model 24 in the virtual environment 22, and that again in real-time." *See* para. [0045]. "Referring back to Figures 2A and 2B, the system 10 may use the estimated distances of the user at each position A to E in the real world (Figure 2A) to position the silhouette model 24 at corresponding positions A' to E' in the virtual environment 22 (Figure 2B). Yet, as illustrated in Figure 2C, as the user moves closer to the image capture device 12, the fraction of the user imaged thereby is reduced such that a representation thereof is limited by the frame 32 of the silhouette image 20. Consequently, a framing 34 of the virtual camera 28 (as illustrated in Figure 1D) is also constrained by the existing portion of the silhouette model 24, that is the portion rendered by the silhouette image 20 at any given position. Consequently, if the silhouette model 24 does not include the silhouette of the model's legs, for instance when the user is at a position at which his/her legs are not visible to the image capture device 12, then the framing 34 (Figure 1D) of the virtual camera 28 should not include the region in the virtual environment 22 where the legs of the silhouette model 24 would be, since visualization data of the silhouette model 24 is not available in this area." *See* para. [0048]. "Despite these constraints, the present embodiment still provides the ability to implement various camera effects by actively controlling the framing 34 and/or the conceptual position of the virtual camera 28." *See* para [0050]. "Referring now to Figure 4, the framing 34 of the virtual camera 28 may also be altered dynamically to provide a zooming action. For instance, the user may use a backward motion to implement a zoom-out function in the application. As the distance of the user from the image capture device 12 increases, the virtual camera framing 34 may also increase, thereby providing a zoom-out effect that may optionally be dynamically coupled to a rearward motion of the silhouette model 24 in the virtual environment 22." *See* para. [0056]. "As will be apparent to a person of skill in the art, various visualization control algorithms may be implemented to produce such lateral displacement effects. For

Asserted Claim of the ’110 Patent	Exemplary Citations to Lizee
	example, the positioning of the silhouette model 24 could be determined as a function of a static virtual panel, as in reference 27 of Figure 1 D on which the silhouette image 20 is projected to construct the silhouette model 24, that moves forward and back based on the distance of the user from the image capture device 12. The lateral position of the virtual silhouette 24 could then be modified dynamically as the position of the silhouette image 20 moves laterally within the framing 32 thereof.” *See* para. [0058]. “Many other examples may also be considered. For instance, as the system 10 detects a motion of the user, the computing device 19 may be configured to implement various motions and/or displacements of the silhouette model 24 in the virtual environment 22, or again implement various modifications to a visualization thereof from the perspective of the virtual camera 28. For example, user arm, leg, hand, head and body motions may be mapped by corresponding motions of the virtual model 24 in the virtual environment 22. Also, user motions may be used to implement virtual displacements of the virtual model 24 such as a forward displacement, a backward displacement, an orbital displacement, a rotational displacement and a side displacement. Alternatively, user motions may be detected and used to control various virtual camera perspective modifications, which may include moving, rotating, panning, zooming, orbiting and/or dollying the virtual camera relative to the silhouette model 24 and/or the virtual environment. A person skilled in the art, namely in the art of video game and virtual reality system development, will understand that such controller mapping features and options used to generate and enhance user immersion, impressions, and experiences may be readily adapted to the system 10 without departing from the general scope and nature of the present disclosure.” *See* para [0063]. “12. The virtual presence system of Claim 11, said image capture device for capturing successive frontal images of the user and said computing device being further configured to detect a motion of the user via said successive user images and implement a predetermined camera action that modifies said perspective based on said detected motion.

Asserted Claim of the '110 Patent	Exemplary Citations to Lizee
	"13. The virtual presence system of Claim 12, wherein said virtual camera action comprises at least one of a camera moving action, a camera rotation action, a camera panning action, a camera zooming action, a camera orbiting action and a camera dollying action." *See* claims 12-13. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Lizee alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[f]. wherein during mirror tracking mode the processor utilizes the angle of the images captured by the camera and applies parametric input for a mapping transformation that changes imaging perspective of the images captured by the camera.	Lizee expressly and/or inherently discloses and/or renders obvious wherein during mirror tracking mode the processor utilizes the angle of the images captured by the camera and applies parametric input for a mapping transformation that changes imaging perspective of the images captured by the camera. *See*, *e.g.*, disclosures below. "As illustrated by Figures 2A and 2B, the projection 26 is adapted to compensate for the displacement of the user relative to the image capture device 12, which displacement is also used to move the silhouette model 24 in the virtual environment 22. For instance, as the user moves from positions A to E in the real world (Figure 2A), the position of the silhouette model 24 moves from corresponding positions A' to E' in the virtual environment 22 (Figure 2B), yet the size of the silhouette remains the same. Additionally, as the user moves from side to side, the silhouette model 24 can also move accordingly. "In Figure 2C, the captured images 14A to 14E and their respective silhouette images 2OA to 2OE are presented for the aforementioned positions A to E in the real world of Figure 2A. As the user moves backward from position A to E, the size of the captured and silhouette images 14 and 20 change within their respective frames 30 and 32. Yet, as illustrated in Figure 2 B, the size of the silhouette model 24 is substantially unchanged. Note however that the shape of the silhouette model 24 may still change if the shape of

Asserted Claim of the '110 Patent	Exemplary Citations to Lizee
	captured image 14 and silhouette image 20 are changed due to user motion and/or action." *See* paras. [0040]-[0041]. "To position the silhouette model 24 within the virtual environment 22 and to adapt the projection 26 to compensate for the displacement of the user relative to the image capture device 12, an estimate distance of the user from the image capture device 12 is used." *See* para. [0043]. "By implementing such a calculation in the system 10 in real-time for each captured image 12 and corresponding silhouette image 20, or again periodically at a predetermined imaging rate, the position of the user relative to the image capture device 12 may be calculated in real-time. This information can then be used to control the position and orientation of the silhouette model 24 in the virtual environment 22, and that again in real-time." *See* para. [0045]. "Referring back to Figures 2A and 2B, the system 10 may use the estimated distances of the user at each position A to E in the real world (Figure 2A) to position the silhouette model 24 at corresponding positions A' to E' in the virtual environment 22 (Figure 2B). Yet, as illustrated in Figure 2C, as the user moves closer to the image capture device 12, the fraction of the user imaged thereby is reduced such that a representation thereof is limited by the frame 32 of the silhouette image 20. Consequently, a framing 34 of the virtual camera 28 (as illustrated in Figure 1D) is also constrained by the existing portion of the silhouette model 24, that is the portion rendered by the silhouette image 20 at any given position. Consequently, if the silhouette model 24 does not include the silhouette of the model's legs, for instance when the user is at a position at which his/her legs are not visible to the image capture device 12, then the framing 34 (Figure 1D) of the virtual camera 28 should not include the region in the virtual environment 22 where the legs of the silhouette model 24 would be, since visualization data of the silhouette model 24 is not available in this area." *See* para. [0048].

Asserted Claim of the '110 Patent	Exemplary Citations to Lizee
	"Despite these constraints, the present embodiment still provides the ability to implement various camera effects by actively controlling the framing 34 and/or the conceptual position of the virtual camera 28." *See* para [0050]. "Referring now to Figure 4, the framing 34 of the virtual camera 28 may also be altered dynamically to provide a zooming action. For instance, the user may use a backward motion to implement a zoom-out function in the application. As the distance of the user from the image capture device 12 increases, the virtual camera framing 34 may also increase, thereby providing a zoom-out effect that may optionally be dynamically coupled to a rearward motion of the silhouette model 24 in the virtual environment 22." *See* para. [0056]. "As will be apparent to a person of skill in the art, various visualization control algorithms may be implemented to produce such lateral displacement effects. For example, the positioning of the silhouette model 24 could be determined as a function of a static virtual panel, as in reference 27 of Figure 1 D on which the silhouette image 20 is projected to construct the silhouette model 24, that moves forward and back based on the distance of the user from the image capture device 12. The lateral position of the virtual silhouette 24 could then be modified dynamically as the position of the silhouette image 20 moves laterally within the framing 32 thereof." *See* para. [0058]. "Many other examples may also be considered. For instance, as the system 10 detects a motion of the user, the computing device 19 may be configured to implement various motions and/or displacements of the silhouette model 24 in the virtual environment 22, or again implement various modifications to a visualization thereof from the perspective of the virtual camera 28. For example, user arm, leg, hand, head and body motions may be mapped by corresponding motions of the virtual model 24 in the virtual environment 22. Also, user motions may be used to implement virtual displacements of the virtual model 24 such as a forward displacement, a backward displacement, an orbital displacement, a rotational displacement and a side displacement. Alternatively, user motions may be detected and used to control various virtual camera perspective modifications, which may include moving, rotating, panning, zooming, orbiting and/or

Asserted Claim of the '110 Patent	Exemplary Citations to Lizee
	dollying the virtual camera relative to the silhouette model 24 and/or the virtual environment. A person skilled in the art, namely in the art of video game and virtual reality system development, will understand that such controller mapping features and options used to generate and enhance user immersion, impressions, and experiences may be readily adapted to the system 10 without departing from the general scope and nature of the present disclosure." *See* para [0063]. "12. The virtual presence system of Claim 11, said image capture device for capturing successive frontal images of the user and said computing device being further configured to detect a motion of the user via said successive user images and implement a predetermined camera action that modifies said perspective based on said detected motion. "13. The virtual presence system of Claim 12, wherein said virtual camera action comprises at least one of a camera moving action, a camera rotation action, a camera panning action, a camera zooming action, a camera orbiting action and a camera dollying action." *See* claims 12-13. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Lizee alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '110 Patent	Exemplary Citations to Lizee
Claim 2	
2. The method of claim 1, wherein the mapping transformation comprises a combination of at least two of the	Lizee expressly and/or inherently discloses and/or renders obvious wherein the mapping transformation comprises a combination of at least two of the following transformations: vertical flips about a vertical axis, a projection transformation, rotation, resize, two-

Asserted Claim of the '110 Patent	Exemplary Citations to Lizee
following transformations: vertical flips about a vertical axis, a projection transformation, rotation, resize, two-dimensional offset, optic distortion correction, and polynomial mapping on part or entire captured image.	dimensional offset, optic distortion correction, and polynomial mapping on part or entire captured image. *See*, *e.g.*, disclosures below. "As illustrated by Figures 2A and 2B, the projection 26 is adapted to compensate for the displacement of the user relative to the image capture device 12, which displacement is also used to move the silhouette model 24 in the virtual environment 22. For instance, as the user moves from positions A to E in the real world (Figure 2A), the position of the silhouette model 24 moves from corresponding positions A' to E' in the virtual environment 22 (Figure 2B), yet the size of the silhouette remains the same. Additionally, as the user moves from side to side, the silhouette model 24 can also move accordingly. "In Figure 2C, the captured images 14A to 14E and their respective silhouette images 2OA to 2OE are presented for the aforementioned positions A to E in the real world of Figure 2A. As the user moves backward from position A to E, the size of the captured and silhouette images 14 and 20 change within their respective frames 30 and 32. Yet, as illustrated in Figure 2 B, the size of the silhouette model 24 is substantially unchanged. Note however that the shape of the silhouette model 24 may still change if the shape of captured image 14 and silhouette image 20 are changed due to user motion and/or action." *See* paras. [0040]-[0041]. "To position the silhouette model 24 within the virtual environment 22 and to adapt the projection 26 to compensate for the displacement of the user relative to the image capture device 12, an estimate distance of the user from the image capture device 12 is used." *See* para. [0043]. "By implementing such a calculation in the system 10 in real-time for each captured image 12 and corresponding silhouette image 20, or again periodically at a predetermined imaging rate, the position of the user relative to the image capture device 12 may be calculated in real-time. This information can then be used to control the

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	position and orientation of the silhouette model 24 in the virtual environment 22, and that again in real-time." *See* para. [0045]. "Referring back to Figures 2A and 2B, the system 10 may use the estimated distances of the user at each position A to E in the real world (Figure 2A) to position the silhouette model 24 at corresponding positions A' to E' in the virtual environment 22 (Figure 2B). Yet, as illustrated in Figure 2C, as the user moves closer to the image capture device 12, the fraction of the user imaged thereby is reduced such that a representation thereof is limited by the frame 32 of the silhouette image 20. Consequently, a framing 34 of the virtual camera 28 (as illustrated in Figure 1D) is also constrained by the existing portion of the silhouette model 24, that is the portion rendered by the silhouette image 20 at any given position. Consequently, if the silhouette model 24 does not include the silhouette of the model's legs, for instance when the user is at a position at which his/her legs are not visible to the image capture device 12, then the framing 34 (Figure 1D) of the virtual camera 28 should not include the region in the virtual environment 22 where the legs of the silhouette model 24 would be, since visualization data of the silhouette model 24 is not available in this area." *See* para. [0048]. "Despite these constraints, the present embodiment still provides the ability to implement various camera effects by actively controlling the framing 34 and/or the conceptual position of the virtual camera 28." *See* para [0050]. "Referring now to Figure 4, the framing 34 of the virtual camera 28 may also be altered dynamically to provide a zooming action. For instance, the user may use a backward motion to implement a zoom-out function in the application. As the distance of the user from the image capture device 12 increases, the virtual camera framing 34 may also increase, thereby providing a zoom-out effect that may optionally be dynamically coupled to a rearward motion of the silhouette model 24 in the virtual environment 22." *See* para. [0056]. "As will be apparent to a person of skill in the art, various visualization control algorithms may be implemented to produce such lateral displacement effects. For

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	example, the positioning of the silhouette model 24 could be determined as a function of a static virtual panel, as in reference 27 of Figure 1 D on which the silhouette image 20 is projected to construct the silhouette model 24, that moves forward and back based on the distance of the user from the image capture device 12. The lateral position of the virtual silhouette 24 could then be modified dynamically as the position of the silhouette image 20 moves laterally within the framing 32 thereof." *See* para. [0058]. "Many other examples may also be considered. For instance, as the system 10 detects a motion of the user, the computing device 19 may be configured to implement various motions and/or displacements of the silhouette model 24 in the virtual environment 22, or again implement various modifications to a visualization thereof from the perspective of the virtual camera 28. For example, user arm, leg, hand, head and body motions may be mapped by corresponding motions of the virtual model 24 in the virtual environment 22. Also, user motions may be used to implement virtual displacements of the virtual model 24 such as a forward displacement, a backward displacement, an orbital displacement, a rotational displacement and a side displacement. Alternatively, user motions may be detected and used to control various virtual camera perspective modifications, which may include moving, rotating, panning, zooming, orbiting and/or dollying the virtual camera relative to the silhouette model 24 and/or the virtual environment. A person skilled in the art, namely in the art of video game and virtual reality system development, will understand that such controller mapping features and options used to generate and enhance user immersion, impressions, and experiences may be readily adapted to the system 10 without departing from the general scope and nature of the present disclosure." *See* para [0063]. "A virtual presence system for generating on a display a virtual representation of a user positioned in front of the display, the system comprising: an image capture device for capturing an image of the user; and a computing device, said computing device being configured to communicate with said image capture device to generate the virtual representation using said user image and communicate the virtual representation to the display; wherein the virtual representation comprises a mirrored silhouette

Asserted Claim of the ’110 Patent	Exemplary Citations to Lizee
	transformation of said user image such that the virtual representation shares a substantially same orientation as the user.” *See* claim 1. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Lizee alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

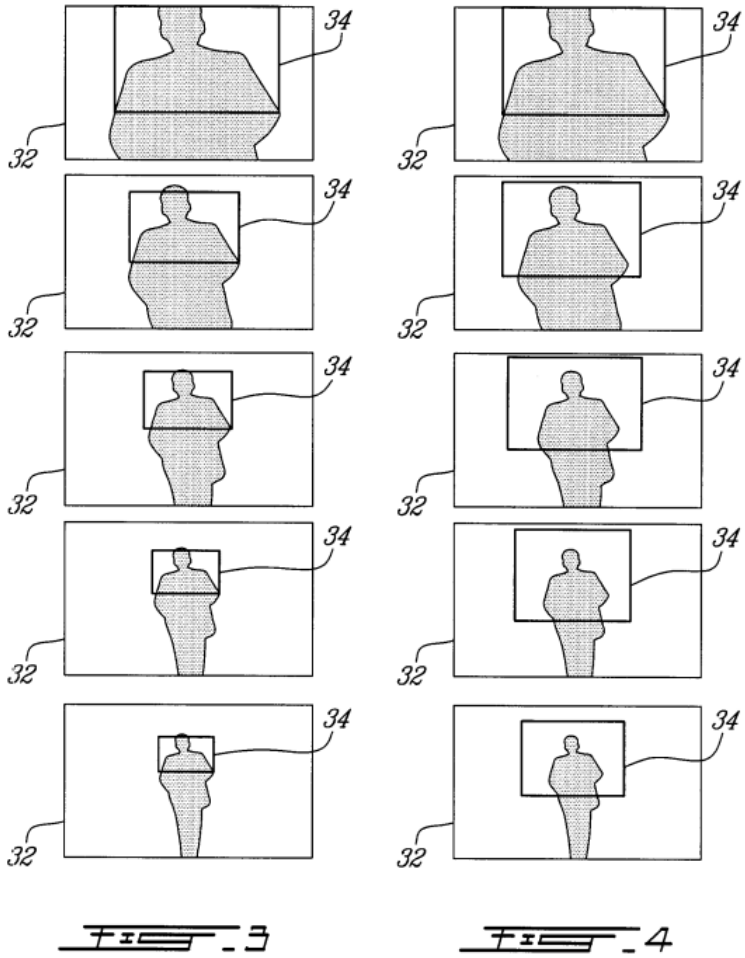
Asserted Claim of the ’110 Patent	Exemplary Citations to Lizee
Claim 3	
3. The method of claim 1, wherein during idle mode the camera continuously sends captured images to the processor, and the user presence is identified by the processor detecting a body part in the images.	Lizee expressly and/or inherently discloses and/or renders obvious wherein during idle mode the camera continuously sends captured images to the processor, and the user presence is identified by the processor detecting a body part in the images. *See*, *e.g.*, disclosures below. “As illustrated by Figures 2A and 2B, the projection 26 is adapted to compensate for the displacement of the user relative to the image capture device 12, which displacement is also used to move the silhouette model 24 in the virtual environment 22. For instance, as the user moves from positions A to E in the real world (Figure 2A), the position of the silhouette model 24 moves from corresponding positions A' to E' in the virtual environment 22 (Figure 2B), yet the size of the silhouette remains the same. Additionally, as the user moves from side to side, the silhouette model 24 can also move accordingly.” *See* para. [0040]. “Yet, as illustrated in Figure 2 B, the size of the silhouette model 24 is substantially unchanged. Note however that the shape of the silhouette model 24 may still change if

Asserted Claim of the '110 Patent	Exemplary Citations to Lizee
	the shape of captured image 14 and silhouette image 20 are changed due to user motion and/or action." *See* para. [0041]. "To position the silhouette model 24 within the virtual environment 22 and to adapt the projection 26 to compensate for the displacement of the user relative to the image capture device 12, an estimate distance of the user from the image capture device 12 is used." *See* para. [0047]. "Alternatively, the user position range may be delimited by the selected virtual camera framing 34. That is, the sensitivity of the system to user motion may be calibrated by selecting a minimal virtual camera framing 34 defined to provide an adequate visualization of the silhouette model 24." *See* para. [0053]. "For instance, as the system 10 detects a motion of the user, the computing device 19 may be configured to implement various motions and/or displacements of the silhouette model 24 in the virtual environment 22, or again implement various modifications to a visualization thereof from the perspective of the virtual camera 28. For example, user arm, leg, hand, head and body motions may be mapped by corresponding motions of the virtual model 24 in the virtual environment 22. Also, user motions may be used to implement virtual displacements of the virtual model 24 such as a forward displacement, a backward displacement, an orbital displacement, a rotational displacement and a side displacement. Alternatively, user motions may be detected and used to control various virtual camera perspective modifications, which may include moving, rotating, panning, zooming, orbiting and/or dollying the virtual camera relative to the silhouette model 24 and/or the virtual environment." *See* para. [0063] This limitation would have been obvious to a person of ordinary skill in the art based on (1) Lizee alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the ’110 Patent	Exemplary Citations to Lizee
Claim 4	
4. The method of claim 3, wherein the body part comprises one of legs, face, eyes, and hands.	Lizee expressly and/or inherently discloses and/or renders obvious wherein the body part comprises one of legs, face, eyes, and hands. *See*, *e.g.*, disclosures below. “Furthermore, conventional or proprietary tracking algorithms may be used to compute the locations of specific user features, for instance the user's face, eyes and/or hands from the image capture device 12 (e.g. tracking on a shape, size and/or color thereof). These locations could then be used to enhance user interactions in the virtual environment 22, for instance again for implementing collision detection algorithms with virtual objects. In this configuration, the user's specific features (e.g. user's face, eyes, hands, etc.) could be used to act as markers, allowing the system 10 to track these features using conventional and/or modified tracking techniques and/or algorithms. This type of marker detection and tracking could also be used to implement various other actions in the virtual environment (e.g. virtual representation movement, virtual camera movement, etc.)” *See* para. [0065]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Lizee alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the ’110 Patent	Exemplary Citations to Lizee
Claim 5	

Asserted Claim of the '110 Patent	Exemplary Citations to Lizee
5. The method of claim 1, further comprising receiving user input and operating the processor to vary image magnitude or field-of-view of the modified images according to the user input.	Lizee expressly and/or inherently discloses and/or renders obvious receiving user input and operating the processor to vary image magnitude or field-of-view of the modified images according to the user input. *See*, *e.g.*, disclosures below. "Referring now to Figure 3, the framing 34 of the virtual camera 28 can be restrained to a selected portion of the user's silhouette image 20. Consequently, as the user moves from position A to E in the real world (Figure 2A), the virtual camera 28 maintains a constant framing 34. As will be readily understood by a person of skill in the art, this will provide the visual effect that the silhouette model 24 moves backward in the virtual environment 22 while a constant representation thereof, limited herein by the virtual camera framing 34, is maintained at every position." *See* para. [0051]. "Referring now to Figure 4, the framing 34 of the virtual camera 28 may also be altered dynamically to provide a zooming action. For instance, the user may use a backward motion to implement a zoom-out function in the application. As the distance of the user from the image capture device 12 increases, the virtual camera framing 34 may also increase, thereby providing a zoom-out effect that may optionally be dynamically coupled to a rearward motion of the silhouette model 24 in the virtual environment 22. "As mentioned hereinabove, the lateral motion of the user may also be used to control actions of the silhouette model 24 and the virtual camera 28 in the virtual environment 22. For instance, when the user moves to the left, the silhouette image 20 will be moved to the left side of the frame 32 thereof. By detecting this lateral displacement, the silhouette model 24 could also be correspondingly displaced in the virtual environment 22. Alternatively, a position or viewpoint of the virtual camera 28 could be moved to reflect a change in the viewing direction of the virtual silhouette 24." *See* paras. [0056]-[0057].

Asserted Claim of the ’110 Patent	Exemplary Citations to Lizee
	 Fig. 3 Fig. 4 *See* Figs. 3-4.

Asserted Claim of the '110 Patent	Exemplary Citations to Lizee
	This limitation would have been obvious to a person of ordinary skill in the art based on (1) Lizee alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '110 Patent	Exemplary Citations to Lizee
Claim 6	
6. The method of claim 5, wherein the processor varies the image magnitude or field-of-view mapping to display a partial or full body of the user in the modified images.	Lizee expressly and/or inherently discloses and/or renders obvious wherein the processor varies the image magnitude or field-of-view mapping to display a partial or full body of the user in the modified images. *See*, *e.g.*, disclosures below. "Referring now to Figure 4, the framing 34 of the virtual camera 28 may also be altered dynamically to provide a zooming action. For instance, the user may use a backward motion to implement a zoom-out function in the application. As the distance of the user from the image capture device 12 increases, the virtual camera framing 34 may also increase, thereby providing a zoom-out effect that may optionally be dynamically coupled to a rearward motion of the silhouette model 24 in the virtual environment 22. "As mentioned hereinabove, the lateral motion of the user may also be used to control actions of the silhouette model 24 and the virtual camera 28 in the virtual environment 22. For instance, when the user moves to the left, the silhouette image 20 will be moved to the left side of the frame 32 thereof. By detecting this lateral displacement, the silhouette model 24 could also be correspondingly displaced in the virtual environment 22. Alternatively, a position or viewpoint of the virtual camera 28 could be moved to reflect a change in the viewing direction of the virtual silhouette 24." *See* paras. [0056]-[0057].

Asserted Claim of the '110 Patent	Exemplary Citations to Lizee
	This limitation would have been obvious to a person of ordinary skill in the art based on (1) Lizee alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '110 Patent	Exemplary Citations to Lizee
Claim 10	
10. The method of claim 1, further comprising operating the processor to augment the modified images by overlaying virtual objects on a user's image appearing within the modified images.	Lizee inherently discloses and/or renders obvious operating the processor to augment the modified images by overlaying virtual objects on a user's image appearing within the modified images. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Lizee alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '110 Patent	Exemplary Citations to Lizee
Claim 11	
11. The method of claim 1, further comprising operating the processor to transmit the modified image over a network.	Lizee expressly and/or inherently discloses and/or renders obvious operating the processor to transmit the modified image over a network. *See*, *e.g.*, disclosures below. "As will be apparent to a person of skill in the art, other embodiments may include multi-player applications comprising plural silhouette models 24 interacting in a same virtual environment 22, either locally or on a shared network of computing devices and displays. For instance, plural users could be imaged by a single image capture device 12 and a

Asserted Claim of the '110 Patent	Exemplary Citations to Lizee
	user identification algorithm could be implemented to identify each user for immersion into the virtual environment 22. Alternatively, plural image capture devices 12 connected to one or more processing device 19 could extract individual user silhouette models 24 and combine them in a given virtual environment on one or more displays 16. Or again, a virtual environment 22 could be shared between two or more networked systems 10, wherein the silhouette model 24 of a first user of a first system 10 would appear as a virtual object in a second system for interaction with a second silhouette model of a second user, and vice versa." *See* para. [0078]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Lizee alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '110 Patent	Exemplary Citations to Lizee
Claim 12	
12. The method of claim 1, further comprising displaying the modified image on a remote screen for video telepresence.	Lizee expressly and/or inherently discloses and/or renders obvious displaying the modified image on a remote screen for video telepresence. *See*, *e.g.*, disclosures below. "As will be apparent to a person of skill in the art, other embodiments may include multi-player applications comprising plural silhouette models 24 interacting in a same virtual environment 22, either locally or on a shared network of computing devices and displays. For instance, plural users could be imaged by a single image capture device 12 and a user identification algorithm could be implemented to identify each user for immersion into the virtual environment 22. Alternatively, plural image capture devices 12 connected to one or more processing device 19 could extract individual user silhouette models 24 and combine them in a given virtual environment on one or more displays 16. Or again, a virtual environment 22 could be shared between two or more networked systems 10,

Asserted Claim of the '110 Patent	Exemplary Citations to Lizee
	wherein the silhouette model 24 of a first user of a first system 10 would appear as a virtual object in a second system for interaction with a second silhouette model of a second user, and vice versa." *See* para. [0078]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Lizee alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '110 Patent	Exemplary Citations to Lizee
Claim 16	
16. The method of claim 1, wherein the processor operates on the images from the camera to generate background segmentation, and replaces segments on the images by replacement segments.	Lizee expressly and/or inherently discloses and/or renders obvious wherein the processor operates on the images from the camera to generate background segmentation, and replaces segments on the images by replacement segments. *See*, *e.g.*, disclosures below. "Also, the use of a silhouette image 20 provides for the easy harmonization of the projected image 26 in a stylized virtual environment 22. For instance, it would be harder to respect the artistic direction of the virtual environment 22 if an actual image was used to overlay the virtual environment graphics. Furthermore, while true image overlays may be intimidating for some users, the use of silhouettes, while still providing an adequate identification of the user on the screen 18, provides a less threatening experience accessible to all. "As stated hereinabove and as will be apparent to a person of ordinary skill in the art, other user visualizations may be implemented in the system 10 without departing from the general scope and nature of the present disclosure. For instance, a user outline may be used instead of a silhouette. Alternatively, the user silhouette could be replaced by a graphical representation of a character in the virtual environment 22, such as the hero in

Asserted Claim of the '110 Patent	Exemplary Citations to Lizee
	a simulated game setting. Furthermore, additional objects and clothing may be added to the user representation, such as a hat, a gun, or other such accessories used to identify the character and various activated features and options in the virtual environment 22. "Other user visualizations, such as 3D mesh mappings, scaled graphical representations, image and graphical overlays and the like, ranging from the fully opaque to various degrees of transparency to allow better visualization of the virtual objects near the silhouette model 24, may also be considered. Furthermore, silhouette image enhancements including, but not limited to, image replacements and fillers to compensate for missing, corrupt or unavailable image data, image overlays providing uniform or patterned templates for user representation and identification, and other such features may also be considered." *See* paras. [0073]-[0075]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Lizee alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '110 Patent	Exemplary Citations to Lizee
Claim 17	
17. The method of claim 16, wherein the replacement segments comprise virtual background or background that was captured in a different setting.	Lizee expressly and/or inherently discloses and/or renders obvious wherein the replacement segments comprise virtual background or background that was captured in a different setting. *See*, *e.g.*, disclosures below. "Also, the use of a silhouette image 20 provides for the easy harmonization of the projected image 26 in a stylized virtual environment 22. For instance, it would be harder to respect the artistic direction of the virtual environment 22 if an actual image was used to overlay the virtual environment graphics. Furthermore, while true image overlays may

Asserted Claim of the ’110 Patent	Exemplary Citations to Lizee
	be intimidating for some users, the use of silhouettes, while still providing an adequate identification of the user on the screen 18, provides a less threatening experience accessible to all. “As stated hereinabove and as will be apparent to a person of ordinary skill in the art, other user visualizations may be implemented in the system 10 without departing from the general scope and nature of the present disclosure. For instance, a user outline may be used instead of a silhouette. Alternatively, the user silhouette could be replaced by a graphical representation of a character in the virtual environment 22, such as the hero in a simulated game setting. Furthermore, additional objects and clothing may be added to the user representation, such as a hat, a gun, or other such accessories used to identify the character and various activated features and options in the virtual environment 22. “Other user visualizations, such as 3D mesh mappings, scaled graphical representations, image and graphical overlays and the like, ranging from the fully opaque to various degrees of transparency to allow better visualization of the virtual objects near the silhouette model 24, may also be considered. Furthermore, silhouette image enhancements including, but not limited to, image replacements and fillers to compensate for missing, corrupt or unavailable image data, image overlays providing uniform or patterned templates for user representation and identification, and other such features may also be considered.” See paras. [0073]-[0075]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Lizee alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Exhibit B-09: Invalidity of U.S. Patent No. 8,982,110 in view of JP Patent Pub. No. 2006-236013 A ("Miyaoku")

This chart is subject to all reservations, objections, and disclaimers in Defendants' Invalidity Contentions and any amendment, supplement, or modification thereof, which are incorporated herein by reference in their entirety.

Miyaoku was originally filed on February 25, 2005 and published on September 7, 2006, and thus is available as prior art to U.S. Patent No. 8,982,110 (the "'110 Patent") under at least 35 U.S.C. §§ 102(a) and (b).

Miyaoku anticipates the Asserted Claims of the '110 Patent. To the extent it is found Miyaoku does not expressly disclose certain limitations in the Asserted Claims, such limitations are at least implicitly or inherently disclosed. Moreover, to the extent it is found that Miyaoku does not anticipate the Asserted Claims, Miyaoku renders obvious the Asserted Claims, either alone or in combination with other prior art identified in the cover pleading or herein, and/or in combination with the general knowledge of a person having ordinary skill in the art.

In these contentions, Defendants have relied in part on Plaintiff's Infringement Contentions. In those contentions, Plaintiff appears to pursue overly broad claim constructions in an effort to assert infringement where none exists, and to accuse products that do not infringe the claims. Defendants' assertion that a particular limitation is disclosed by a prior art reference and/or is disclosed in a particular manner may be based in part on Plaintiff's apparent claim interpretations. In relying on Plaintiff's apparent claim interpretations, Defendants do not admit that Plaintiff's apparent claim interpretations are supportable or proper or that the claim limitations in question are definite or otherwise amenable to construction.

Defendants have endeavored to provide as much detail as possible in these contentions and, in doing so, have exceeded the level of detail required. The inclusion of specific details in some areas is not a concession that such details are required or that the omission of similar details in other areas is a defect. These citations to portions of any reference in this chart are exemplary only. Defendants will rely on the entirety of the references cited in this chart to show that the Asserted Claims are invalid.

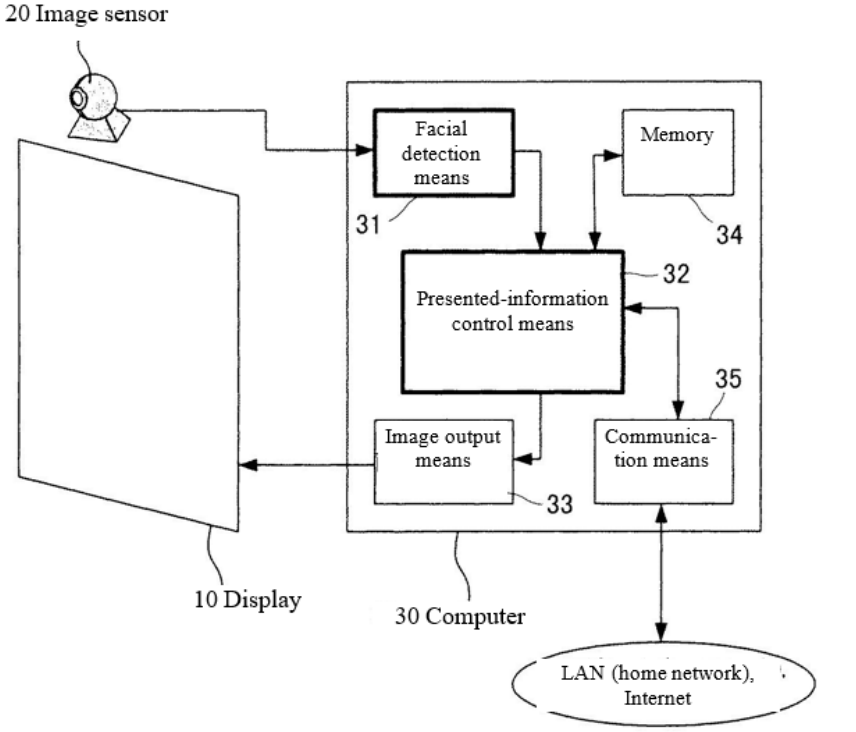
Asserted Claim of the '110 Patent	Exemplary Citations to Miyaoku
Claim 1	
1[pre]. A computerized method for operating a display system, the display system having a camera, a monitor, and a processor, the method comprising:	To the extent the preamble is limiting, Miyaoku expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. "OBJECTIVE: To perpetually present information in a form that is easy for the user to notice and visually recognize and further present information without hindering the original functions of the mirror. MEANS FOR ACHIEVING THE OBJECTIVE: Facial detection means 31 detects the region representing a human face in the image projected from image sensor 20 that forms the image of the front region of display 10. And presented-information control means 32 alters the information presented and thus displayed on said display based on the position and shape of the facial region thus detected. The means for achieving the objective include presenting information in ways suitable for the user's visual recognition according to the distance between the user and the display, presenting animation that moves at a faster or slower speed or stops moving depending on whether the distance to the user is close or far, and altering the magnification ratio of the information according to the variation in the distance between the user and the display." *See* Abstract. "Systems that provide information to users through displays embedded in indoor walls and furniture have been proposed in the field of ubiquitous computing research. Such systems are intended to spontaneously increase the opportunities for users to notice such information throughout their everyday lives. Here, such systems shall be referred to as the "environmental information-presentation devices. The most basic example configuration of an environmental information-presentation device is a wall-mounted display. It is a thin display with built-in computer and network communication features, such a thin display being mountable on an indoor wall. The wall-mounted display acquires and presents information sequentially from a prescribed

Asserted Claim of the ’110 Patent	Exemplary Citations to Miyaoku
	server on the network. For example, it regularly accesses a server that provides weather forecast information and presents that information. The wall-mounted displays can not only present information but also have features for interactions. The wall-mounted displays are essentially the same as ordinary computers. If an input device, such as a button or a touch panel, is provided, the user can use it to manipulate the information to be displayed. Videophones, which have become popular in recent years, can be used as a type of environmental information-presentation device. Videophones based on VoIP (Voice Over Internet Protocol) have the ability to obtain information from the Internet. This makes it possible for the videophones’ displays to present information environmentally when not on a call. Furthermore, according to some systems that have been developed so far, the existing functions of household goods are extended with computers so that household goods can be used as environmental information-presentation devices. In particular, some mirror systems have been developed with additional features that allow the mirrors to act as wall-mounted displays, given that mirrors are often subject to users’ attention in their daily lives and also comprise surface areas suitable for presenting information. For example, Non-Patent Literature 1 describes a system that presents information on a display placed behind a one-way mirror. Said system has an image sensor and also a feature that allows for the reception of optical signals from mobile terminals and the manipulation of information according to the content of the signals. Additionally, Non-Patent Literature 2 proposes a system that allows the user to manipulate image information that is virtually presented in a mirror, doing by pointing the image with the hand of his or her own image projected in the mirror. In order to calculate the positional relationship between the user's own figure and the image information presented on the mirror, this system uses a video mirror, whereby an image

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	projected from a camera capturing the front of the system is displayed on the display." *See* paras. [0002]-[0008]. "Furthermore, it is important that the mirror-type environmental information-presentation device has both the original function of a mirror and the ability to present information. To begin with, a mirror is a tool the user uses to confirm his or her appearance based on his or her own reflection in the mirror. Such an original function of the mirror will be hindered if any information is superimposed on the same position as the user's reflection. The mirror-type environmental information-presentation device must have an information presentation mechanism that takes this point into account." *See* para. [0011]. "Given this factor, the environmental information-presentation device according to the present invention is characterized by comprising a display, an image sensor, a means for detecting faces, and a means for controlling the information presented, wherein: The facial detection means detects the region representing a human face in the image projected from the image sensor that forms the image of the front region of the display; and The presented-information control means alters the information presented and thus displayed on the display based on the position and shape of the facial region thus detected." *See* para. [0015]. "Furthermore, the mirror-type environmental information-presentation device has the following mechanism to prevent any interference with the user's act of viewing the mirror. That is, in the environmental information-presentation device according to the present invention, the aforementioned presented-information control means calculates the facial presentation region and the truncal presentation region in the display viewport based on the facial region detected by the aforementioned facial detection means and then presents

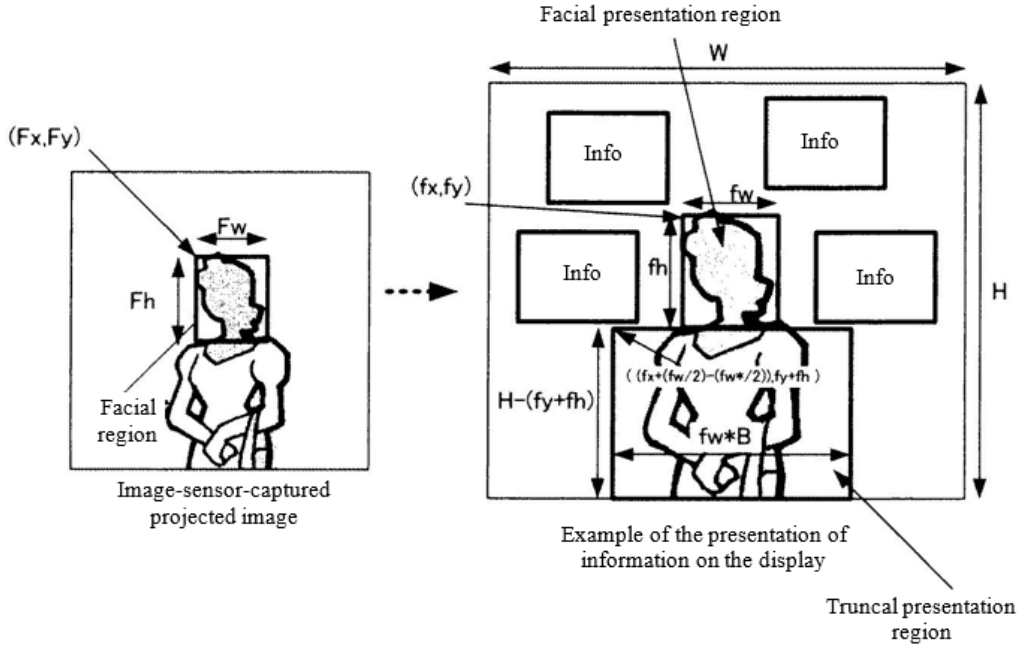
Asserted Claim of the '110 Patent	Exemplary Citations to Miyaoku
	information in regions within the viewport other than the facial and truncal presentation regions. Additionally, the environmental information-presentation method according to the present invention is characterized by being adapted to devices equipped with a display, an image sensor, a facial detection means, and a presented-information control means and comprising each processing step performed in the above-mentioned processing means so as to achieve the presentation of environmental information. Additionally, the program according to the present invention is characterized by being configured so as to allow the aforementioned environmental information-presentation method to be executed on a computer." [0022]-[0025]. "The basic example configuration of the environmental information-presentation device according to the present invention is shown in Figure 1. The figure consists of at least display 10, image sensor 20 that forms images of the area from which one can view said display (generally the area in front of the display), and computer 30 that processes projected images input from the image sensor and controls the information presented on the display. Here, computer 30 internally comprises facial detection means 31 that detects a facial region in the image projected from image sensor 20, and presented-information control means 32 that controls the presented information based on the position and shape of the facial region thus detected. Facial detection means 31 and presented-information control means 32 may be implemented as software that runs on the OS of computer 30. In this case, computer 10 is equipped with an input/output interface means (e.g., image processing means 33, which is an interface device used to output images onto a display or the like) — such an input/output interface means being provided in order to enable each means (which is software) to process projected images as formed by image sensor 20 and control the output toward display 10 — and memory 34. Furthermore, facial detection means 31, in

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	particular, can be implemented using hardware dedicated to processing projected images to improve processing speed. The information displayed on display 10 via presented-information control means 32 may be pre-stored in memory 34 of computer 30. Additionally, because a particularly important role of an environmental information-presentation device is to inform users of new information, the device may be configured so as to receive information over a network and present the information thus received. For this purpose, computer 30 is equipped with a communication means 35 for communicating with LAN and the Internet. In this case, presented-information control means 32 basically downloads information from a prescribed server in a sequential manner, converts it into a prescribed form suitable for the environmental information presentation, displays it on display 10, and perpetually repeats these steps. The following is an explanation of the operation of the environmental information-presentation device according to the present invention: Image sensor 20 forms the image of the front area of display 10, as described above. Facial detection means 31 processes the projected image in real-time as it is formed by image sensor 20. First, it detects the presence of a human face. And, if a face is detected, it detects the region of the face (the facial region) in the projected image. For example, the technique described in Non-Patent Literature 3 below can be used for such processing. Furthermore, facial detection means 31 sends information about the position and shape of the facial region to presented-information control means 32.” *See* paras. [0028]-[0031]. Figure 1:

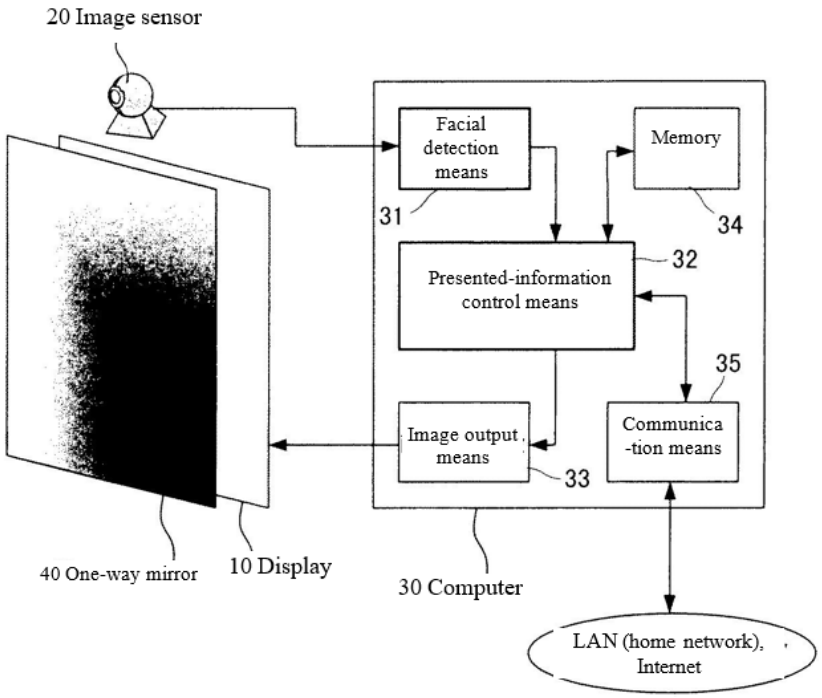
Asserted Claim of the ’110 Patent	Exemplary Citations to Miyaoku
	 “(Embodiment 4) Control Based on the Position of Facial region in Mirror-type Environmental Information-Presentation Device Figure 6 shows an example configuration of the mirror-type environmental information-presentation device. In the example configuration shown in the figure, a video mirror acts as display 10A. Computer 30A horizontally flips the projected image formed by image sensor 20, converts the size to fit the display size, and thus presents the image on display 10A. As such, it virtually acts as a mirror. Information such as thumbnail images

Asserted Claim of the ’110 Patent	Exemplary Citations to Miyaoku
	presented by presented-information control means 32 is superimposed and thus presented on the image projected from image sensor 20. For this purpose, the present mirror-type environmental information-presentation device is equipped with an image horizontal-flip means 36 and image superimposition means 37, in addition to each means constituting the environmental information-presentation device shown in Figure 1. When a mirror-type environmental information-presentation device presents information, it is expected that the information thus presented does not interfere with the user's own figure projected in the mirror. Given this factor, presented-information control means 32 performs the following processing steps: First, upon receipt of facial region position/shape information [(Fx, Fy), Fw, and Fh] from facial detection means 31, the facial presentation region in the viewport on display 10A is calculated based on said facial region position/shape information thus received. For example, suppose that the resolution of the projected image, as formed by image sensor 20, is 500 × 400, and the resolution of the display viewport is 1000 × 800. In this case, the facial presentation region of the display viewport that corresponds to the facial region position/shape information [(Fx, Fy), Fw, and Fh] is a rectangular region with the upper-right-corner coordinates of (Fx*2, Fy*2), the width of Fw*2, and the height of Fh*2. The user won't be able to see his or her own face projected in the mirror if an image or other information is displayed in the facial presentation region. Accordingly, presented-information control means 32 prevents information from being presented in the facial presentation region. Additionally, if any information has already been presented in the facial presentation region, presented-information control means 32 changes the position of the information to a position outside the facial presentation region. Furthermore, presented-information control means 32 may be configured to control the presentation of information by estimating the truncal presentation region in the display viewport based on the facial region detected by facial detection means 31 so as to present information in regions other than the facial presentation region and the truncal

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	presentation region. Figure 7 shows an example presentation of information in such a case. Additionally, an example content of the processing performed by presented-information control means 32 is described below: Suppose that the resolution of the viewport on display 10A is W × H, and the facial presentation region calculated by presented-information control means 32 is a rectangular region with the upper-right-corner coordinates of the display viewport being (Fx, Fy), the width being fw, and the height being fh. In this case, the trunk is located below the facial region. It also occupies a region that is wider than the facial region. Accordingly, presented-information control means 32 uses a prescribed value B (value representing (Width of the truncal presentation region / Width of the facial presentation region)) to estimate that the truncal presentation region is a rectangular region with the upper right corner coordinate of ((fx+(fw/2)-(fw*B/2)), fy+fh), the width of fw*B, and the height of H-(fy+fh). Presented-information control means 32 performs the steps described above to thereby prevent information from being presented in the facial and truncal presentation regions thus calculated. Additionally, if any information has already been presented in the facial or truncal presentation region, presented-information control means 32 changes the position of the information to a position outside the facial presentation region." *See* paras. [0073]-[0080]. Figure 7:

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	 “ Figure 8 shows another example configuration of the mirror-type environmental information-presentation device. The present mirror-type environmental information-presentation device has the same basic configuration as that of the environmental information-presentation device shown in Figure 1, except that one-way mirror 40 is affixed to the surface of display 10. Technically speaking, it is extremely difficult to calculate where on the mirror’s surface the user's figure is projected as viewed from the user’s perspective. However, when the above-described steps performed by presented-information control means 32 in the mirror-type environmental information-presentation device that uses a video mirror is applied in the as-is state to the configuration shown in Figure 8, it becomes possible to present information in regions that do not overlap with the user's figure on the mirror. In

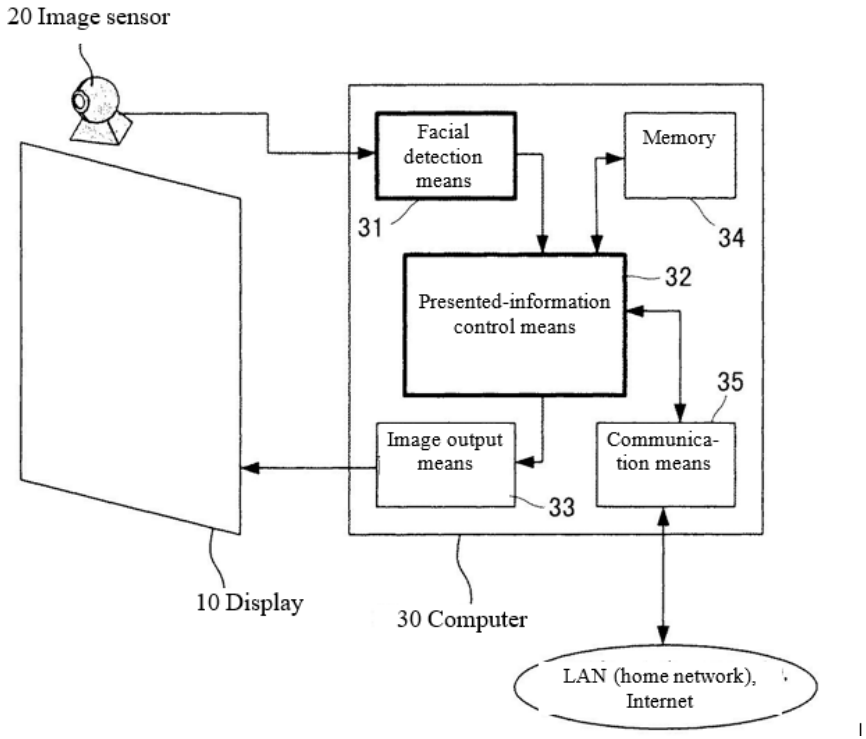
Asserted Claim of the ’110 Patent	Exemplary Citations to Miyaoku
	other words, presented-information control means 32 of the mirror-type environmental information-presentation device shown in Figure 8 can also control the position of presented information, doing so through the steps described with reference to figures 6 and 7. The embodiments of the environmental information-presentation device according to the present invention are as described above. The environmental information-presentation method according to the present invention corresponds to each presented-information control step performed by the presented-information control means in the environmental information-presentation device described above. The application of the environmental information-presentation method according to the present invention is not limited to the devices illustrated with reference to figures 1, 6, and 8. The environmental information-presentation method according to the present invention may be applied to any device that is equipped with an image sensor, a display, and a computer. For example, a mobile terminal equipped with an image sensor may further comprise facial detection means 31 and presented-information control means 32 in the form of software, etc., so as to present information according to the distance between the terminal and the user's face through the above-described steps. Additionally, a part or all of the processing functions of the environmental information-presentation method according to the present invention can be configured as a program that can be executed on a computer.” *See* paras. [0081]-[0084]. Figure 8:

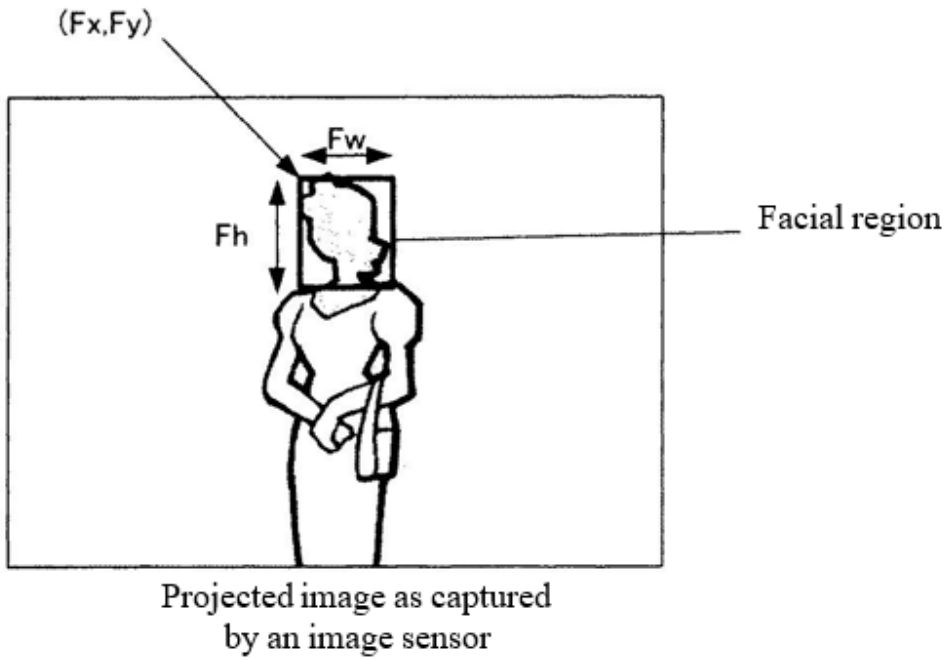
Asserted Claim of the '110 Patent	Exemplary Citations to Miyaoku
	 This limitation would have been obvious to a person of ordinary skill in the art based on (1) Miyaoku alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[a]. operating the camera to generate a stream of images of the user;	Miyaoku expressly and/or inherently discloses and/or renders obvious operating the camera to generate a stream of images of the user. *See*, *e.g.*, disclosures below.

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	“OBJECTIVE: To perpetually present information in a form that is easy for the user to notice and visually recognize and further present information without hindering the original functions of the mirror. MEANS FOR ACHIEVING THE OBJECTIVE: Facial detection means 31 detects the region representing a human face in the image projected from image sensor 20 that forms the image of the front region of display 10. And presented-information control means 32 alters the information presented and thus displayed on said display based on the position and shape of the facial region thus detected. The means for achieving the objective include presenting information in ways suitable for the user's visual recognition according to the distance between the user and the display, presenting animation that moves at a faster or slower speed or stops moving depending on whether the distance to the user is close or far, and altering the magnification ratio of the information according to the variation in the distance between the user and the display.” *See* Abstract. “For example, Non-Patent Literature 1 describes a system that presents information on a display placed behind a one-way mirror. Said system has an image sensor and also a feature that allows for the reception of optical signals from mobile terminals and the manipulation of information according to the content of the signals. Additionally, Non-Patent Literature 2 proposes a system that allows the user to manipulate image information that is virtually presented in a mirror, doing by pointing the image with the hand of his or her own image projected in the mirror. In order to calculate the positional relationship between the user's own figure and the image information presented on the mirror, this system uses a video mirror, whereby an image projected from a camera capturing the front of the system is displayed on the display.” *See* paras. [0007]-[0008]. “When the user's face is detected through an image sensor installed on the device side, the positional relationship between the device and the user can be estimated based on the

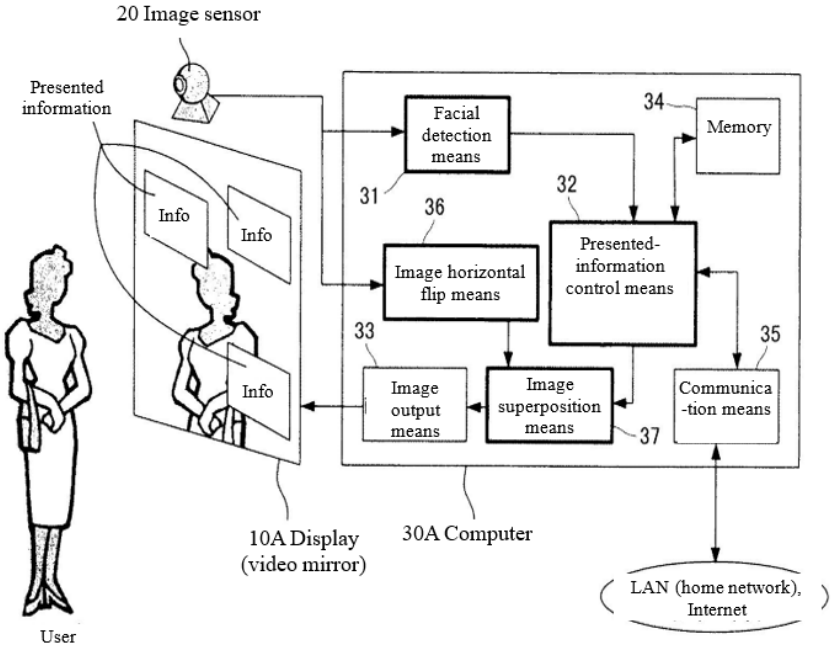
Asserted Claim of the '110 Patent	Exemplary Citations to Miyaoku
	position and size of the facial region. It also becomes possible to present appropriate information based on the positional relationship thus estimated. Given this factor, the environmental information-presentation device according to the present invention is characterized by comprising a display, an image sensor, a means for detecting faces, and a means for controlling the information presented, wherein: The facial detection means detects the region representing a human face in the image projected from the image sensor that forms the image of the front region of the display; and The presented-information control means alters the information presented and thus displayed on the display based on the position and shape of the facial region thus detected." *See* paras. [0014]-[0015]. "Additionally, the environmental information-presentation method according to the present invention is characterized by being adapted to devices equipped with a display, an image sensor, a facial detection means, and a presented-information control means and comprising each processing step performed in the above-mentioned processing means so as to achieve the presentation of environmental information." *See* para. [0024]. "Additionally, because the present invention uses an image sensor, it can be implemented in existing devices that are already equipped with an image sensor, e.g., videophones, thus lowering the cost." *See* para. [0027]. "The basic example configuration of the environmental information-presentation device according to the present invention is shown in Figure 1. The figure consists of at least display 10, image sensor 20 that forms images of the area from which one can view said display (generally the area in front of the display), and computer 30 that processes projected images input from the image sensor and controls the information presented on the display. Here, computer 30 internally comprises facial detection means 31 that detects a facial region in the image projected from image sensor 20, and presented-

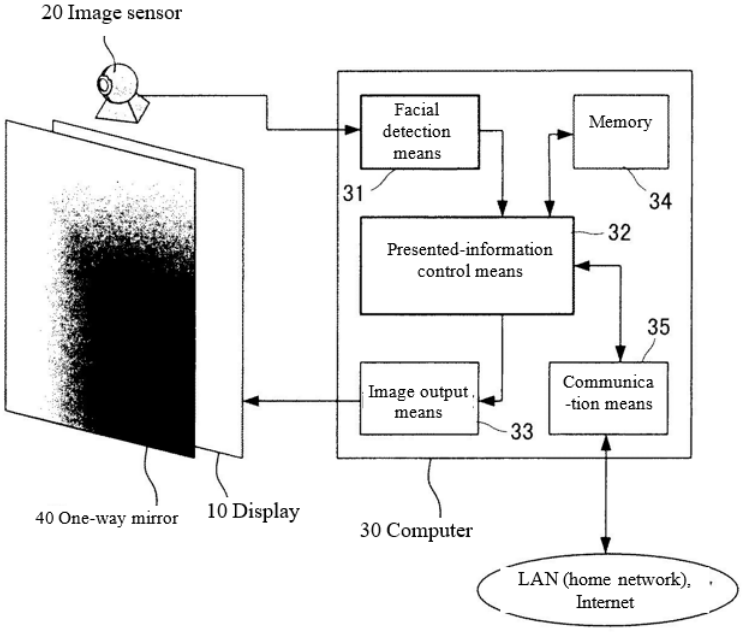
Asserted Claim of the ’110 Patent	Exemplary Citations to Miyaoku
	information control means 32 that controls the presented information based on the position and shape of the facial region thus detected. Facial detection means 31 and presented-information control means 32 may be implemented as software that runs on the OS of computer 30. In this case, computer 10 is equipped with an input/output interface means (e.g., image processing means 33, which is an interface device used to output images onto a display or the like) — such an input/output interface means being provided in order to enable each means (which is software) to process projected images as formed by image sensor 20 and control the output toward display 10 — and memory 34. Furthermore, facial detection means 31, in particular, can be implemented using hardware dedicated to processing projected images to improve processing speed. The information displayed on display 10 via presented-information control means 32 may be pre-stored in memory 34 of computer 30. Additionally, because a particularly important role of an environmental information-presentation device is to inform users of new information, the device may be configured so as to receive information over a network and present the information thus received. For this purpose, computer 30 is equipped with a communication means 35 for communicating with LAN and the Internet. In this case, presented-information control means 32 basically downloads information from a prescribed server in a sequential manner, converts it into a prescribed form suitable for the environmental information presentation, displays it on display 10, and perpetually repeats these steps. The following is an explanation of the operation of the environmental information-presentation device according to the present invention: Image sensor 20 forms the image of the front area of display 10, as described above. Facial detection means 31 processes the projected image in real-time as it is formed by image sensor 20. First, it detects the presence of a human face. And, if a face is detected, it detects the region of the face (the facial region) in the projected image. For example, the technique described in Non-Patent Literature 3 below can be used for such processing. Furthermore, facial detection

Asserted Claim of the '110 Patent	Exemplary Citations to Miyaoku
	means 31 sends information about the position and shape of the facial region to presented-information control means 32." *See* paras. [0028]-[0031]. Figure 1:  "Figure 2 shows an example of a facial region detected, by facial detection means 31, in a projected image as formed by image sensor 20. In this example, the facial region is detected as a rectangular region. When such a rectangular facial region is detected, facial detection means 31 sends, to presented-information control means 32, the coordinates (Fx, Fy) of the upper right corner of said rectangular region in the projected image as

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	well as the width Fw and the height Fh of the rectangular, all of which act as the facial region position/shape information.” *See* para. [0033]. Figure 2:  “When a mirror-type environmental information-presentation device presents information, it is expected that the information thus presented does not interfere with the user's own figure projected in the mirror. Given this factor, presented-information control means 32 performs the following processing steps: First, upon receipt of facial region position/shape information [(Fx, Fy), Fw, and Fh] from facial detection means 31, the facial presentation region in the viewport on display

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	10A is calculated based on said facial region position/shape information thus received. For example, suppose that the resolution of the projected image, as formed by image sensor 20, is 500 × 400, and the resolution of the display viewport is 1000 × 800. In this case, the facial presentation region of the display viewport that corresponds to the facial region position/shape information [(Fx, Fy), Fw, and Fh] is a rectangular region with the upper-right-corner coordinates of (Fx*2, Fy*2), the width of Fw*2, and the height of Fh*2.” *See* paras. [0074]-[0075]. “The embodiments of the environmental information-presentation device according to the present invention are as described above. The environmental information-presentation method according to the present invention corresponds to each presented-information control step performed by the presented-information control means in the environmental information-presentation device described above. The application of the environmental information-presentation method according to the present invention is not limited to the devices illustrated with reference to figures 1, 6, and 8. The environmental information-presentation method according to the present invention may be applied to any device that is equipped with an image sensor, a display, and a computer. For example, a mobile terminal equipped with an image sensor may further comprise facial detection means 31 and presented-information control means 32 in the form of software, etc., so as to present information according to the distance between the terminal and the user's face through the above-described steps.” *See* para. [0083]. Figure 6:

Asserted Claim of the ’110 Patent	Exemplary Citations to Miyaoku
	 Figure 8:

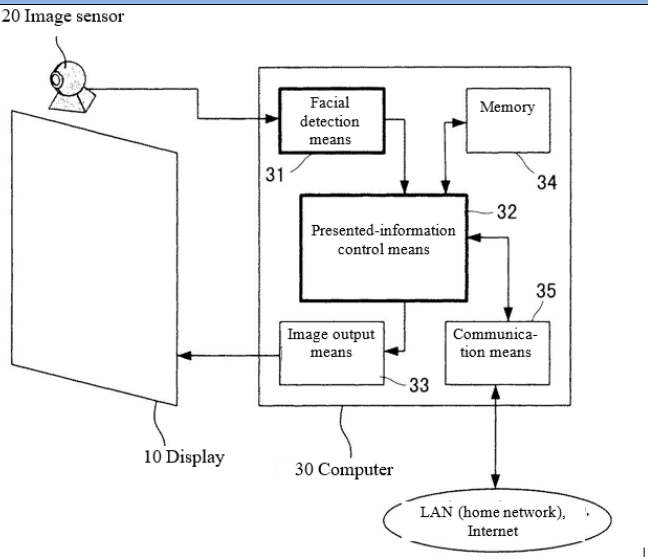
Asserted Claim of the ’110 Patent	Exemplary Citations to Miyaoku
	 This limitation would have been obvious to a person of ordinary skill in the art based on (1) Miyaoku alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[b]. operating the processor to detect the presence of the user in the stream of image;	Miyaoku expressly and/or inherently discloses and/or renders obvious operating the processor to detect the presence of the user in the stream of image. *See*, *e.g.*, disclosures below.

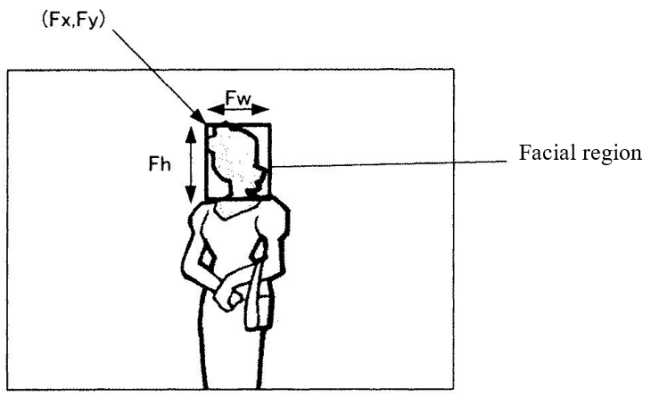
Asserted Claim of the ’110 Patent	Exemplary Citations to Miyaoku
	“OBJECTIVE: To perpetually present information in a form that is easy for the user to notice and visually recognize and further present information without hindering the original functions of the mirror. MEANS FOR ACHIEVING THE OBJECTIVE: Facial detection means 31 detects the region representing a human face in the image projected from image sensor 20 that forms the image of the front region of display 10. And presented-information control means 32 alters the information presented and thus displayed on said display based on the position and shape of the facial region thus detected. The means for achieving the objective include presenting information in ways suitable for the user's visual recognition according to the distance between the user and the display, presenting animation that moves at a faster or slower speed or stops moving depending on whether the distance to the user is close or far, and altering the magnification ratio of the information according to the variation in the distance between the user and the display.” *See* Abstract. “When the user's face is detected through an image sensor installed on the device side, the positional relationship between the device and the user can be estimated based on the position and size of the facial region. It also becomes possible to present appropriate information based on the positional relationship thus estimated. Given this factor, the environmental information-presentation device according to the present invention is characterized by comprising a display, an image sensor, a means for detecting faces, and a means for controlling the information presented, wherein: The facial detection means detects the region representing a human face in the image projected from the image sensor that forms the image of the front region of the display; and

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	The presented-information control means alters the information presented and thus displayed on the display based on the position and shape of the facial region thus detected. In particular, the size of the facial region detected is associated with the distance between the user and the device. Accordingly, the aforementioned presented-information control means presents information suitable for viewing from a distance when the size of the facial region detected by the facial detection means is small. However, when the size of the facial region detected by the facial detection means is large, the presented-information control means presents information suitable for viewing from a close range.” *See* paras. [0014]-[0016]. “That is, the aforementioned presented-information control means of the aforementioned environmental information-presentation device according to the present invention is characterized by detecting chronological changes in the size of the facial region detected by the aforementioned facial detection means and altering the presented information upon detection of an increase in the size of the facial region. Furthermore, the mirror-type environmental information-presentation device has the following mechanism to prevent any interference with the user's act of viewing the mirror. That is, in the environmental information-presentation device according to the present invention, the aforementioned presented-information control means calculates the facial presentation region and the truncal presentation region in the display viewport based on the facial region detected by the aforementioned facial detection means and then presents information in regions within the viewport other than the facial and truncal presentation regions. Additionally, the environmental information-presentation method according to the present invention is characterized by being adapted to devices equipped with a display, an image sensor, a facial detection means, and a presented-information control means

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	and comprising each processing step performed in the above-mentioned processing means so as to achieve the presentation of environmental information. Additionally, the program according to the present invention is characterized by being configured so as to allow the aforementioned environmental information-presentation method to be executed on a computer." [0021]-[0025]. "The basic example configuration of the environmental information-presentation device according to the present invention is shown in Figure 1. The figure consists of at least display 10, image sensor 20 that forms images of the area from which one can view said display (generally the area in front of the display), and computer 30 that processes projected images input from the image sensor and controls the information presented on the display. Here, computer 30 internally comprises facial detection means 31 that detects a facial region in the image projected from image sensor 20, and presented-information control means 32 that controls the presented information based on the position and shape of the facial region thus detected. Facial detection means 31 and presented-information control means 32 may be implemented as software that runs on the OS of computer 30. In this case, computer 10 is equipped with an input/output interface means (e.g., image processing means 33, which is an interface device used to output images onto a display or the like) — such an input/output interface means being provided in order to enable each means (which is software) to process projected images as formed by image sensor 20 and control the output toward display 10 — and memory 34. Furthermore, facial detection means 31, in particular, can be implemented using hardware dedicated to processing projected images to improve processing speed. The information displayed on display 10 via presented-information control means 32 may be pre-stored in memory 34 of computer 30. Additionally, because a particularly important role of an environmental information-presentation device is to inform users of new information, the device may be configured so as to receive information over a network and present the information thus received. For this purpose, computer 30 is

Asserted Claim of the ’110 Patent	Exemplary Citations to Miyaoku
	equipped with a communication means 35 for communicating with LAN and the Internet. In this case, presented-information control means 32 basically downloads information from a prescribed server in a sequential manner, converts it into a prescribed form suitable for the environmental information presentation, displays it on display 10, and perpetually repeats these steps. The following is an explanation of the operation of the environmental information-presentation device according to the present invention: Image sensor 20 forms the image of the front area of display 10, as described above. Facial detection means 31 processes the projected image in real-time as it is formed by image sensor 20. First, it detects the presence of a human face. And, if a face is detected, it detects the region of the face (the facial region) in the projected image. For example, the technique described in Non-Patent Literature 3 below can be used for such processing. Furthermore, facial detection means 31 sends information about the position and shape of the facial region to presented-information control means 32.” *See* paras. [0028]-[0031]. Figure 1:

Asserted Claim of the ’110 Patent	Exemplary Citations to Miyaoku
	 “Figure 2 shows an example of a facial region detected, by facial detection means 31, in a projected image as formed by image sensor 20. In this example, the facial region is detected as a rectangular region. When such a rectangular facial region is detected, facial detection means 31 sends, to presented-information control means 32, the coordinates (Fx, Fy) of the upper right corner of said rectangular region in the projected image as well as the width Fw and the height Fh of the rectangular, all of which act as the facial region position/shape information. Presented-information control means 32 modifies the information to be presented, doing so based on the facial region position/shape information received from facial detection means 31. The following is an explanation of embodiments of the control of information presented.” *See* paras. [0033]-[0034].

Asserted Claim of the ’110 Patent	Exemplary Citations to Miyaoku
	Figure 2:  Projected image as captured by an image sensor “(Embodiment 1) Control Based on the Size of Facial Region Presented-information control means 32 presets a threshold value Z for facial region sizes. Additionally, presented-information control means 32, at the initial stage, presents information in a form suitable for viewing from a distance. Said “form suitable for viewing from a distance” is, for example, a form of display whereby most characters are in large font and only a small amount of information is presented, e.g., to the extent of headings only. In terms of images or videos, they are displayed in forms enlarged enough to allow the subjects to be identified even from a distance. Presented-information control means 32 — upon receipt of facial region position/shape information [(Fx, Fy), Fw, and Fh] from facial detection means 31 — calculates the facial region size (the area size of the rectangular facial region) Fw*Fh. Then, if Fw*Fh≧ Z, the information presented is altered to a form suitable for viewing from a close range. Said “form suitable for viewing from a close range” is, for example, a form in which characters are in relatively small font presenting detailed information. In

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	terms of images or videos, they are displayed in sizes suitable for viewing from a close range and in forms that may include the display of text information, such as telops." *See* paras. [0035]-[0036]. "Presented-information control means 32 retains predefined thresholds Z(0), . . ., Z(n-1) for n facial image sizes. Additionally, presented-information control means 32 retains n+1 sets of character display specifications Dn (n=0, 1,. . ., n) corresponding to the cases of the facial image size Fw*Fh<Z(0), the cases of Z(k-1)≦Fw*Fh<Z(k) (where k = 1, 2, . . ., n-1), and the cases of Z(n-1)≦Fw*Fh. That is, the table shown in Table 2 below is retained so as to manage the correlation between the size of the facial image detected and the respective set of character display specifications D0 through Dn." *See* para. [0047]. "First, upon receipt of facial region position/shape information [(Fx, Fy), Fw, and Fh] from facial detection means 31, the facial presentation region in the viewport on display 10A is calculated based on said facial region position/shape information thus received. For example, suppose that the resolution of the projected image, as formed by image sensor 20, is 500 × 400, and the resolution of the display viewport is 1000 × 800. In this case, the facial presentation region of the display viewport that corresponds to the facial region position/shape information [(Fx, Fy), Fw, and Fh] is a rectangular region with the upper-right-corner coordinates of (Fx*2, Fy*2), the width of Fw*2, and the height of Fh*2." *See* para. [0075]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Miyaoku alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

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1[c]. operating the processor to apply adaptive transformation mapping to the stream of images captured by the camera to generate modified images that appear to be captured from a different point of view of the camera's actual point of view; and	Miyaoku expressly and/or inherently discloses and/or renders obvious operating the processor to apply adaptive transformation mapping to the stream of images captured by the camera to generate modified images that appear to be captured from a different point of view of the camera's actual point of view. *See*, *e.g.*, disclosures below. "When the user's face is detected through an image sensor installed on the device side, the positional relationship between the device and the user can be estimated based on the position and size of the facial region. It also becomes possible to present appropriate information based on the positional relationship thus estimated. Given this factor, the environmental information-presentation device according to the present invention is characterized by comprising a display, an image sensor, a means for detecting faces, and a means for controlling the information presented, wherein: The facial detection means detects the region representing a human face in the image projected from the image sensor that forms the image of the front region of the display; and The presented-information control means alters the information presented and thus displayed on the display based on the position and shape of the facial region thus detected. In particular, the size of the facial region detected is associated with the distance between the user and the device. Accordingly, the aforementioned presented-information control means presents information suitable for viewing from a distance when the size of the facial region detected by the facial detection means is small. However, when the size of the facial region detected by the facial detection means is large, the presented-information control means presents information suitable for viewing from a close range." *See* paras. [0014]-[0016].

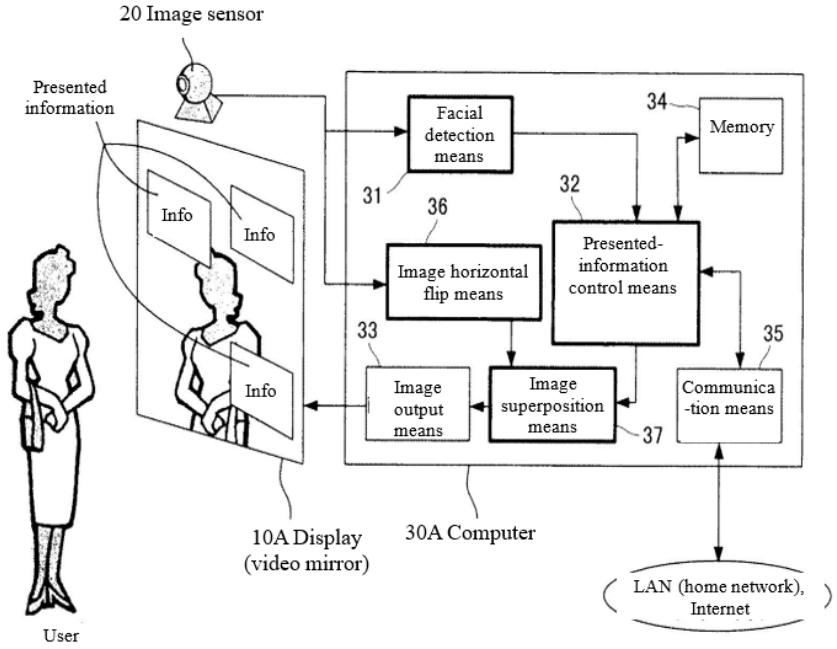
Asserted Claim of the ’110 Patent	Exemplary Citations to Miyaoku
	“An environmental information-presentation device, comprising a display, an image sensor, a means for detecting faces, and a means for controlling the information presented, wherein: The aforementioned image sensor has a means for forming the image of the frontal area of the aforementioned display; The aforementioned facial detection means has a means for detecting the region representing a human face in the projected image formed by the aforementioned image sensor; and The aforementioned presented-information control means has a means for altering the information presented and thus displayed on the aforementioned display based on the position and shape of the facial region detected by the aforementioned facial detection means.” *See* claim 1. “That is, the aforementioned presented-information control means of the aforementioned environmental information-presentation device according to the present invention is characterized by detecting chronological changes in the size of the facial region detected by the aforementioned facial detection means and altering the presented information upon detection of an increase in the size of the facial region. Furthermore, the mirror-type environmental information-presentation device has the following mechanism to prevent any interference with the user's act of viewing the mirror. That is, in the environmental information-presentation device according to the present invention, the aforementioned presented-information control means calculates the facial presentation region and the truncal presentation region in the display viewport based on the facial region detected by the aforementioned facial detection means and then presents

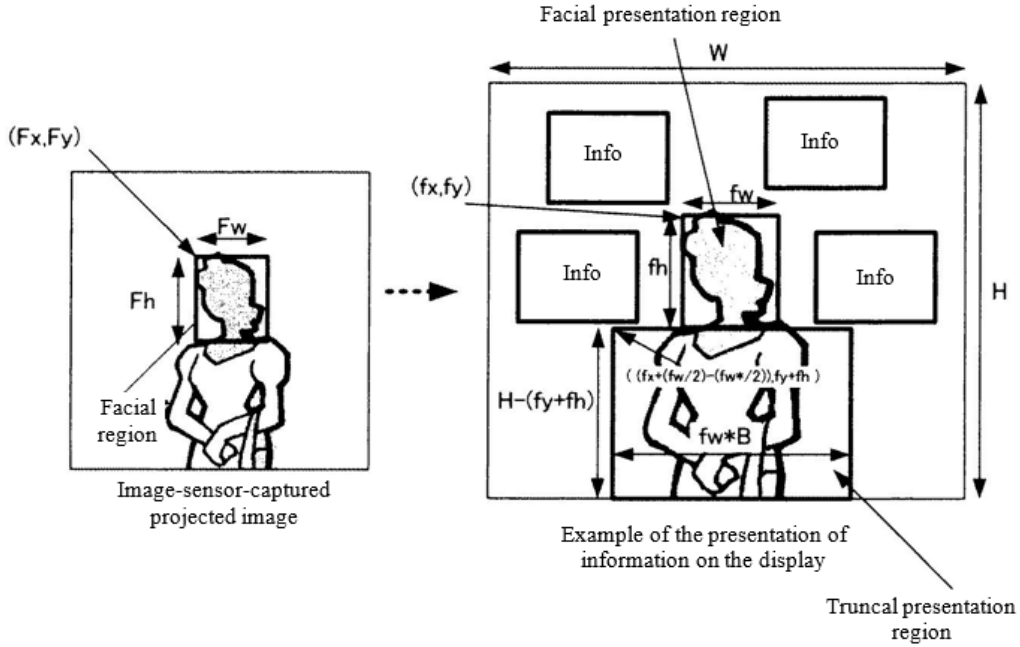
Asserted Claim of the '110 Patent	Exemplary Citations to Miyaoku
	information in regions within the viewport other than the facial and truncal presentation regions. Additionally, the environmental information-presentation method according to the present invention is characterized by being adapted to devices equipped with a display, an image sensor, a facial detection means, and a presented-information control means and comprising each processing step performed in the above-mentioned processing means so as to achieve the presentation of environmental information. Additionally, the program according to the present invention is characterized by being configured so as to allow the aforementioned environmental information-presentation method to be executed on a computer." [0021]-[0025]. "Presented-information control means 32 modifies the information to be presented, doing so based on the facial region position/shape information received from facial detection means 31. The following is an explanation of embodiments of the control of information presented. (Embodiment 1) Control Based on the Size of Facial Region Presented-information control means 32 presets a threshold value Z for facial region sizes. Additionally, presented-information control means 32, at the initial stage, presents information in a form suitable for viewing from a distance. Said "form suitable for viewing from a distance" is, for example, a form of display whereby most characters are in large font and only a small amount of information is presented, e.g., to the extent of headings only. In terms of images or videos, they are displayed in forms enlarged enough to allow the subjects to be identified even from a distance. Presented-information control means 32 — upon receipt of facial region position/shape information [(Fx, Fy), Fw, and Fh] from facial detection means 31 — calculates the facial region size (the area size of the rectangular facial region) Fw*Fh. Then, if Fw*Fh $\geqq$ Z, the information presented is altered to a form suitable for viewing from a close range. Said "form suitable for viewing from a close range" is, for example, a form in

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	which characters are in relatively small font presenting detailed information. In terms of images or videos, they are displayed in sizes suitable for viewing from a close range and in forms that may include the display of text information, such as telops. However, when Fw*Fh<Z, presented-information control means 32 continues to present information in a form suitable for viewing from a distance. Suppose that the information has already been switched to and thus presented in a form suitable for viewing from a close range because Fw*Fh was equal to or greater than Z (Fw*Fh≧Z). In this case, the information will be switched back to and thus presented in a form suitable for viewing from a distance when Fw*Fh becomes smaller than Z (Fw*Fh<Z).” *See* paras. [0034]-[0037]. “(Embodiment 4) Control Based on the Position of Facial region in Mirror-type Environmental Information-Presentation Device Figure 6 shows an example configuration of the mirror-type environmental information-presentation device. In the example configuration shown in the figure, a video mirror acts as display 10A. Computer 30A horizontally flips the projected image formed by image sensor 20, converts the size to fit the display size, and thus presents the image on display 10A. As such, it virtually acts as a mirror. Information such as thumbnail images presented by presented-information control means 32 is superimposed and thus presented on the image projected from image sensor 20. For this purpose, the present mirror-type environmental information-presentation device is equipped with an image horizontal-flip means 36 and image superimposition means 37, in addition to each means constituting the environmental information-presentation device shown in Figure 1. When a mirror-type environmental information-presentation device presents information, it is expected that the information thus presented does not interfere with the user's own figure projected in the mirror. Given this factor, presented-information control means 32 performs the following processing steps:

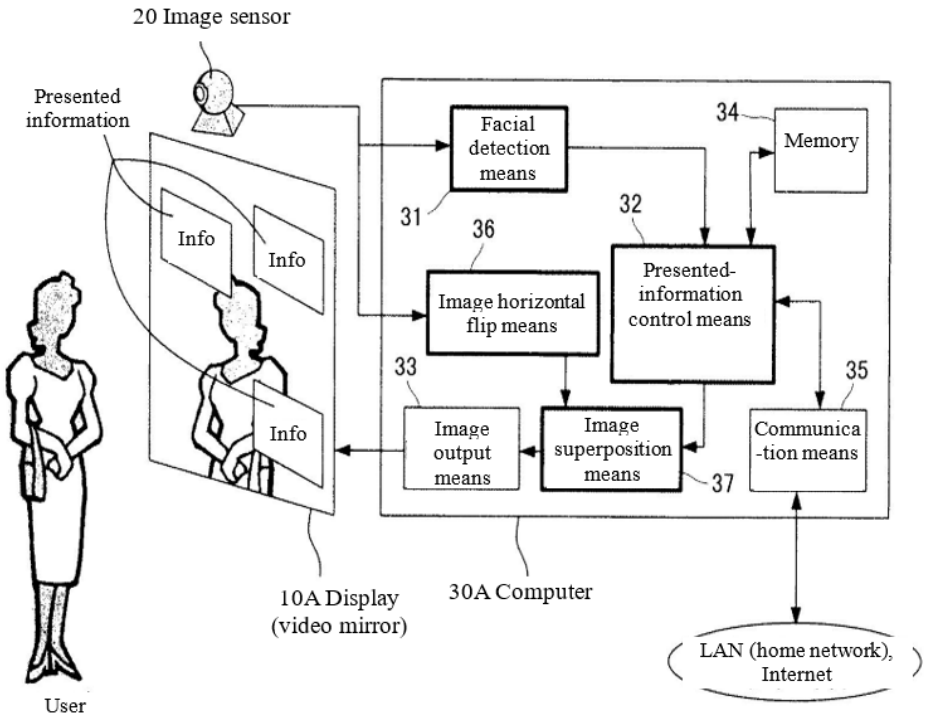
Asserted Claim of the '110 Patent	Exemplary Citations to Miyaoku
	First, upon receipt of facial region position/shape information [(Fx, Fy), Fw, and Fh] from facial detection means 31, the facial presentation region in the viewport on display 10A is calculated based on said facial region position/shape information thus received. For example, suppose that the resolution of the projected image, as formed by image sensor 20, is 500 × 400, and the resolution of the display viewport is 1000 × 800. In this case, the facial presentation region of the display viewport that corresponds to the facial region position/shape information [(Fx, Fy), Fw, and Fh] is a rectangular region with the upper-right-corner coordinates of (Fx*2, Fy*2), the width of Fw*2, and the height of Fh*2. The user won't be able to see his or her own face projected in the mirror if an image or other information is displayed in the facial presentation region. Accordingly, presented-information control means 32 prevents information from being presented in the facial presentation region. Additionally, if any information has already been presented in the facial presentation region, presented-information control means 32 changes the position of the information to a position outside the facial presentation region. Furthermore, presented-information control means 32 may be configured to control the presentation of information by estimating the truncal presentation region in the display viewport based on the facial region detected by facial detection means 31 so as to present information in regions other than the facial presentation region and the truncal presentation region. Figure 7 shows an example presentation of information in such a case. Additionally, an example content of the processing performed by presented-information control means 32 is described below: Suppose that the resolution of the viewport on display 10A is W × H, and the facial presentation region calculated by presented-information control means 32 is a rectangular region with the upper-right-corner coordinates of the display viewport being (Fx, Fy), the width being fw, and the height being fh. In this case, the trunk is located below the facial region. It also occupies a region that is wider than the facial region.

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	Accordingly, presented-information control means 32 uses a prescribed value B (value representing (Width of the truncal presentation region / Width of the facial presentation region)) to estimate that the truncal presentation region is a rectangular region with the upper right corner coordinate of ((fx+(fw/2)-(fw*B/2)), fy+fh), the width of fw*B, and the height of H-(fy+fh). Presented-information control means 32 performs the steps described above to thereby prevent information from being presented in the facial and truncal presentation regions thus calculated. Additionally, if any information has already been presented in the facial or truncal presentation region, presented-information control means 32 changes the position of the information to a position outside the facial presentation region.” *See* paras. [0073]-[0080]. Figure 6:

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	 Figure 7:

Asserted Claim of the ’110 Patent	Exemplary Citations to Miyaoku
	 “ Figure 8 shows another example configuration of the mirror-type environmental information-presentation device. The present mirror-type environmental information-presentation device has the same basic configuration as that of the environmental information-presentation device shown in Figure 1, except that one-way mirror 40 is affixed to the surface of display 10. Technically speaking, it is extremely difficult to calculate where on the mirror’s surface the user's figure is projected as viewed from the user’s perspective. However, when the above-described steps performed by presented-information control means 32 in the mirror-type environmental information-presentation device that uses a video mirror is applied in the as-is state to the configuration shown in Figure 8, it becomes possible to present information in regions that do not overlap with the user's figure on the mirror. In

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	other words, presented-information control means 32 of the mirror-type environmental information-presentation device shown in Figure 8 can also control the position of presented information, doing so through the steps described with reference to figures 6 and 7. The embodiments of the environmental information-presentation device according to the present invention are as described above. The environmental information-presentation method according to the present invention corresponds to each presented-information control step performed by the presented-information control means in the environmental information-presentation device described above. The application of the environmental information-presentation method according to the present invention is not limited to the devices illustrated with reference to figures 1, 6, and 8. The environmental information-presentation method according to the present invention may be applied to any device that is equipped with an image sensor, a display, and a computer. For example, a mobile terminal equipped with an image sensor may further comprise facial detection means 31 and presented-information control means 32 in the form of software, etc., so as to present information according to the distance between the terminal and the user's face through the above-described steps. Additionally, a part or all of the processing functions of the environmental information-presentation method according to the present invention can be configured as a program that can be executed on a computer.” *See* paras. [0081]-[0084]. Figure 8:

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	 This limitation would have been obvious to a person of ordinary skill in the art based on (1) Miyaoku alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[d]. displaying the modified images on the monitor;	To the extent the preamble is limiting, Miyaoku expressly and/or inherently discloses and/or renders obvious displaying the modified images on the monitor. *See*, *e.g.*, disclosures below.

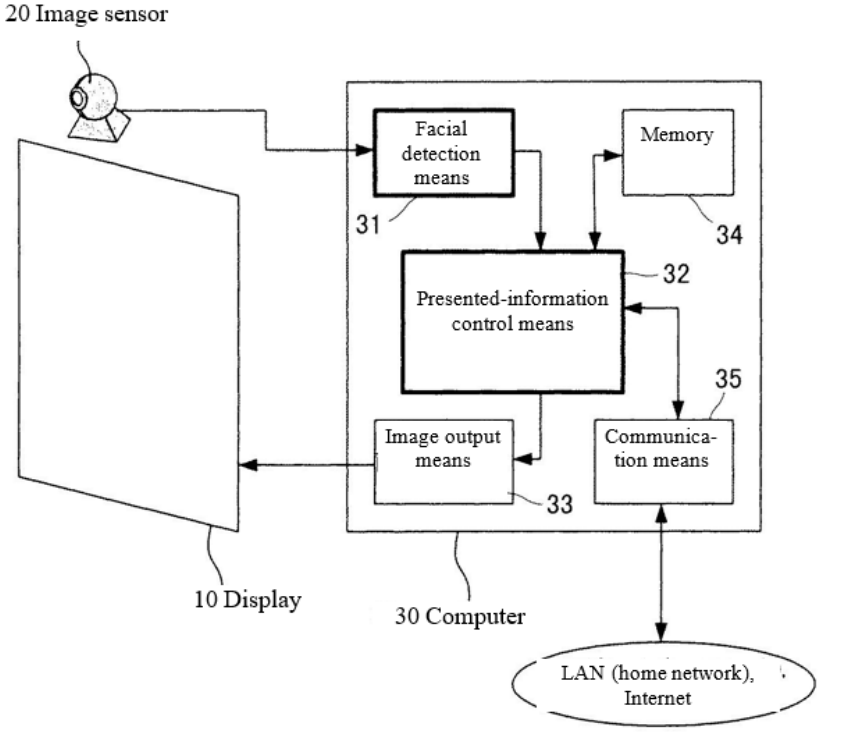
Asserted Claim of the ’110 Patent	Exemplary Citations to Miyaoku
	“OBJECTIVE: To perpetually present information in a form that is easy for the user to notice and visually recognize and further present information without hindering the original functions of the mirror. MEANS FOR ACHIEVING THE OBJECTIVE: Facial detection means 31 detects the region representing a human face in the image projected from image sensor 20 that forms the image of the front region of display 10. And presented-information control means 32 alters the information presented and thus displayed on said display based on the position and shape of the facial region thus detected. The means for achieving the objective include presenting information in ways suitable for the user's visual recognition according to the distance between the user and the display, presenting animation that moves at a faster or slower speed or stops moving depending on whether the distance to the user is close or far, and altering the magnification ratio of the information according to the variation in the distance between the user and the display.” *See* Abstract. “Systems that provide information to users through displays embedded in indoor walls and furniture have been proposed in the field of ubiquitous computing research. Such systems are intended to spontaneously increase the opportunities for users to notice such information throughout their everyday lives. Here, such systems shall be referred to as the “environmental information-presentation devices. The most basic example configuration of an environmental information-presentation device is a wall-mounted display. It is a thin display with built-in computer and network communication features, such a thin display being mountable on an indoor wall. The wall-mounted display acquires and presents information sequentially from a prescribed server on the network. For example, it regularly accesses a server that provides weather forecast information and presents that information. The wall-mounted displays can not only present information but also have features for interactions. The wall-mounted displays are essentially the same as ordinary computers.

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	If an input device, such as a button or a touch panel, is provided, the user can use it to manipulate the information to be displayed. Videophones, which have become popular in recent years, can be used as a type of environmental information-presentation device. Videophones based on VoIP (Voice Over Internet Protocol) have the ability to obtain information from the Internet. This makes it possible for the videophones’ displays to present information environmentally when not on a call. Furthermore, according to some systems that have been developed so far, the existing functions of household goods are extended with computers so that household goods can be used as environmental information-presentation devices. In particular, some mirror systems have been developed with additional features that allow the mirrors to act as wall-mounted displays, given that mirrors are often subject to users’ attention in their daily lives and also comprise surface areas suitable for presenting information. For example, Non-Patent Literature 1 describes a system that presents information on a display placed behind a one-way mirror. Said system has an image sensor and also a feature that allows for the reception of optical signals from mobile terminals and the manipulation of information according to the content of the signals. Additionally, Non-Patent Literature 2 proposes a system that allows the user to manipulate image information that is virtually presented in a mirror, doing by pointing the image with the hand of his or her own image projected in the mirror. In order to calculate the positional relationship between the user's own figure and the image information presented on the mirror, this system uses a video mirror, whereby an image projected from a camera capturing the front of the system is displayed on the display.” *See* paras. [0002]-[0008]. “Furthermore, it is important that the mirror-type environmental information-presentation device has both the original function of a mirror and the ability to present information. To begin with, a mirror is a tool the user uses to confirm his or her

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	appearance based on his or her own reflection in the mirror. Such an original function of the mirror will be hindered if any information is superimposed on the same position as the user's reflection. The mirror-type environmental information-presentation device must have an information presentation mechanism that takes this point into account.” *See* para. [0011]. “Given this factor, the environmental information-presentation device according to the present invention is characterized by comprising a display, an image sensor, a means for detecting faces, and a means for controlling the information presented, wherein: The facial detection means detects the region representing a human face in the image projected from the image sensor that forms the image of the front region of the display; and The presented-information control means alters the information presented and thus displayed on the display based on the position and shape of the facial region thus detected.” *See* para. [0015]. “Furthermore, the mirror-type environmental information-presentation device has the following mechanism to prevent any interference with the user's act of viewing the mirror. That is, in the environmental information-presentation device according to the present invention, the aforementioned presented-information control means calculates the facial presentation region and the truncal presentation region in the display viewport based on the facial region detected by the aforementioned facial detection means and then presents information in regions within the viewport other than the facial and truncal presentation regions. Additionally, the environmental information-presentation method according to the present invention is characterized by being adapted to devices equipped with a display, an image sensor, a facial detection means, and a presented-information control means

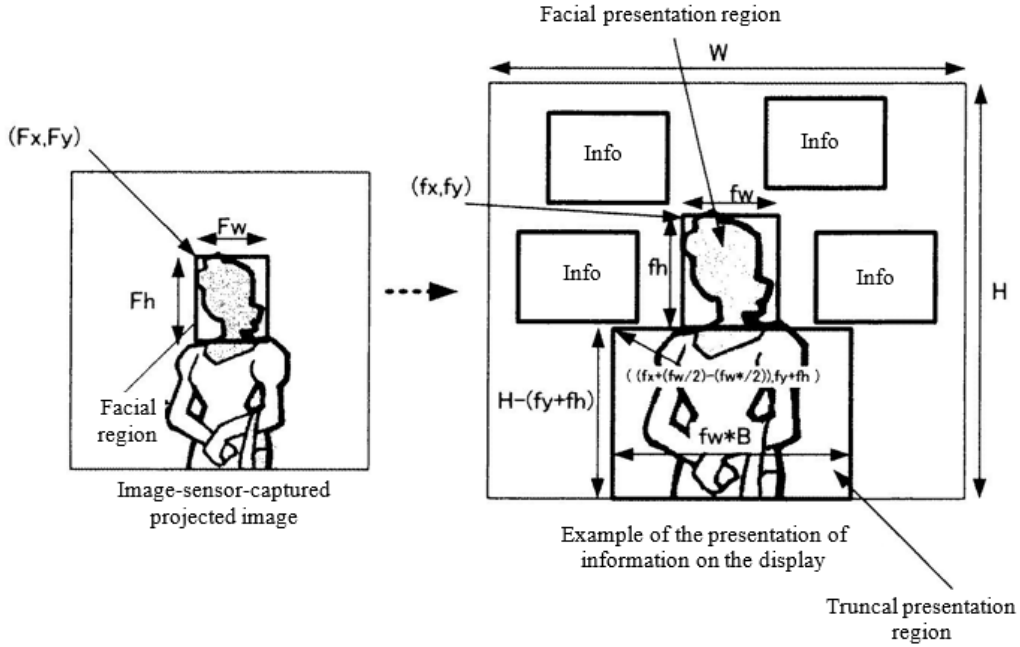
Asserted Claim of the ’110 Patent	Exemplary Citations to Miyaoku
	and comprising each processing step performed in the above-mentioned processing means so as to achieve the presentation of environmental information. Additionally, the program according to the present invention is characterized by being configured so as to allow the aforementioned environmental information-presentation method to be executed on a computer.” [0022]-[0025]. “The basic example configuration of the environmental information-presentation device according to the present invention is shown in Figure 1. The figure consists of at least display 10, image sensor 20 that forms images of the area from which one can view said display (generally the area in front of the display), and computer 30 that processes projected images input from the image sensor and controls the information presented on the display. Here, computer 30 internally comprises facial detection means 31 that detects a facial region in the image projected from image sensor 20, and presented-information control means 32 that controls the presented information based on the position and shape of the facial region thus detected. Facial detection means 31 and presented-information control means 32 may be implemented as software that runs on the OS of computer 30. In this case, computer 10 is equipped with an input/output interface means (e.g., image processing means 33, which is an interface device used to output images onto a display or the like) — such an input/output interface means being provided in order to enable each means (which is software) to process projected images as formed by image sensor 20 and control the output toward display 10 — and memory 34. Furthermore, facial detection means 31, in particular, can be implemented using hardware dedicated to processing projected images to improve processing speed. The information displayed on display 10 via presented-information control means 32 may be pre-stored in memory 34 of computer 30. Additionally, because a particularly important role of an environmental information-presentation device is to inform users of new information, the device may be configured so as to receive information over a network and present the information thus received. For this purpose, computer 30 is

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	equipped with a communication means 35 for communicating with LAN and the Internet. In this case, presented-information control means 32 basically downloads information from a prescribed server in a sequential manner, converts it into a prescribed form suitable for the environmental information presentation, displays it on display 10, and perpetually repeats these steps. The following is an explanation of the operation of the environmental information-presentation device according to the present invention: Image sensor 20 forms the image of the front area of display 10, as described above. Facial detection means 31 processes the projected image in real-time as it is formed by image sensor 20. First, it detects the presence of a human face. And, if a face is detected, it detects the region of the face (the facial region) in the projected image. For example, the technique described in Non-Patent Literature 3 below can be used for such processing. Furthermore, facial detection means 31 sends information about the position and shape of the facial region to presented-information control means 32.” *See* paras. [0028]-[0031]. Figure 1:

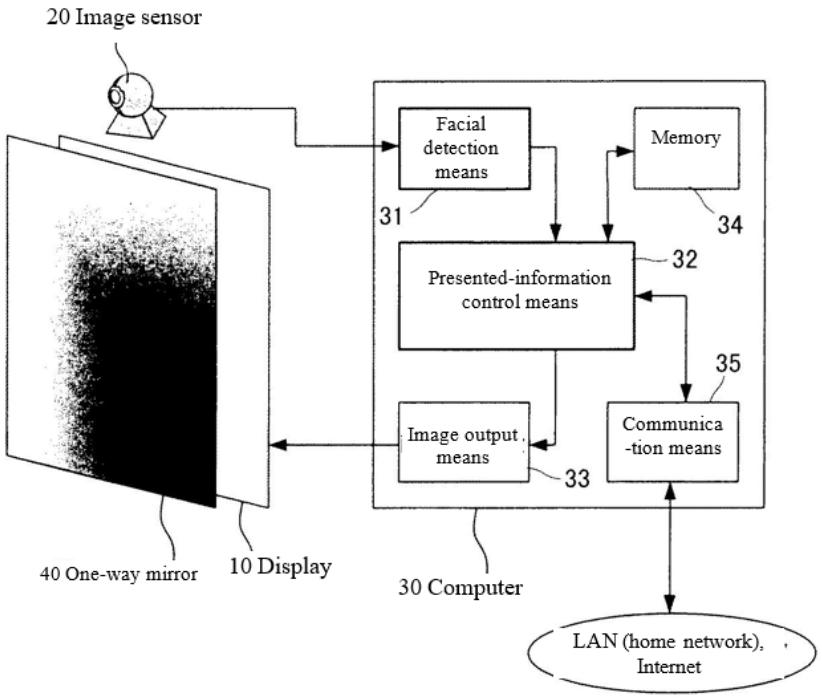
Asserted Claim of the ’110 Patent	Exemplary Citations to Miyaoku
	 “(Embodiment 4) Control Based on the Position of Facial region in Mirror-type Environmental Information-Presentation Device Figure 6 shows an example configuration of the mirror-type environmental information-presentation device. In the example configuration shown in the figure, a video mirror acts as display 10A. Computer 30A horizontally flips the projected image formed by image sensor 20, converts the size to fit the display size, and thus presents the image on display 10A. As such, it virtually acts as a mirror. Information such as thumbnail images

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	presented by presented-information control means 32 is superimposed and thus presented on the image projected from image sensor 20. For this purpose, the present mirror-type environmental information-presentation device is equipped with an image horizontal-flip means 36 and image superimposition means 37, in addition to each means constituting the environmental information-presentation device shown in Figure 1. When a mirror-type environmental information-presentation device presents information, it is expected that the information thus presented does not interfere with the user's own figure projected in the mirror. Given this factor, presented-information control means 32 performs the following processing steps: First, upon receipt of facial region position/shape information [(Fx, Fy), Fw, and Fh] from facial detection means 31, the facial presentation region in the viewport on display 10A is calculated based on said facial region position/shape information thus received. For example, suppose that the resolution of the projected image, as formed by image sensor 20, is 500 × 400, and the resolution of the display viewport is 1000 × 800. In this case, the facial presentation region of the display viewport that corresponds to the facial region position/shape information [(Fx, Fy), Fw, and Fh] is a rectangular region with the upper-right-corner coordinates of (Fx*2, Fy*2), the width of Fw*2, and the height of Fh*2. The user won't be able to see his or her own face projected in the mirror if an image or other information is displayed in the facial presentation region. Accordingly, presented-information control means 32 prevents information from being presented in the facial presentation region. Additionally, if any information has already been presented in the facial presentation region, presented-information control means 32 changes the position of the information to a position outside the facial presentation region. Furthermore, presented-information control means 32 may be configured to control the presentation of information by estimating the truncal presentation region in the display viewport based on the facial region detected by facial detection means 31 so as to present information in regions other than the facial presentation region and the truncal

Asserted Claim of the '110 Patent	Exemplary Citations to Miyaoku
	presentation region. Figure 7 shows an example presentation of information in such a case. Additionally, an example content of the processing performed by presented-information control means 32 is described below: Suppose that the resolution of the viewport on display 10A is W × H, and the facial presentation region calculated by presented-information control means 32 is a rectangular region with the upper-right-corner coordinates of the display viewport being (Fx, Fy), the width being fw, and the height being fh. In this case, the trunk is located below the facial region. It also occupies a region that is wider than the facial region. Accordingly, presented-information control means 32 uses a prescribed value B (value representing (Width of the truncal presentation region / Width of the facial presentation region)) to estimate that the truncal presentation region is a rectangular region with the upper right corner coordinate of ((fx+(fw/2)-(fw*B/2)), fy+fh), the width of fw*B, and the height of H-(fy+fh). Presented-information control means 32 performs the steps described above to thereby prevent information from being presented in the facial and truncal presentation regions thus calculated. Additionally, if any information has already been presented in the facial or truncal presentation region, presented-information control means 32 changes the position of the information to a position outside the facial presentation region." *See* paras. [0073]-[0080]. Figure 7:

Asserted Claim of the ’110 Patent	Exemplary Citations to Miyaoku
	 “ Figure 8 shows another example configuration of the mirror-type environmental information-presentation device. The present mirror-type environmental information-presentation device has the same basic configuration as that of the environmental information-presentation device shown in Figure 1, except that one-way mirror 40 is affixed to the surface of display 10. Technically speaking, it is extremely difficult to calculate where on the mirror’s surface the user's figure is projected as viewed from the user’s perspective. However, when the above-described steps performed by presented-information control means 32 in the mirror-type environmental information-presentation device that uses a video mirror is applied in the as-is state to the configuration shown in Figure 8, it becomes possible to present information in regions that do not overlap with the user's figure on the mirror. In

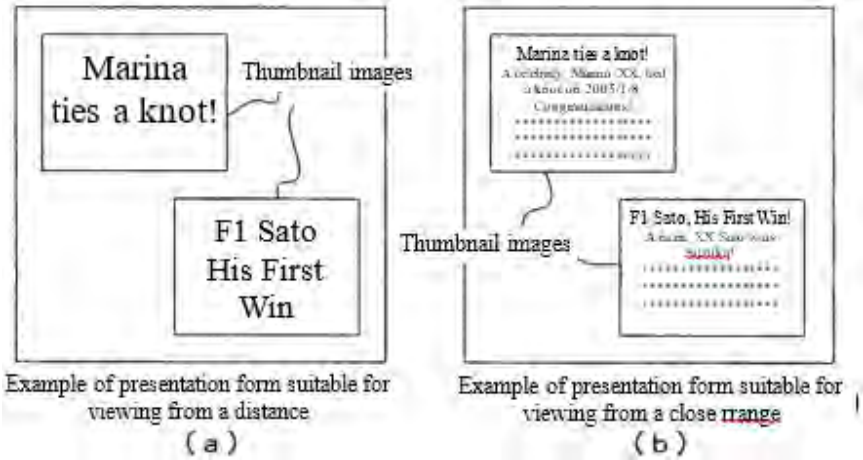
Asserted Claim of the ’110 Patent	Exemplary Citations to Miyaoku
	other words, presented-information control means 32 of the mirror-type environmental information-presentation device shown in Figure 8 can also control the position of presented information, doing so through the steps described with reference to figures 6 and 7. The embodiments of the environmental information-presentation device according to the present invention are as described above. The environmental information-presentation method according to the present invention corresponds to each presented-information control step performed by the presented-information control means in the environmental information-presentation device described above. The application of the environmental information-presentation method according to the present invention is not limited to the devices illustrated with reference to figures 1, 6, and 8. The environmental information-presentation method according to the present invention may be applied to any device that is equipped with an image sensor, a display, and a computer. For example, a mobile terminal equipped with an image sensor may further comprise facial detection means 31 and presented-information control means 32 in the form of software, etc., so as to present information according to the distance between the terminal and the user's face through the above-described steps. Additionally, a part or all of the processing functions of the environmental information-presentation method according to the present invention can be configured as a program that can be executed on a computer.” *See* paras. [0081]-[0084]. Figure 8:

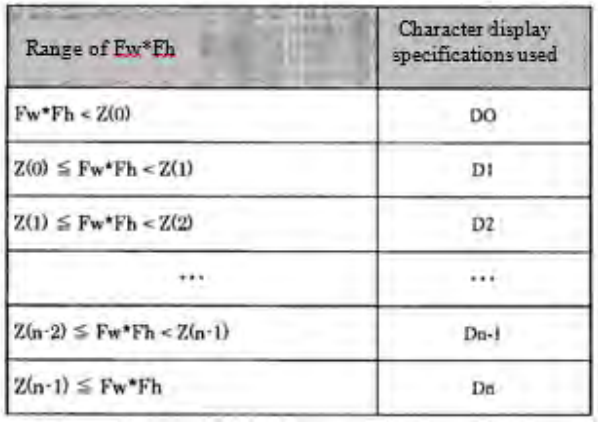
Asserted Claim of the '110 Patent	Exemplary Citations to Miyaoku
	 This limitation would have been obvious to a person of ordinary skill in the art based on (1) Miyaoku alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[e]. wherein the different point of view corresponds to an image taken from a different angle and a different distance than	Miyaoku expressly and/or inherently discloses and/or renders obvious wherein the different point of view corresponds to an image taken from a different angle and a different distance than the actual images captured by the camera. *See*, *e.g.*, disclosures below.

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the actual images captured by the camera; and	“OBJECTIVE: To perpetually present information in a form that is easy for the user to notice and visually recognize and further present information without hindering the original functions of the mirror. MEANS FOR ACHIEVING THE OBJECTIVE: Facial detection means 31 detects the region representing a human face in the image projected from image sensor 20 that forms the image of the front region of display 10. And presented-information control means 32 alters the information presented and thus displayed on said display based on the position and shape of the facial region thus detected. The means for achieving the objective include presenting information in ways suitable for the user's visual recognition according to the distance between the user and the display, presenting animation that moves at a faster or slower speed or stops moving depending on whether the distance to the user is close or far, and altering the magnification ratio of the information according to the variation in the distance between the user and the display.” *See* Abstract. “In particular, because the distance between a user and the environmental information-presentation device is not fixed, the present system must take into account the distance from the user when displaying information. For example, it is meaningless to present detailed information that contains a large amount of text in a small font to a user who is far away from the device because the user cannot read it. The environmental information-presentation device is useless unless one can visually recognize the content of the presented information when he or she happens to turn their eyes toward the device. Accordingly, it must be able to present information in a form that is easy for the user to visually recognize according to the distance.” *See* para. [0010]. “In particular, the size of the facial region detected is associated with the distance between the user and the device. Accordingly, the aforementioned presented-information control means presents information suitable for viewing from a distance when the size of the facial region detected by the facial detection means is small. However, when the size of the facial region detected by the facial detection means is

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	large, the presented-information control means presents information suitable for viewing from a close range. Users far away from the environmental information-presentation device cannot visually recognize details in a text shown on the display screen. Animation is a possible option to express information in such a way that it is easy to understand for users located far away from the device. Objects displayed on the screen can convey simple attributes of information to the user by making characteristic motions (gestures) consisting of combinations of rotations, position changes, etc. Animation is also effective for making users at a distance aware of the existence of the information. However, nearby users can read text, etc., to obtain more specific information. In this case, it is not advisable to apply animation (i.e., a moving object, including text), as it will interfere with the user's visual recognition of the text. In other words, when using animation, its behavior must be controlled according to the distance from the user." *See* paras. [0016]-[0018]. "Presented-information control means 32 modifies the information to be presented, doing so based on the facial region position/shape information received from facial detection means 31. The following is an explanation of embodiments of the control of information presented. (Embodiment 1) Control Based on the Size of Facial Region Presented-information control means 32 presets a threshold value Z for facial region sizes. Additionally, presented-information control means 32, at the initial stage, presents information in a form suitable for viewing from a distance. Said "form suitable for viewing from a distance" is, for example, a form of display whereby most characters are in large font and only a small amount of information is presented, e.g., to the extent of headings only. In terms of images or videos, they are displayed in forms enlarged enough to allow the subjects to be identified even from a distance.

Asserted Claim of the ’110 Patent	Exemplary Citations to Miyaoku
	Presented-information control means 32 — upon receipt of facial region position/shape information [(Fx, Fy), Fw, and Fh] from facial detection means 31 — calculates the facial region size (the area size of the rectangular facial region) Fw*Fh. Then, if Fw*Fh≧ Z, the information presented is altered to a form suitable for viewing from a close range. Said “form suitable for viewing from a close range” is, for example, a form in which characters are in relatively small font presenting detailed information. In terms of images or videos, they are displayed in sizes suitable for viewing from a close range and in forms that may include the display of text information, such as telops. However, when Fw*Fh<Z, presented-information control means 32 continues to present information in a form suitable for viewing from a distance. Suppose that the information has already been switched to and thus presented in a form suitable for viewing from a close range because Fw*Fh was equal to or greater than Z (Fw*Fh≧ Z). In this case, the information will be switched back to and thus presented in a form suitable for viewing from a distance when Fw*Fh becomes smaller than Z (Fw*Fh<Z).” *See* paras. [0034]-[0037]. Figure 3:

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	 “Such control is achieved by utilizing the fact that the distance between the user and the device is greater when the facial region size is smaller while the distance between the user and the device is closer when the facial region size is larger. In the example illustrated above, a single threshold Z is used as the value that triggers the switch between the character display specifications suitable for viewing from a distance and the character display specifications suitable for viewing from a close range. Incidentally, presented-information control method 32 may use multiple thresholds Z(0), . . ., Z(n-1), (where Z(0)<Z(1)< . . . <Z(n-1)) to control n+1 types of presentation form in incremental steps. The following is an explanation of such incremental control of multiple presentation forms with reference to the above-mentioned character display control by way of example. Presented-information control means 32 retains predefined thresholds Z(0), . . ., Z(n-1) for n facial image sizes. Additionally, presented-information control means 32 retains n+1 sets of character display specifications Dn (n=0, 1,. . ., n) corresponding to the cases of the facial image size Fw*Fh<Z(0), the cases of Z(k-1)≦Fw*Fh<Z(k) (where k

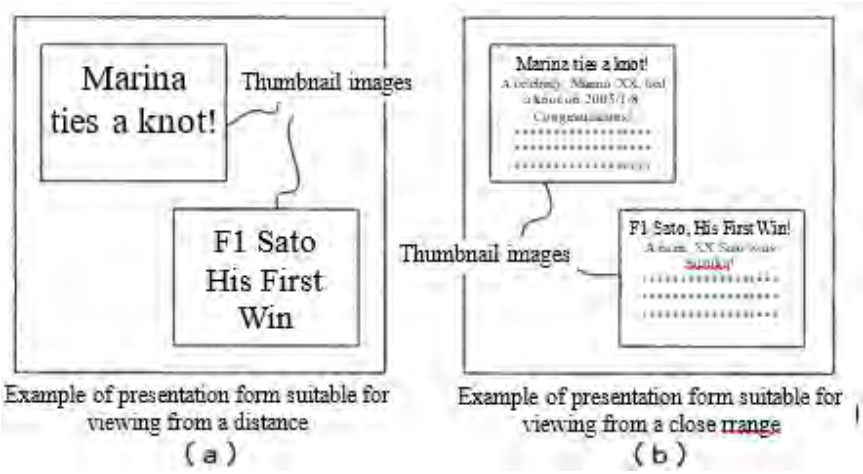
Asserted Claim of the '110 Patent	Exemplary Citations to Miyaoku
	= 1, 2, . . ., n-1), and the cases of Z(n-1)≦Fw*Fh. That is, the table shown in Table 2 below is retained so as to manage the correlation between the size of the facial image detected and the respective set of character display specifications D0 through Dn. [TABLE 2]  Here, suppose that character display specifications D0 represent the form most suitable for viewing from a distance, and character display specifications Dn represent the form most suitable for viewing from a close distance. In this case, character display specifications D0 could be the character display specifications for presenting the largest font with the least number of characters, whereas character display specifications Dn could be the character display specifications for displaying many characters in the smallest font." *See* paras. [0045]-[0049]. "Furthermore, the animated motion of objects in the viewport on display 10 is easy to visually recognize from a distance. For example, the characteristic position-shifting patterns, such as vertical movement, horizontal movement, etc., as well as actions, such as zooming in/out action, showing/hiding action (blinking), can catch one's eye even from a distance at which images and text information presented within an object may

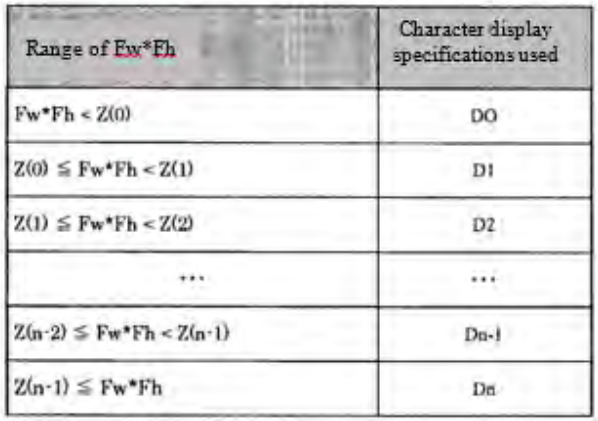
Range of Fw*Fh	Character display specifications used
Fw*Fh < Z(0)	D0
Z(0) ≦ Fw*Fh < Z(1)	D1
Z(1) ≦ Fw*Fh < Z(2)	D2
...	...
Z(n-2) ≦ Fw*Fh < Z(n-1)	Dn-1
Z(n-1) ≦ Fw*Fh	Dn

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	not be visible. The inclusion of information in animated motions can be said to be one of the information presentation forms suggested for viewing from a distance." *See* para. [0054]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Miyaoku alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[f]. wherein during mirror tracking mode the processor utilizes the angle of the images captured by the camera and applies parametric input for a mapping transformation that changes imaging perspective of the images captured by the camera.	Miyaoku expressly and/or inherently discloses and/or renders obvious wherein during mirror tracking mode the processor utilizes the angle of the images captured by the camera and applies parametric input for a mapping transformation that changes imaging perspective of the images captured by the camera. *See*, *e.g.*, disclosures below. "OBJECTIVE: To perpetually present information in a form that is easy for the user to notice and visually recognize and further present information without hindering the original functions of the mirror. MEANS FOR ACHIEVING THE OBJECTIVE: Facial detection means 31 detects the region representing a human face in the image projected from image sensor 20 that forms the image of the front region of display 10. And presented-information control means 32 alters the information presented and thus displayed on said display based on the position and shape of the facial region thus detected. The means for achieving the objective include presenting information in ways suitable for the user's visual recognition according to the distance between the user and the display, presenting animation that moves at a faster or slower speed or stops moving depending on whether the distance to the user is close or far, and altering the magnification ratio of the information according to the variation in the distance between the user and the display." *See* Abstract.

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	"In particular, because the distance between a user and the environmental information-presentation device is not fixed, the present system must take into account the distance from the user when displaying information. For example, it is meaningless to present detailed information that contains a large amount of text in a small font to a user who is far away from the device because the user cannot read it. The environmental information-presentation device is useless unless one can visually recognize the content of the presented information when he or she happens to turn their eyes toward the device. Accordingly, it must be able to present information in a form that is easy for the user to visually recognize according to the distance." *See* para. [0010]. "In particular, the size of the facial region detected is associated with the distance between the user and the device. Accordingly, the aforementioned presented-information control means presents information suitable for viewing from a distance when the size of the facial region detected by the facial detection means is small. However, when the size of the facial region detected by the facial detection means is large, the presented-information control means presents information suitable for viewing from a close range. Users far away from the environmental information-presentation device cannot visually recognize details in a text shown on the display screen. Animation is a possible option to express information in such a way that it is easy to understand for users located far away from the device. Objects displayed on the screen can convey simple attributes of information to the user by making characteristic motions (gestures) consisting of combinations of rotations, position changes, etc. Animation is also effective for making users at a distance aware of the existence of the information. However, nearby users can read text, etc., to obtain more specific information. In this case, it is not advisable to apply animation (i.e., a moving object, including text), as it will interfere with the user's visual recognition of the text. In other words, when using animation, its behavior must be controlled according to the distance from the user." *See* paras. [0016]-[0018].

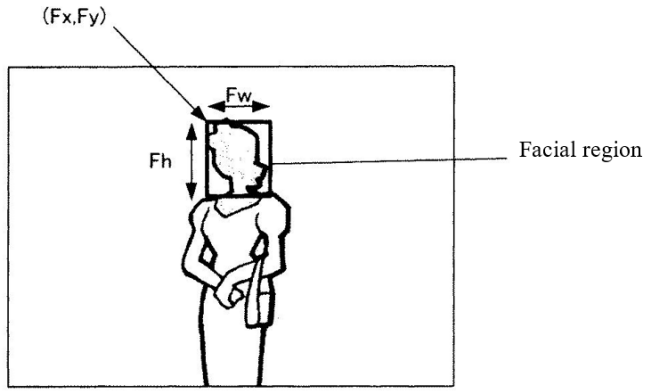
Asserted Claim of the '110 Patent	Exemplary Citations to Miyaoku
	"Presented-information control means 32 modifies the information to be presented, doing so based on the facial region position/shape information received from facial detection means 31. The following is an explanation of embodiments of the control of information presented. (Embodiment 1) Control Based on the Size of Facial Region Presented-information control means 32 presets a threshold value Z for facial region sizes. Additionally, presented-information control means 32, at the initial stage, presents information in a form suitable for viewing from a distance. Said "form suitable for viewing from a distance" is, for example, a form of display whereby most characters are in large font and only a small amount of information is presented, e.g., to the extent of headings only. In terms of images or videos, they are displayed in forms enlarged enough to allow the subjects to be identified even from a distance. Presented-information control means 32 — upon receipt of facial region position/shape information [(Fx, Fy), Fw, and Fh] from facial detection means 31 — calculates the facial region size (the area size of the rectangular facial region) Fw*Fh. Then, if Fw*Fh $\geqq$ Z, the information presented is altered to a form suitable for viewing from a close range. Said "form suitable for viewing from a close range" is, for example, a form in which characters are in relatively small font presenting detailed information. In terms of images or videos, they are displayed in sizes suitable for viewing from a close range and in forms that may include the display of text information, such as telops. However, when Fw*Fh<Z, presented-information control means 32 continues to present information in a form suitable for viewing from a distance. Suppose that the information has already been switched to and thus presented in a form suitable for viewing from a close range because Fw*Fh was equal to or greater than Z (Fw*Fh$\geqq$Z). In this case, the information will be switched back to and thus presented in a form suitable for viewing from a distance when Fw*Fh becomes smaller than Z (Fw*Fh<Z)." *See* paras. [0034]-[0037].

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	Figure 3:  “Such control is achieved by utilizing the fact that the distance between the user and the device is greater when the facial region size is smaller while the distance between the user and the device is closer when the facial region size is larger. In the example illustrated above, a single threshold Z is used as the value that triggers the switch between the character display specifications suitable for viewing from a distance and the character display specifications suitable for viewing from a close range. Incidentally, presented-information control method 32 may use multiple thresholds Z(0), . . ., Z(n-1), (where Z(0)<Z(1)< . . . <Z(n-1)) to control n+1 types of presentation form in incremental steps. The following is an explanation of such incremental control of multiple presentation forms with reference to the above-mentioned character display control by way of example. Presented-information control means 32 retains predefined thresholds Z(0), . . ., Z(n-1) for n facial image sizes. Additionally, presented-information control means 32 retains

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	n+1 sets of character display specifications Dn (n=0, 1,. . ., n) corresponding to the cases of the facial image size Fw*Fh<Z(0), the cases of Z(k-1)≦Fw*Fh<Z(k) (where k = 1, 2, . . ., n-1), and the cases of Z(n-1)≦Fw*Fh. That is, the table shown in Table 2 below is retained so as to manage the correlation between the size of the facial image detected and the respective set of character display specifications D0 through Dn. [TABLE 2]  Range of Fw*Fh / Character display specifications used Fw*Fh < Z(0) — D0 Z(0) ≤ Fw*Fh < Z(1) — D1 Z(1) ≤ Fw*Fh < Z(2) — D2 ... — ... Z(n-2) ≤ Fw*Fh < Z(n-1) — Dn-1 Z(n-1) ≤ Fw*Fh — Dn Here, suppose that character display specifications D0 represent the form most suitable for viewing from a distance, and character display specifications Dn represent the form most suitable for viewing from a close distance. In this case, character display specifications D0 could be the character display specifications for presenting the largest font with the least number of characters, whereas character display specifications Dn could be the character display specifications for displaying many characters in the smallest font." *See* paras. [0045]-[0049]. "Furthermore, the animated motion of objects in the viewport on display 10 is easy to visually recognize from a distance. For example, the characteristic position-shifting patterns, such as vertical movement, horizontal movement, etc., as well as actions, such

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	as zooming in/out action, showing/hiding action (blinking), can catch one's eye even from a distance at which images and text information presented within an object may not be visible. The inclusion of information in animated motions can be said to be one of the information presentation forms suggested for viewing from a distance." *See* para. [0054]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Miyaoku alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

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Claim 2	
2. The method of claim 1, wherein the mapping transformation comprises a combination of at least two of the following transformations: vertical flips about a vertical axis, a projection transformation, rotation, resize, two-dimensional offset, optic distortion correction, and polynomial mapping on part or entire captured image.	Miyaoku expressly and/or inherently discloses and/or renders obvious wherein the mapping transformation comprises a combination of at least two of the following transformations: vertical flips about a vertical axis, a projection transformation, rotation, resize, two-dimensional offset, optic distortion correction, and polynomial mapping on part or entire captured image. *See*, *e.g.*, disclosures below. "Furthermore, the environmental information-presentation device according to the present invention adopts a creative approach in order to make presented information more visually recognizable, doing so through a mechanism that actively expands information and presents more details to the user who is about to approach the device." *See* para. [0020]. "Figure 2 shows an example of a facial region detected, by facial detection means 31, in a projected image as formed by image sensor 20. In this example, the facial region is

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	detected as a rectangular region. When such a rectangular facial region is detected, facial detection means 31 sends, to presented-information control means 32, the coordinates (Fx, Fy) of the upper right corner of said rectangular region in the projected image as well as the width Fw and the height Fh of the rectangular, all of which act as the facial region position/shape information. Presented-information control means 32 modifies the information to be presented, doing so based on the facial region position/shape information received from facial detection means 31. The following is an explanation of embodiments of the control of information presented." *See* paras. [0033]-[0034]. Figure 2:  "(Embodiment 1) Control Based on the Size of Facial Region Presented-information control means 32 presets a threshold value Z for facial region sizes. Additionally, presented-information control means 32, at the initial stage, presents information in a form suitable for viewing from a distance. Said "form

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	suitable for viewing from a distance" is, for example, a form of display whereby most characters are in large font and only a small amount of information is presented, e.g., to the extent of headings only. In terms of images or videos, they are displayed in forms enlarged enough to allow the subjects to be identified even from a distance. Presented-information control means 32 — upon receipt of facial region position/shape information [(Fx, Fy), Fw, and Fh] from facial detection means 31 — calculates the facial region size (the area size of the rectangular facial region) Fw*Fh. Then, if Fw*Fh≧ Z, the information presented is altered to a form suitable for viewing from a close range. Said "form suitable for viewing from a close range" is, for example, a form in which characters are in relatively small font presenting detailed information. In terms of images or videos, they are displayed in sizes suitable for viewing from a close range and in forms that may include the display of text information, such as telops." *See* paras. [0035]-[0036]. "(Embodiment 2) Control Based on Facial region Size and Application to Animation Presented-information control means 32 may use animation when presenting information. Human vision is responsive to moving objects. By nature, it instinctively fixates on a moving object that is present in the field of view. Therefore, animation is a useful means for attracting the attention of users located in the vicinity of the environmental information-presentation device. Given this factor, presented-information control means 32 may, for example, present multiple thumbnail images and apply animation in such a way that each thumbnail moves through the viewport on display 10. Figure 5 shows an example of the animation of moving thumbnails. Additionally, various types of animation can be used. Examples include animated text, images, and other objects that expand and shrink in size in a repetitive manner, appear and disappear in a repetitive manner, and so on.

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	Furthermore, the animated motion of objects in the viewport on display 10 is easy to visually recognize from a distance. For example, the characteristic position-shifting patterns, such as vertical movement, horizontal movement, etc., as well as actions, such as zooming in/out action, showing/hiding action (blinking), can catch one’s eye even from a distance at which images and text information presented within an object may not be visible. The inclusion of information in animated motions can be said to be one of the information presentation forms suggested for viewing from a distance. By including information in animated motions, it becomes possible, for example, to express the importance of the information by the speed of the movement or the blinking speed. It becomes also possible to associate a specific behavior pattern to a specific meaning, for example, to a type of information. In this way, animation can be used to draw users' attention and make distant users recognize the attributes of the information. Also, by presenting images of fish instead of thumbnail images and animating each image of fish as if swimming in water, it becomes possible to add an aquarium-like anesthetic value to the environmental information-presentation device. In this case, it is also possible to make the users recognize the attributes of the information by means of the color and movement of the fish. However, such animation can get in the way of nearby users trying to see the detailed information presented on display 10. For example, it will be very difficult to read text if the thumbnail images containing text information move up and down, left to right, etc. Given this factor, the present embodiment executes the following processing to enable the effective use of animation in environmental information presentation. First, presented-information control means 32 presets a threshold Z associated with the facial region size. Furthermore, presented-information control means 32 manages

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	animation specifications A0 predefined for the cases of Fw*Fh<Z and animation specifications A1 predefined for the cases of Fw*Fh≧Z, doing so in a memory accessible by said presented-information control means 32. Incidentally, the term “animation specifications” refers to a description of the specifications of animation to be displayed in the display viewport. In the case of animated thumbnail images shown in Figure 5, the animation specifications include information such as the image display size, image blinking pattern, image blinking speed, image motion pattern, image motion range, image motion speed, etc. Presented-information control means 32 executes the animation of each thumbnail image according to such animation specifications. Presented-information control means 32 calculates the facial region size (area size of the rectangular facial region) Fw*Fh upon receipt of facial region position/shape information [(Fx, Fy), Fw, and Fh] from facial detection means 31. If Fw*Fh<Z, presented-information control means 32 controls the presentation of thumbnail images according to animation specifications A0. However, if Fw*Fh≧Z, it controls the presentation of thumbnail images according to animation specifications A1. Fast-moving animation is suitable for presenting information to distant users, and slow-moving animation is suitable for presenting information to nearby users. Accordingly, in the present embodiment, the above-mentioned processing may be set so as to accelerate the image blinking speed and image operation speed according to animation specifications A0 when Fw*Fh<Z (i.e., when the facial image size is small) but decelerate the image blinking speed and image operation speed according to animation specifications A0 when Fw*Fh≧Z (i.e., when the facial image size is large). This makes it possible to adapt the animation speed to the distance between the user and the device.” *See* paras. [0052]-[0062]. “Fast-moving animation is suitable for presenting information to distant users, and slow-moving animation is suitable for presenting information to nearby users.

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	Accordingly, in the present embodiment, the above-mentioned processing may be set so as to accelerate the image blinking speed and image operation speed according to animation specifications A0 when Fw*Fh<Z (i.e., when the facial image size is small) but decelerate the image blinking speed and image operation speed according to animation specifications A0 when Fw*Fh≧Z (i.e., when the facial image size is large). This makes it possible to adapt the animation speed to the distance between the user and the device. Incidentally, it is also possible to implement incremental motion control in the control of animation, doing so through the same steps described in Embodiment 1 above. In this case, presented-information control means 32 retains thresholds Z(0), . . ., Z(n-1) predefined for n facial image sizes. Additionally, presented-information control means 32 retains n+1 sets of animation specifications An (n=0, 1, . . ., n) corresponding to the cases of the facial image size Fw*Fh<Z(0), the cases of Z(k-1)≦Fw*Fh<Z(k) (where k = 1, 2, . . ., n-1), and the cases of Z(n-1)≦Fw*Fh. The content of the processing is the same as the steps described in Embodiment 1, except that the animation specifications are used in place of the character display specifications and that the subject of the control is animation, not the text display, as shown in Table 3 below by way of example. Through such processing, it becomes possible to control the animation, for example, in such a way that the motion speed of the animation gradually slows down as the size of the facial region Fw*Fh increases." *See* paras. [0063]-[0066]. Table 3:

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Name of specification item	Description of specification
Image display size	320×240
Image blinking pattern	Blink with difference brightness levels
Image blinking speed	5 times per second
Image behavior pattern	Vertical movement
Image movement range	Upper/lower ±100 pixels
Image movement speed	100 pixels per second
. . .	

“Incidentally, presented-information control means 32 may be implemented in such a way that it manages multiple sets of character display specifications Dn (n = 0, 1, . . ., n) and animation specifications An (n = 0, 1, . . ., n) concurrently so that the text display control and the animation control described in embodiments 1 and 2 are performed concurrently.

(Embodiment 3) Control Based on Size Variation of Facial region
Presented-information control means 32 presets a threshold value V for the size variation of the facial region. It retains, in memory 34, facial region position/shape information [(Fx(i), Fy(i), Fw(i), and Fh(i)], which is sequentially received from facial detection means 31. Each time the facial region position/shape information is received, the facial-region size variation value is calculated as follows:

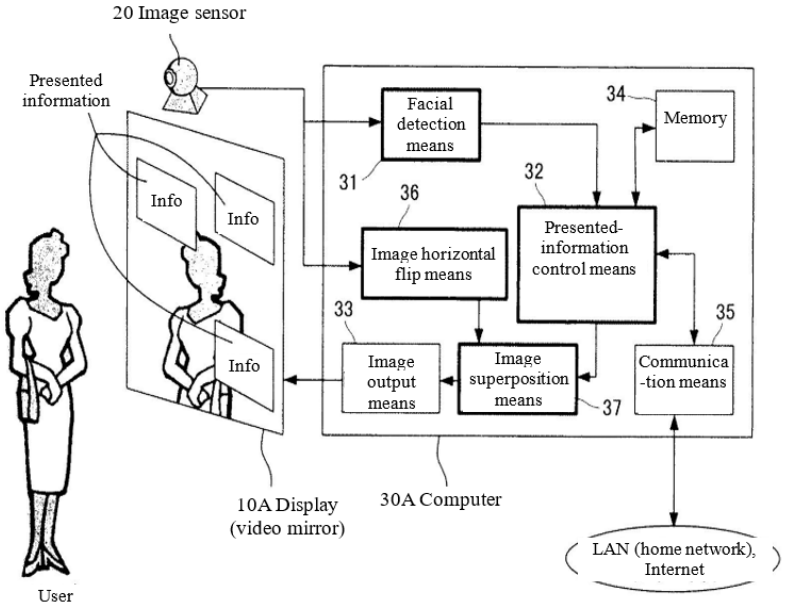
((Fw(i)*Fh(i))/(Fw(i-1)*Fh(i-1)))

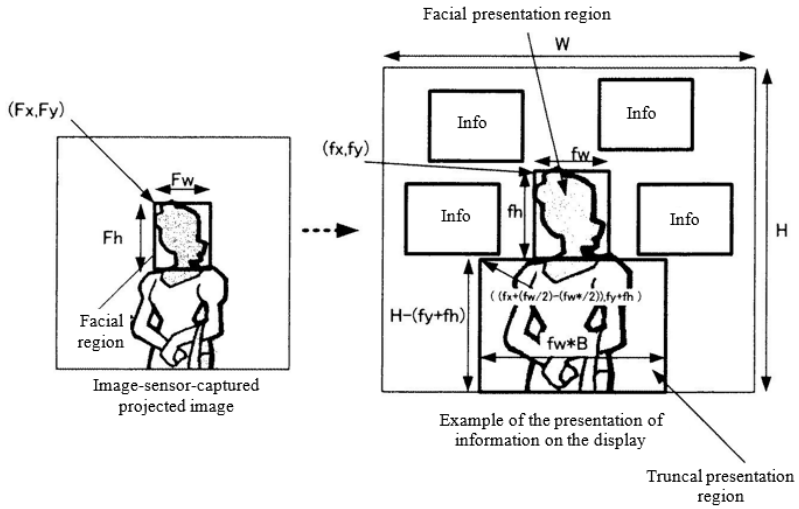
The facial-region size variation value represents the ratio of the most recently detected size Fw(i)*Fh(i) of the facial region to the size Fw(i-1)*Fh(i-1) of the facial region detected one before said most recent size. If it is greater than 1, the facial region size has become larger. If it is less than 1, the facial region's size has become smaller.

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	The direction in which the user moves can be estimated based on the variation in the size of the facial region. That is, if the size of a user's facial region increases, it can be determined that the user is approaching the environmental information-presentation device. The threshold V for the facial-region size variation is used as an indicator to determine whether the user’s movement is intentional. Suppose the facial-region size variation value is somewhat high, indicating a value equal to or greater than 1. In that case, it can be determined that the user is approaching the environmental information-presentation device at a relatively fast speed. In other words, it is determined that the user is intentionally moving toward the environmental information-presentation device. As such, the presented-information control means determines that the user is approaching the device because he or she is interested in the presented information and thus performs the processing required to alter, e.g., expand, the presented information when the following condition is satisfied: ((Fw(i)*Fh(i))/(Fw(i-1)*Fh(i-1)))≧V It should be noted that the above illustration is an example of the present embodiment. Presented-information control means 32 may set a threshold value V’, which is less than 1, so as to perform the processing required to present a message to attract the user's interest when the following condition is satisfied, i.e., when the user is moving in the direction away from the environmental information-presentation device: ((Fw(i)*Fh(i))/(Fw(i-1)*Fh(i-1)))<V’” *See* paras. [0067]-[0072]. “(Embodiment 4) Control Based on the Position of Facial region in Mirror-type Environmental Information-Presentation Device Figure 6 shows an example configuration of the mirror-type environmental information-presentation device. In the example configuration shown in the figure, a video mirror acts as display 10A. Computer 30A horizontally flips the projected image formed by

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	image sensor 20, converts the size to fit the display size, and thus presents the image on display 10A. As such, it virtually acts as a mirror. Information such as thumbnail images presented by presented-information control means 32 is superimposed and thus presented on the image projected from image sensor 20. For this purpose, the present mirror-type environmental information-presentation device is equipped with an image horizontal-flip means 36 and image superimposition means 37, in addition to each means constituting the environmental information-presentation device shown in Figure 1. When a mirror-type environmental information-presentation device presents information, it is expected that the information thus presented does not interfere with the user's own figure projected in the mirror. Given this factor, presented-information control means 32 performs the following processing steps: First, upon receipt of facial region position/shape information [(Fx, Fy), Fw, and Fh] from facial detection means 31, the facial presentation region in the viewport on display 10A is calculated based on said facial region position/shape information thus received. For example, suppose that the resolution of the projected image, as formed by image sensor 20, is 500 × 400, and the resolution of the display viewport is 1000 × 800. In this case, the facial presentation region of the display viewport that corresponds to the facial region position/shape information [(Fx, Fy), Fw, and Fh] is a rectangular region with the upper-right-corner coordinates of (Fx*2, Fy*2), the width of Fw*2, and the height of Fh*2. The user won't be able to see his or her own face projected in the mirror if an image or other information is displayed in the facial presentation region. Accordingly, presented-information control means 32 prevents information from being presented in the facial presentation region. Additionally, if any information has already been presented in the facial presentation region, presented-information control means 32 changes the position of the information to a position outside the facial presentation region. Furthermore, presented-information control means 32 may be configured to control the presentation of information by estimating the truncal presentation region in the display

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	viewport based on the facial region detected by facial detection means 31 so as to present information in regions other than the facial presentation region and the truncal presentation region. Figure 7 shows an example presentation of information in such a case. Additionally, an example content of the processing performed by presented-information control means 32 is described below: Suppose that the resolution of the viewport on display 10A is W × H, and the facial presentation region calculated by presented-information control means 32 is a rectangular region with the upper-right-corner coordinates of the display viewport being (Fx, Fy), the width being fw, and the height being fh. In this case, the trunk is located below the facial region. It also occupies a region that is wider than the facial region. Accordingly, presented-information control means 32 uses a prescribed value B (value representing (Width of the truncal presentation region / Width of the facial presentation region)) to estimate that the truncal presentation region is a rectangular region with the upper right corner coordinate of ((fx+(fw/2)-(fw*B/2)), fy+fh), the width of fw*B, and the height of H-(fy+fh). Presented-information control means 32 performs the steps described above to thereby prevent information from being presented in the facial and truncal presentation regions thus calculated. Additionally, if any information has already been presented in the facial or truncal presentation region, presented-information control means 32 changes the position of the information to a position outside the facial presentation region.” *See* paras. [0073]-[0080]. Figure 6:

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	 Figure 7:

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	 This limitation would have been obvious to a person of ordinary skill in the art based on (1) Miyaoku alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

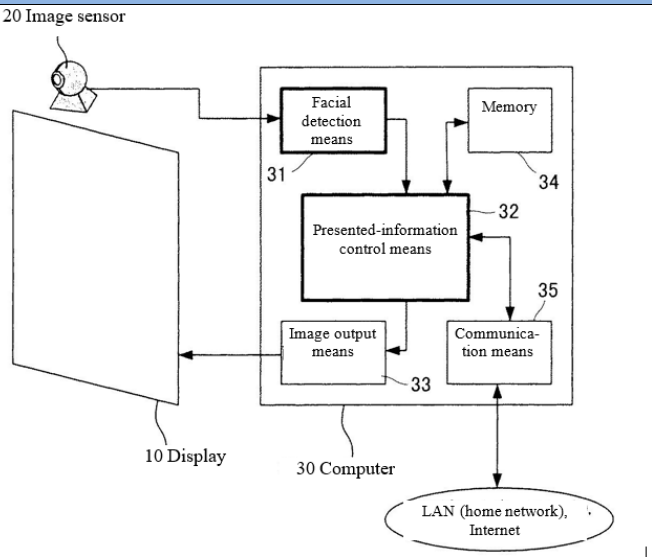
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Claim 3	
3. The method of claim 1, wherein during idle mode the camera continuously sends captured images to the processor, and the	Miyaoku expressly and/or inherently discloses and/or renders obvious wherein during idle mode the camera continuously sends captured images to the processor, and the user

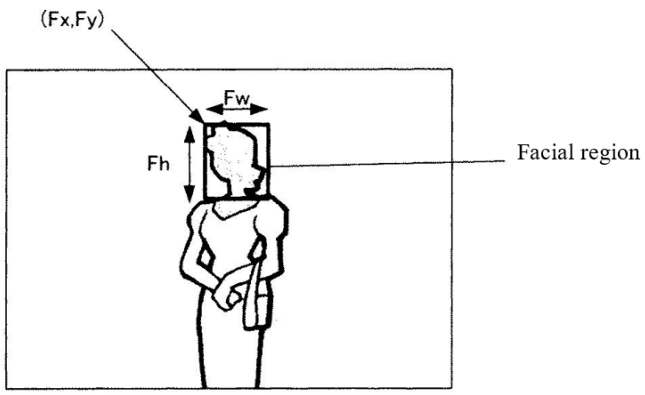
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user presence is identified by the processor detecting a body part in the images.	presence is identified by the processor detecting a body part in the images. *See*, *e.g.*, disclosures below. "OBJECTIVE: To perpetually present information in a form that is easy for the user to notice and visually recognize and further present information without hindering the original functions of the mirror. MEANS FOR ACHIEVING THE OBJECTIVE: Facial detection means 31 detects the region representing a human face in the image projected from image sensor 20 that forms the image of the front region of display 10. And presented-information control means 32 alters the information presented and thus displayed on said display based on the position and shape of the facial region thus detected. The means for achieving the objective include presenting information in ways suitable for the user's visual recognition according to the distance between the user and the display, presenting animation that moves at a faster or slower speed or stops moving depending on whether the distance to the user is close or far, and altering the magnification ratio of the information according to the variation in the distance between the user and the display." *See* Abstract. "When the user's face is detected through an image sensor installed on the device side, the positional relationship between the device and the user can be estimated based on the position and size of the facial region. It also becomes possible to present appropriate information based on the positional relationship thus estimated. Given this factor, the environmental information-presentation device according to the present invention is characterized by comprising a display, an image sensor, a means for detecting faces, and a means for controlling the information presented, wherein:

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	The facial detection means detects the region representing a human face in the image projected from the image sensor that forms the image of the front region of the display; and The presented-information control means alters the information presented and thus displayed on the display based on the position and shape of the facial region thus detected. In particular, the size of the facial region detected is associated with the distance between the user and the device. Accordingly, the aforementioned presented-information control means presents information suitable for viewing from a distance when the size of the facial region detected by the facial detection means is small. However, when the size of the facial region detected by the facial detection means is large, the presented-information control means presents information suitable for viewing from a close range." *See* paras. [0014]-[0016]. "That is, the aforementioned presented-information control means of the aforementioned environmental information-presentation device according to the present invention is characterized by detecting chronological changes in the size of the facial region detected by the aforementioned facial detection means and altering the presented information upon detection of an increase in the size of the facial region. Furthermore, the mirror-type environmental information-presentation device has the following mechanism to prevent any interference with the user's act of viewing the mirror. That is, in the environmental information-presentation device according to the present invention, the aforementioned presented-information control means calculates the facial presentation region and the truncal presentation region in the display viewport based on the facial region detected by the aforementioned facial detection means and then presents

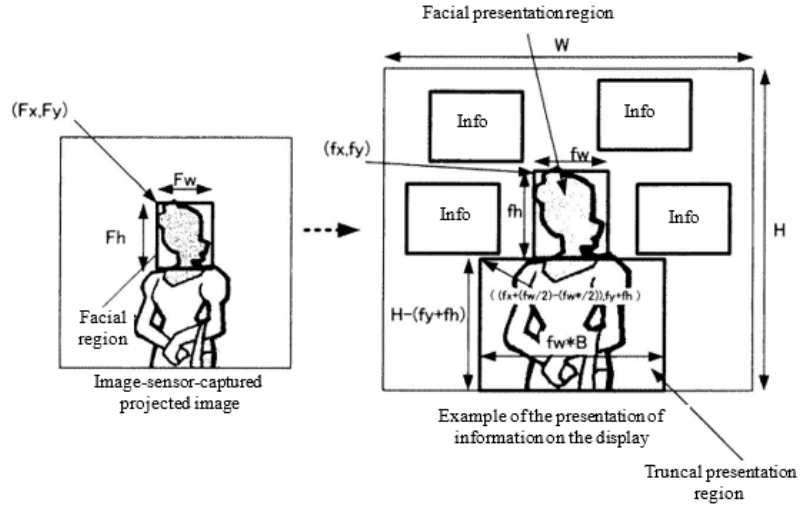
Asserted Claim of the '110 Patent	Exemplary Citations to Miyaoku
	information in regions within the viewport other than the facial and truncal presentation regions. Additionally, the environmental information-presentation method according to the present invention is characterized by being adapted to devices equipped with a display, an image sensor, a facial detection means, and a presented-information control means and comprising each processing step performed in the above-mentioned processing means so as to achieve the presentation of environmental information. Additionally, the program according to the present invention is characterized by being configured so as to allow the aforementioned environmental information-presentation method to be executed on a computer." [0021]-[0025]. "The basic example configuration of the environmental information-presentation device according to the present invention is shown in Figure 1. The figure consists of at least display 10, image sensor 20 that forms images of the area from which one can view said display (generally the area in front of the display), and computer 30 that processes projected images input from the image sensor and controls the information presented on the display. Here, computer 30 internally comprises facial detection means 31 that detects a facial region in the image projected from image sensor 20, and presented-information control means 32 that controls the presented information based on the position and shape of the facial region thus detected. Facial detection means 31 and presented-information control means 32 may be implemented as software that runs on the OS of computer 30. In this case, computer 10 is equipped with an input/output interface means (e.g., image processing means 33, which is an interface device used to output images onto a display or the like) — such an input/output interface means being provided in order to enable each means (which is software) to process projected images as formed by image sensor 20 and control the output toward display 10 — and memory 34. Furthermore, facial detection means 31, in

Asserted Claim of the ’110 Patent	Exemplary Citations to Miyaoku
	particular, can be implemented using hardware dedicated to processing projected images to improve processing speed. The information displayed on display 10 via presented-information control means 32 may be pre-stored in memory 34 of computer 30. Additionally, because a particularly important role of an environmental information-presentation device is to inform users of new information, the device may be configured so as to receive information over a network and present the information thus received. For this purpose, computer 30 is equipped with a communication means 35 for communicating with LAN and the Internet. In this case, presented-information control means 32 basically downloads information from a prescribed server in a sequential manner, converts it into a prescribed form suitable for the environmental information presentation, displays it on display 10, and perpetually repeats these steps. The following is an explanation of the operation of the environmental information-presentation device according to the present invention: Image sensor 20 forms the image of the front area of display 10, as described above. Facial detection means 31 processes the projected image in real-time as it is formed by image sensor 20. First, it detects the presence of a human face. And, if a face is detected, it detects the region of the face (the facial region) in the projected image. For example, the technique described in Non-Patent Literature 3 below can be used for such processing. Furthermore, facial detection means 31 sends information about the position and shape of the facial region to presented-information control means 32.” *See* paras. [0028]-[0031]. Figure 1:

Asserted Claim of the ’110 Patent	Exemplary Citations to Miyaoku
	 “Figure 2 shows an example of a facial region detected, by facial detection means 31, in a projected image as formed by image sensor 20. In this example, the facial region is detected as a rectangular region. When such a rectangular facial region is detected, facial detection means 31 sends, to presented-information control means 32, the coordinates (Fx, Fy) of the upper right corner of said rectangular region in the projected image as well as the width Fw and the height Fh of the rectangular, all of which act as the facial region position/shape information. Presented-information control means 32 modifies the information to be presented, doing so based on the facial region position/shape information received from facial detection means 31. The following is an explanation of embodiments of the control of information presented.” *See* paras. [0033]-[0034].

Asserted Claim of the ’110 Patent	Exemplary Citations to Miyaoku
	Figure 2:  Projected image as captured by an image sensor “(Embodiment 1) Control Based on the Size of Facial Region Presented-information control means 32 presets a threshold value Z for facial region sizes. Additionally, presented-information control means 32, at the initial stage, presents information in a form suitable for viewing from a distance. Said “form suitable for viewing from a distance” is, for example, a form of display whereby most characters are in large font and only a small amount of information is presented, e.g., to the extent of headings only. In terms of images or videos, they are displayed in forms enlarged enough to allow the subjects to be identified even from a distance. Presented-information control means 32 — upon receipt of facial region position/shape information [(Fx, Fy), Fw, and Fh] from facial detection means 31 — calculates the facial region size (the area size of the rectangular facial region) Fw*Fh. Then, if Fw*Fh $\geqq$ Z, the information presented is altered to a form suitable for viewing from a close range. Said “form suitable for viewing from a close range” is, for example, a form in which characters are in relatively small font presenting detailed information. In terms of

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	images or videos, they are displayed in sizes suitable for viewing from a close range and in forms that may include the display of text information, such as telops." *See* paras. [0035]-[0036]. "Presented-information control means 32 retains predefined thresholds Z(0), . . ., Z(n-1) for n facial image sizes. Additionally, presented-information control means 32 retains n+1 sets of character display specifications Dn (n=0, 1,. . ., n) corresponding to the cases of the facial image size Fw*Fh<Z(0), the cases of Z(k-1)≦Fw*Fh<Z(k) (where k = 1, 2, . . ., n-1), and the cases of Z(n-1)≦Fw*Fh. That is, the table shown in Table 2 below is retained so as to manage the correlation between the size of the facial image detected and the respective set of character display specifications D0 through Dn." *See* para. [0047]. "First, upon receipt of facial region position/shape information [(Fx, Fy), Fw, and Fh] from facial detection means 31, the facial presentation region in the viewport on display 10A is calculated based on said facial region position/shape information thus received. For example, suppose that the resolution of the projected image, as formed by image sensor 20, is 500 × 400, and the resolution of the display viewport is 1000 × 800. In this case, the facial presentation region of the display viewport that corresponds to the facial region position/shape information [(Fx, Fy), Fw, and Fh] is a rectangular region with the upper-right-corner coordinates of (Fx*2, Fy*2), the width of Fw*2, and the height of Fh*2." *See* para. [0075]. Figure 7:

Asserted Claim of the ’110 Patent	Exemplary Citations to Miyaoku
	 This limitation would have been obvious to a person of ordinary skill in the art based on (1) Miyaoku alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

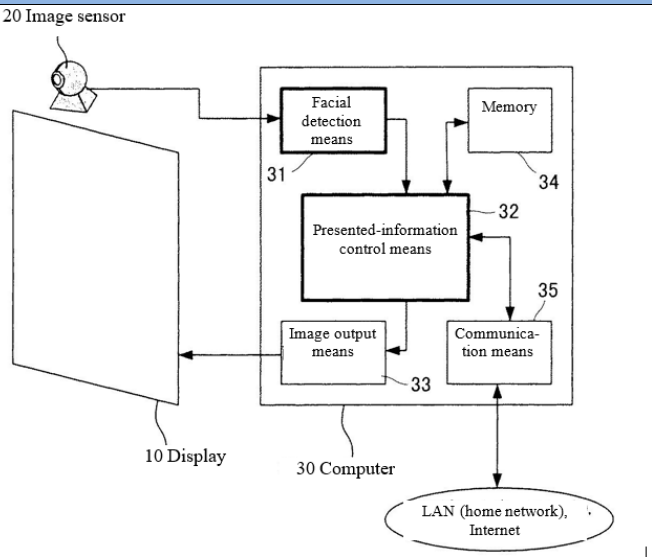
Asserted Claim of the ’110 Patent	Exemplary Citations to Miyaoku
Claim 4	
4. The method of claim 3, wherein the body part comprises one of legs, face, eyes, and hands.	Miyaoku expressly and/or inherently discloses and/or renders obvious wherein the body part comprises one of legs, face, eyes, and hands. *See*, *e.g.*, disclosures below.

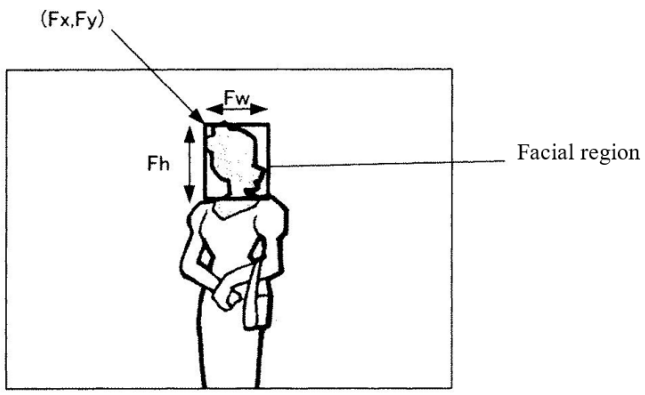
Asserted Claim of the ’110 Patent	Exemplary Citations to Miyaoku
	“OBJECTIVE: To perpetually present information in a form that is easy for the user to notice and visually recognize and further present information without hindering the original functions of the mirror. MEANS FOR ACHIEVING THE OBJECTIVE: Facial detection means 31 detects the region representing a human face in the image projected from image sensor 20 that forms the image of the front region of display 10. And presented-information control means 32 alters the information presented and thus displayed on said display based on the position and shape of the facial region thus detected. The means for achieving the objective include presenting information in ways suitable for the user's visual recognition according to the distance between the user and the display, presenting animation that moves at a faster or slower speed or stops moving depending on whether the distance to the user is close or far, and altering the magnification ratio of the information according to the variation in the distance between the user and the display.” *See* Abstract. “When the user's face is detected through an image sensor installed on the device side, the positional relationship between the device and the user can be estimated based on the position and size of the facial region. It also becomes possible to present appropriate information based on the positional relationship thus estimated. Given this factor, the environmental information-presentation device according to the present invention is characterized by comprising a display, an image sensor, a means for detecting faces, and a means for controlling the information presented, wherein: The facial detection means detects the region representing a human face in the image projected from the image sensor that forms the image of the front region of the display; and

Asserted Claim of the '110 Patent	Exemplary Citations to Miyaoku
	The presented-information control means alters the information presented and thus displayed on the display based on the position and shape of the facial region thus detected. In particular, the size of the facial region detected is associated with the distance between the user and the device. Accordingly, the aforementioned presented-information control means presents information suitable for viewing from a distance when the size of the facial region detected by the facial detection means is small. However, when the size of the facial region detected by the facial detection means is large, the presented-information control means presents information suitable for viewing from a close range." *See* paras. [0014]-[0016]. "That is, the aforementioned presented-information control means of the aforementioned environmental information-presentation device according to the present invention is characterized by detecting chronological changes in the size of the facial region detected by the aforementioned facial detection means and altering the presented information upon detection of an increase in the size of the facial region. Furthermore, the mirror-type environmental information-presentation device has the following mechanism to prevent any interference with the user's act of viewing the mirror. That is, in the environmental information-presentation device according to the present invention, the aforementioned presented-information control means calculates the facial presentation region and the truncal presentation region in the display viewport based on the facial region detected by the aforementioned facial detection means and then presents information in regions within the viewport other than the facial and truncal presentation regions. Additionally, the environmental information-presentation method according to the present invention is characterized by being adapted to devices equipped with a display, an image sensor, a facial detection means, and a presented-information control means

Asserted Claim of the '110 Patent	Exemplary Citations to Miyaoku
	and comprising each processing step performed in the above-mentioned processing means so as to achieve the presentation of environmental information. Additionally, the program according to the present invention is characterized by being configured so as to allow the aforementioned environmental information-presentation method to be executed on a computer." [0021]-[0025]. "The basic example configuration of the environmental information-presentation device according to the present invention is shown in Figure 1. The figure consists of at least display 10, image sensor 20 that forms images of the area from which one can view said display (generally the area in front of the display), and computer 30 that processes projected images input from the image sensor and controls the information presented on the display. Here, computer 30 internally comprises facial detection means 31 that detects a facial region in the image projected from image sensor 20, and presented-information control means 32 that controls the presented information based on the position and shape of the facial region thus detected. Facial detection means 31 and presented-information control means 32 may be implemented as software that runs on the OS of computer 30. In this case, computer 10 is equipped with an input/output interface means (e.g., image processing means 33, which is an interface device used to output images onto a display or the like) — such an input/output interface means being provided in order to enable each means (which is software) to process projected images as formed by image sensor 20 and control the output toward display 10 — and memory 34. Furthermore, facial detection means 31, in particular, can be implemented using hardware dedicated to processing projected images to improve processing speed. The information displayed on display 10 via presented-information control means 32 may be pre-stored in memory 34 of computer 30. Additionally, because a particularly important role of an environmental information-presentation device is to inform users of new information, the device may be configured so as to receive information over a network and present the information thus received. For this purpose, computer 30 is

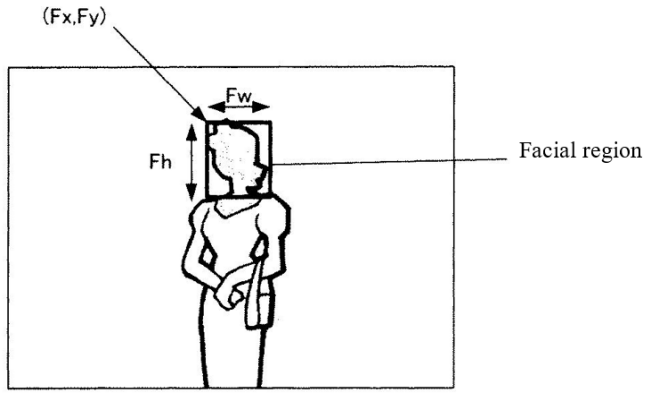
Asserted Claim of the ’110 Patent	Exemplary Citations to Miyaoku
	equipped with a communication means 35 for communicating with LAN and the Internet. In this case, presented-information control means 32 basically downloads information from a prescribed server in a sequential manner, converts it into a prescribed form suitable for the environmental information presentation, displays it on display 10, and perpetually repeats these steps. The following is an explanation of the operation of the environmental information-presentation device according to the present invention: Image sensor 20 forms the image of the front area of display 10, as described above. Facial detection means 31 processes the projected image in real-time as it is formed by image sensor 20. First, it detects the presence of a human face. And, if a face is detected, it detects the region of the face (the facial region) in the projected image. For example, the technique described in Non-Patent Literature 3 below can be used for such processing. Furthermore, facial detection means 31 sends information about the position and shape of the facial region to presented-information control means 32.” *See* paras. [0028]-[0031]. Figure 1:

Asserted Claim of the '110 Patent	Exemplary Citations to Miyaoku
	 "Figure 2 shows an example of a facial region detected, by facial detection means 31, in a projected image as formed by image sensor 20. In this example, the facial region is detected as a rectangular region. When such a rectangular facial region is detected, facial detection means 31 sends, to presented-information control means 32, the coordinates (Fx, Fy) of the upper right corner of said rectangular region in the projected image as well as the width Fw and the height Fh of the rectangular, all of which act as the facial region position/shape information. Presented-information control means 32 modifies the information to be presented, doing so based on the facial region position/shape information received from facial detection means 31. The following is an explanation of embodiments of the control of information presented." *See* paras. [0033]-[0034].

Asserted Claim of the ’110 Patent	Exemplary Citations to Miyaoku
	Figure 2:  Projected image as captured by an image sensor “(Embodiment 1) Control Based on the Size of Facial Region Presented-information control means 32 presets a threshold value Z for facial region sizes. Additionally, presented-information control means 32, at the initial stage, presents information in a form suitable for viewing from a distance. Said “form suitable for viewing from a distance” is, for example, a form of display whereby most characters are in large font and only a small amount of information is presented, e.g., to the extent of headings only. In terms of images or videos, they are displayed in forms enlarged enough to allow the subjects to be identified even from a distance. Presented-information control means 32 — upon receipt of facial region position/shape information [(Fx, Fy), Fw, and Fh] from facial detection means 31 — calculates the facial region size (the area size of the rectangular facial region) Fw*Fh. Then, if Fw*Fh $\geqq$ Z, the information presented is altered to a form suitable for viewing from a close range. Said “form suitable for viewing from a close range” is, for example, a form in which characters are in relatively small font presenting detailed information. In terms of

Asserted Claim of the ’110 Patent	Exemplary Citations to Miyaoku
	images or videos, they are displayed in sizes suitable for viewing from a close range and in forms that may include the display of text information, such as telops.” *See* paras. [0035]-[0036]. “Presented-information control means 32 retains predefined thresholds Z(0), . . ., Z(n-1) for n facial image sizes. Additionally, presented-information control means 32 retains n+1 sets of character display specifications Dn (n=0, 1,. . ., n) corresponding to the cases of the facial image size Fw*Fh<Z(0), the cases of Z(k-1)≦Fw*Fh<Z(k) (where k = 1, 2, . . ., n-1), and the cases of Z(n-1)≦Fw*Fh. That is, the table shown in Table 2 below is retained so as to manage the correlation between the size of the facial image detected and the respective set of character display specifications D0 through Dn.” *See* para. [0047]. “First, upon receipt of facial region position/shape information [(Fx, Fy), Fw, and Fh] from facial detection means 31, the facial presentation region in the viewport on display 10A is calculated based on said facial region position/shape information thus received. For example, suppose that the resolution of the projected image, as formed by image sensor 20, is 500 × 400, and the resolution of the display viewport is 1000 × 800. In this case, the facial presentation region of the display viewport that corresponds to the facial region position/shape information [(Fx, Fy), Fw, and Fh] is a rectangular region with the upper-right-corner coordinates of (Fx*2, Fy*2), the width of Fw*2, and the height of Fh*2.” *See* para. [0075]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Miyaoku alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

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Claim 5	
5. The method of claim 1, further comprising receiving user input and operating the processor to vary image magnitude or field-of-view of the modified images according to the user input.	Miyaoku expressly and/or inherently discloses and/or renders obvious receiving user input and operating the processor to vary image magnitude or field-of-view of the modified images according to the user input. *See*, *e.g.*, disclosures below. "Furthermore, the environmental information-presentation device according to the present invention adopts a creative approach in order to make presented information more visually recognizable, doing so through a mechanism that actively expands information and presents more details to the user who is about to approach the device." *See* para. [0020]. "Figure 2 shows an example of a facial region detected, by facial detection means 31, in a projected image as formed by image sensor 20. In this example, the facial region is detected as a rectangular region. When such a rectangular facial region is detected, facial detection means 31 sends, to presented-information control means 32, the coordinates (Fx, Fy) of the upper right corner of said rectangular region in the projected image as well as the width Fw and the height Fh of the rectangular, all of which act as the facial region position/shape information. Presented-information control means 32 modifies the information to be presented, doing so based on the facial region position/shape information received from facial detection means 31. The following is an explanation of embodiments of the control of information presented." *See* paras. [0033]-[0034]. Figure 2:

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	 Projected image as captured by an image sensor “(Embodiment 1) Control Based on the Size of Facial Region Presented-information control means 32 presets a threshold value Z for facial region sizes. Additionally, presented-information control means 32, at the initial stage, presents information in a form suitable for viewing from a distance. Said “form suitable for viewing from a distance” is, for example, a form of display whereby most characters are in large font and only a small amount of information is presented, e.g., to the extent of headings only. In terms of images or videos, they are displayed in forms enlarged enough to allow the subjects to be identified even from a distance. Presented-information control means 32 — upon receipt of facial region position/shape information [(Fx, Fy), Fw, and Fh] from facial detection means 31 — calculates the facial region size (the area size of the rectangular facial region) Fw*Fh. Then, if Fw*Fh $\geqq$ Z, the information presented is altered to a form suitable for viewing from a close range. Said “form suitable for viewing from a close range” is, for example, a form in which characters are in relatively small font presenting detailed information. In terms of images or videos, they are displayed in sizes suitable for viewing from a close range and

Asserted Claim of the '110 Patent	Exemplary Citations to Miyaoku
	in forms that may include the display of text information, such as telops." *See* paras. [0035]-[0036]. "(Embodiment 2) Control Based on Facial region Size and Application to Animation Presented-information control means 32 may use animation when presenting information. Human vision is responsive to moving objects. By nature, it instinctively fixates on a moving object that is present in the field of view. Therefore, animation is a useful means for attracting the attention of users located in the vicinity of the environmental information-presentation device. Given this factor, presented-information control means 32 may, for example, present multiple thumbnail images and apply animation in such a way that each thumbnail moves through the viewport on display 10. Figure 5 shows an example of the animation of moving thumbnails. Additionally, various types of animation can be used. Examples include animated text, images, and other objects that expand and shrink in size in a repetitive manner, appear and disappear in a repetitive manner, and so on. Furthermore, the animated motion of objects in the viewport on display 10 is easy to visually recognize from a distance. For example, the characteristic position-shifting patterns, such as vertical movement, horizontal movement, etc., as well as actions, such as zooming in/out action, showing/hiding action (blinking), can catch one's eye even from a distance at which images and text information presented within an object may not be visible. The inclusion of information in animated motions can be said to be one of the information presentation forms suggested for viewing from a distance. By including information in animated motions, it becomes possible, for example, to express the importance of the information by the speed of the movement or the blinking speed. It becomes also possible to associate a specific behavior pattern to a specific meaning, for example, to a type of information.

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	In this way, animation can be used to draw users' attention and make distant users recognize the attributes of the information. Also, by presenting images of fish instead of thumbnail images and animating each image of fish as if swimming in water, it becomes possible to add an aquarium-like anesthetic value to the environmental information-presentation device. In this case, it is also possible to make the users recognize the attributes of the information by means of the color and movement of the fish. However, such animation can get in the way of nearby users trying to see the detailed information presented on display 10. For example, it will be very difficult to read text if the thumbnail images containing text information move up and down, left to right, etc. Given this factor, the present embodiment executes the following processing to enable the effective use of animation in environmental information presentation. First, presented-information control means 32 presets a threshold Z associated with the facial region size. Furthermore, presented-information control means 32 manages animation specifications A0 predefined for the cases of Fw*Fh<Z and animation specifications A1 predefined for the cases of Fw*Fh≧Z, doing so in a memory accessible by said presented-information control means 32. Incidentally, the term “animation specifications” refers to a description of the specifications of animation to be displayed in the display viewport. In the case of animated thumbnail images shown in Figure 5, the animation specifications include information such as the image display size, image blinking pattern, image blinking speed, image motion pattern, image motion range, image motion speed, etc. Presented-information control means 32 executes the animation of each thumbnail image according to such animation specifications. Presented-information control means 32 calculates the facial region size (area size of the rectangular facial region) Fw*Fh upon receipt of facial region position/shape information [(Fx, Fy), Fw, and Fh] from facial detection means 31. If Fw*Fh<Z,

Asserted Claim of the '110 Patent	Exemplary Citations to Miyaoku
	presented-information control means 32 controls the presentation of thumbnail images according to animation specifications A0. However, if Fw*Fh≧Z, it controls the presentation of thumbnail images according to animation specifications A1. Fast-moving animation is suitable for presenting information to distant users, and slow-moving animation is suitable for presenting information to nearby users. Accordingly, in the present embodiment, the above-mentioned processing may be set so as to accelerate the image blinking speed and image operation speed according to animation specifications A0 when Fw*Fh<Z (i.e., when the facial image size is small) but decelerate the image blinking speed and image operation speed according to animation specifications A0 when Fw*Fh≧Z (i.e., when the facial image size is large). This makes it possible to adapt the animation speed to the distance between the user and the device." *See* paras. [0052]-[0062]. "Fast-moving animation is suitable for presenting information to distant users, and slow-moving animation is suitable for presenting information to nearby users. Accordingly, in the present embodiment, the above-mentioned processing may be set so as to accelerate the image blinking speed and image operation speed according to animation specifications A0 when Fw*Fh<Z (i.e., when the facial image size is small) but decelerate the image blinking speed and image operation speed according to animation specifications A0 when Fw*Fh≧Z (i.e., when the facial image size is large). This makes it possible to adapt the animation speed to the distance between the user and the device. Incidentally, it is also possible to implement incremental motion control in the control of animation, doing so through the same steps described in Embodiment 1 above. In this case, presented-information control means 32 retains thresholds Z(0), . . ., Z(n-1) predefined for n facial image sizes. Additionally, presented-information control means 32 retains n+1 sets of animation specifications An (n=0, 1, . . ., n) corresponding to the cases of the facial image size Fw*Fh<Z(0), the cases of Z(k-1)≦Fw*Fh<Z(k) (where k = 1, 2, . . ., n-1), and the cases of Z(n-1)≦Fw*Fh.

<table>
<tr><th>Asserted Claim of the ’110 Patent</th><th>Exemplary Citations to Miyaoku</th></tr>
<tr><td></td><td>The content of the processing is the same as the steps described in Embodiment 1, except that the animation specifications are used in place of the character display specifications and that the subject of the control is animation, not the text display, as shown in Table 3 below by way of example.

Through such processing, it becomes possible to control the animation, for example, in such a way that the motion speed of the animation gradually slows down as the size of the facial region Fw*Fh increases.” See paras. [0063]-[0066].

Table 3:

<table>
<tr><td>Name of specification item</td><td>Description of specification</td></tr>
<tr><td>Image display size</td><td>320×240</td></tr>
<tr><td>Image blinking pattern</td><td>Blink with difference brightness levels</td></tr>
<tr><td>Image blinking speed</td><td>5 times per second</td></tr>
<tr><td>Image behavior pattern</td><td>Vertical movement</td></tr>
<tr><td>Image movement range</td><td>Upper/lower ±100 pixels</td></tr>
<tr><td>Image movement speed</td><td>100 pixels per second</td></tr>
<tr><td>. . .</td><td></td></tr>
</table>

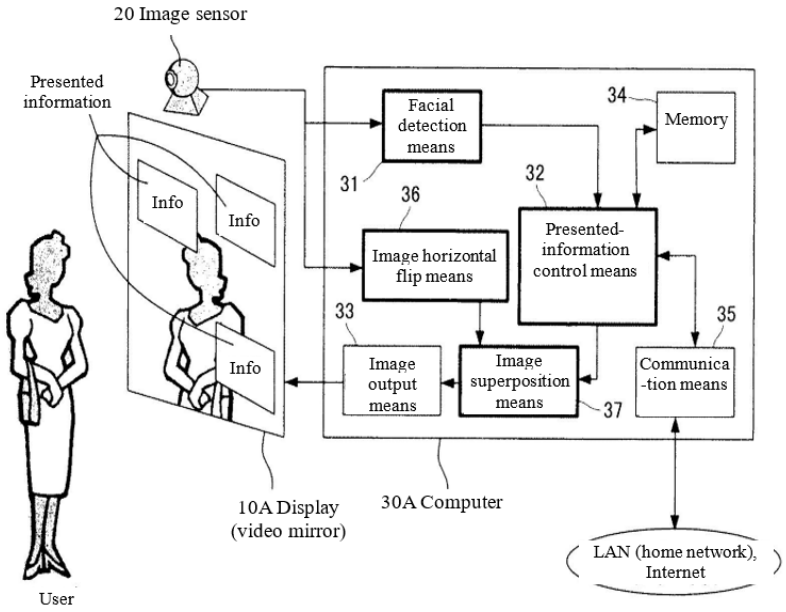
“Incidentally, presented-information control means 32 may be implemented in such a way that it manages multiple sets of character display specifications Dn (n = 0, 1, . . ., n) and animation specifications An (n = 0, 1, . . ., n) concurrently so that the text display control and the animation control described in embodiments 1 and 2 are performed concurrently.

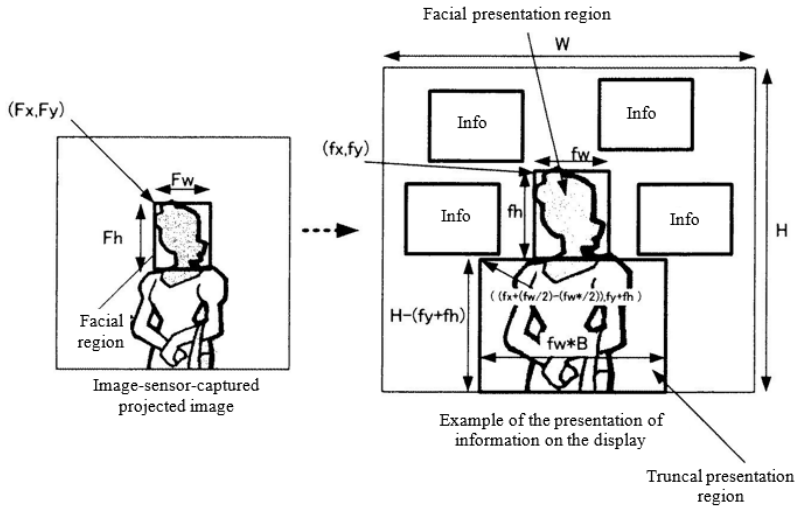
(Embodiment 3) Control Based on Size Variation of Facial region
Presented-information control means 32 presets a threshold value V for the size variation of the facial region. It retains, in memory 34, facial region position/shape</td></tr>
</table>

Asserted Claim of the ’110 Patent	Exemplary Citations to Miyaoku
	information [(Fx(i), Fy(i), Fw(i), and Fh(i)], which is sequentially received from facial detection means 31. Each time the facial region position/shape information is received, the facial-region size variation value is calculated as follows: ((Fw(i)*Fh(i))/(Fw(i-1)*Fh(i-1))) The facial-region size variation value represents the ratio of the most recently detected size Fw(i)*Fh(i) of the facial region to the size Fw(i-1)*Fh(i-1) of the facial region detected one before said most recent size. If it is greater than 1, the facial region size has become larger. If it is less than 1, the facial region's size has become smaller. The direction in which the user moves can be estimated based on the variation in the size of the facial region. That is, if the size of a user's facial region increases, it can be determined that the user is approaching the environmental information-presentation device. The threshold V for the facial-region size variation is used as an indicator to determine whether the user’s movement is intentional. Suppose the facial-region size variation value is somewhat high, indicating a value equal to or greater than 1. In that case, it can be determined that the user is approaching the environmental information-presentation device at a relatively fast speed. In other words, it is determined that the user is intentionally moving toward the environmental information-presentation device. As such, the presented-information control means determines that the user is approaching the device because he or she is interested in the presented information and thus performs the processing required to alter, e.g., expand, the presented information when the following condition is satisfied: ((Fw(i)*Fh(i))/(Fw(i-1)*Fh(i-1)))≧V It should be noted that the above illustration is an example of the present embodiment. Presented-information control means 32 may set a threshold value V’, which is less than 1, so as to perform the processing required to present a message to attract the user's

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	interest when the following condition is satisfied, i.e., when the user is moving in the direction away from the environmental information-presentation device: ((Fw(i)*Fh(i))/(Fw(i-1)*Fh(i-1)))<V’” *See* paras. [0067]-[0072]. “(Embodiment 4) Control Based on the Position of Facial region in Mirror-type Environmental Information-Presentation Device Figure 6 shows an example configuration of the mirror-type environmental information-presentation device. In the example configuration shown in the figure, a video mirror acts as display 10A. Computer 30A horizontally flips the projected image formed by image sensor 20, converts the size to fit the display size, and thus presents the image on display 10A. As such, it virtually acts as a mirror. Information such as thumbnail images presented by presented-information control means 32 is superimposed and thus presented on the image projected from image sensor 20. For this purpose, the present mirror-type environmental information-presentation device is equipped with an image horizontal-flip means 36 and image superimposition means 37, in addition to each means constituting the environmental information-presentation device shown in Figure 1. When a mirror-type environmental information-presentation device presents information, it is expected that the information thus presented does not interfere with the user's own figure projected in the mirror. Given this factor, presented-information control means 32 performs the following processing steps: First, upon receipt of facial region position/shape information [(Fx, Fy), Fw, and Fh] from facial detection means 31, the facial presentation region in the viewport on display 10A is calculated based on said facial region position/shape information thus received. For example, suppose that the resolution of the projected image, as formed by image sensor 20, is 500 × 400, and the resolution of the display viewport is 1000 × 800. In this case, the facial presentation region of the display viewport that corresponds to the facial region position/shape information [(Fx, Fy), Fw, and Fh] is a rectangular region with the

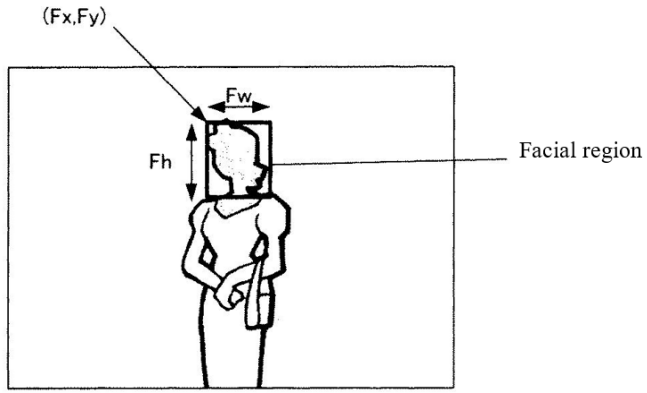
Asserted Claim of the ’110 Patent	Exemplary Citations to Miyaoku
	upper-right-corner coordinates of (Fx*2, Fy*2), the width of Fw*2, and the height of Fh*2. The user won't be able to see his or her own face projected in the mirror if an image or other information is displayed in the facial presentation region. Accordingly, presented-information control means 32 prevents information from being presented in the facial presentation region. Additionally, if any information has already been presented in the facial presentation region, presented-information control means 32 changes the position of the information to a position outside the facial presentation region. Furthermore, presented-information control means 32 may be configured to control the presentation of information by estimating the truncal presentation region in the display viewport based on the facial region detected by facial detection means 31 so as to present information in regions other than the facial presentation region and the truncal presentation region. Figure 7 shows an example presentation of information in such a case. Additionally, an example content of the processing performed by presented-information control means 32 is described below: Suppose that the resolution of the viewport on display 10A is W × H, and the facial presentation region calculated by presented-information control means 32 is a rectangular region with the upper-right-corner coordinates of the display viewport being (Fx, Fy), the width being fw, and the height being fh. In this case, the trunk is located below the facial region. It also occupies a region that is wider than the facial region. Accordingly, presented-information control means 32 uses a prescribed value B (value representing (Width of the truncal presentation region / Width of the facial presentation region)) to estimate that the truncal presentation region is a rectangular region with the upper right corner coordinate of ((fx+(fw/2)-(fw*B/2)), fy+fh), the width of fw*B, and the height of H-(fy+fh). Presented-information control means 32 performs the steps described above to thereby prevent information from being presented in the facial and truncal presentation regions

Asserted Claim of the ’110 Patent	Exemplary Citations to Miyaoku
	thus calculated. Additionally, if any information has already been presented in the facial or truncal presentation region, presented-information control means 32 changes the position of the information to a position outside the facial presentation region.” *See* paras. [0073]-[0080]. Figure 6:  Figure 7:

Asserted Claim of the '110 Patent	Exemplary Citations to Miyaoku
	 This limitation would have been obvious to a person of ordinary skill in the art based on (1) Miyaoku alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

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Claim 6	
6. The method of claim 5, wherein the processor varies the image magnitude or field-of-view mapping to display a partial	Miyaoku expressly and/or inherently discloses and/or renders obvious wherein the processor varies the image magnitude or field-of-view mapping to display a partial or full body of the user in the modified images. *See*, *e.g.*, disclosures below.

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or full body of the user in the modified images.	"Furthermore, the environmental information-presentation device according to the present invention adopts a creative approach in order to make presented information more visually recognizable, doing so through a mechanism that actively expands information and presents more details to the user who is about to approach the device." *See* para. [0020]. "Figure 2 shows an example of a facial region detected, by facial detection means 31, in a projected image as formed by image sensor 20. In this example, the facial region is detected as a rectangular region. When such a rectangular facial region is detected, facial detection means 31 sends, to presented-information control means 32, the coordinates (Fx, Fy) of the upper right corner of said rectangular region in the projected image as well as the width Fw and the height Fh of the rectangular, all of which act as the facial region position/shape information. Presented-information control means 32 modifies the information to be presented, doing so based on the facial region position/shape information received from facial detection means 31. The following is an explanation of embodiments of the control of information presented." *See* paras. [0033]-[0034]. Figure 2:

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	 Projected image as captured by an image sensor “(Embodiment 1) Control Based on the Size of Facial Region Presented-information control means 32 presets a threshold value Z for facial region sizes. Additionally, presented-information control means 32, at the initial stage, presents information in a form suitable for viewing from a distance. Said “form suitable for viewing from a distance” is, for example, a form of display whereby most characters are in large font and only a small amount of information is presented, e.g., to the extent of headings only. In terms of images or videos, they are displayed in forms enlarged enough to allow the subjects to be identified even from a distance. Presented-information control means 32 — upon receipt of facial region position/shape information [(Fx, Fy), Fw, and Fh] from facial detection means 31 — calculates the facial region size (the area size of the rectangular facial region) Fw*Fh. Then, if Fw*Fh $\geqq$ Z, the information presented is altered to a form suitable for viewing from a close range. Said “form suitable for viewing from a close range” is, for example, a form in which characters are in relatively small font presenting detailed information. In terms of images or videos, they are displayed in sizes suitable for viewing from a close range and

Asserted Claim of the '110 Patent	Exemplary Citations to Miyaoku
	in forms that may include the display of text information, such as telops." *See* paras. [0035]-[0036]. "(Embodiment 2) Control Based on Facial region Size and Application to Animation Presented-information control means 32 may use animation when presenting information. Human vision is responsive to moving objects. By nature, it instinctively fixates on a moving object that is present in the field of view. Therefore, animation is a useful means for attracting the attention of users located in the vicinity of the environmental information-presentation device. Given this factor, presented-information control means 32 may, for example, present multiple thumbnail images and apply animation in such a way that each thumbnail moves through the viewport on display 10. Figure 5 shows an example of the animation of moving thumbnails. Additionally, various types of animation can be used. Examples include animated text, images, and other objects that expand and shrink in size in a repetitive manner, appear and disappear in a repetitive manner, and so on. Furthermore, the animated motion of objects in the viewport on display 10 is easy to visually recognize from a distance. For example, the characteristic position-shifting patterns, such as vertical movement, horizontal movement, etc., as well as actions, such as zooming in/out action, showing/hiding action (blinking), can catch one's eye even from a distance at which images and text information presented within an object may not be visible. The inclusion of information in animated motions can be said to be one of the information presentation forms suggested for viewing from a distance. By including information in animated motions, it becomes possible, for example, to express the importance of the information by the speed of the movement or the blinking speed. It becomes also possible to associate a specific behavior pattern to a specific meaning, for example, to a type of information.

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	In this way, animation can be used to draw users' attention and make distant users recognize the attributes of the information. Also, by presenting images of fish instead of thumbnail images and animating each image of fish as if swimming in water, it becomes possible to add an aquarium-like anesthetic value to the environmental information-presentation device. In this case, it is also possible to make the users recognize the attributes of the information by means of the color and movement of the fish. However, such animation can get in the way of nearby users trying to see the detailed information presented on display 10. For example, it will be very difficult to read text if the thumbnail images containing text information move up and down, left to right, etc. Given this factor, the present embodiment executes the following processing to enable the effective use of animation in environmental information presentation. First, presented-information control means 32 presets a threshold Z associated with the facial region size. Furthermore, presented-information control means 32 manages animation specifications A0 predefined for the cases of Fw*Fh<Z and animation specifications A1 predefined for the cases of Fw*Fh≧Z, doing so in a memory accessible by said presented-information control means 32. Incidentally, the term “animation specifications” refers to a description of the specifications of animation to be displayed in the display viewport. In the case of animated thumbnail images shown in Figure 5, the animation specifications include information such as the image display size, image blinking pattern, image blinking speed, image motion pattern, image motion range, image motion speed, etc. Presented-information control means 32 executes the animation of each thumbnail image according to such animation specifications. Presented-information control means 32 calculates the facial region size (area size of the rectangular facial region) Fw*Fh upon receipt of facial region position/shape information [(Fx, Fy), Fw, and Fh] from facial detection means 31. If Fw*Fh<Z,

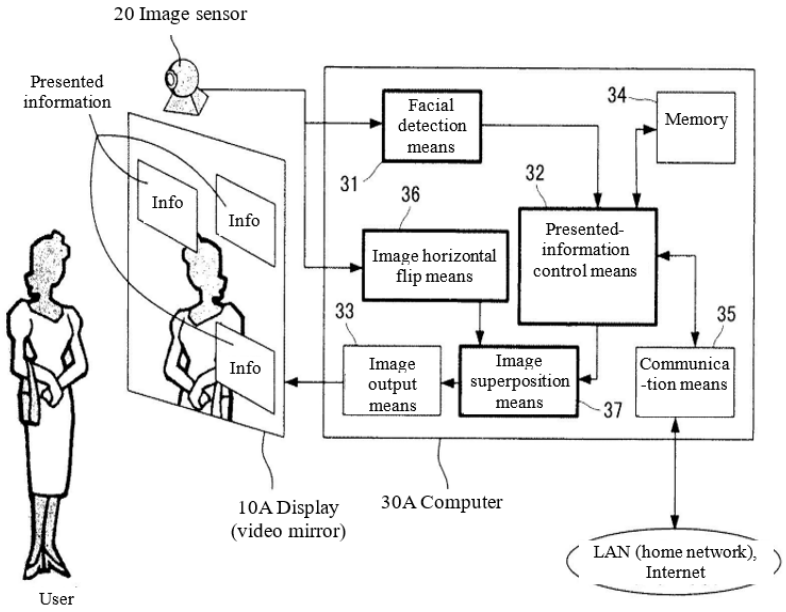
Asserted Claim of the '110 Patent	Exemplary Citations to Miyaoku
	presented-information control means 32 controls the presentation of thumbnail images according to animation specifications A0. However, if Fw*Fh≧Z, it controls the presentation of thumbnail images according to animation specifications A1. Fast-moving animation is suitable for presenting information to distant users, and slow-moving animation is suitable for presenting information to nearby users. Accordingly, in the present embodiment, the above-mentioned processing may be set so as to accelerate the image blinking speed and image operation speed according to animation specifications A0 when Fw*Fh<Z (i.e., when the facial image size is small) but decelerate the image blinking speed and image operation speed according to animation specifications A0 when Fw*Fh≧Z (i.e., when the facial image size is large). This makes it possible to adapt the animation speed to the distance between the user and the device." *See* paras. [0052]-[0062]. "Fast-moving animation is suitable for presenting information to distant users, and slow-moving animation is suitable for presenting information to nearby users. Accordingly, in the present embodiment, the above-mentioned processing may be set so as to accelerate the image blinking speed and image operation speed according to animation specifications A0 when Fw*Fh<Z (i.e., when the facial image size is small) but decelerate the image blinking speed and image operation speed according to animation specifications A0 when Fw*Fh≧Z (i.e., when the facial image size is large). This makes it possible to adapt the animation speed to the distance between the user and the device. Incidentally, it is also possible to implement incremental motion control in the control of animation, doing so through the same steps described in Embodiment 1 above. In this case, presented-information control means 32 retains thresholds Z(0), . . ., Z(n-1) predefined for n facial image sizes. Additionally, presented-information control means 32 retains n+1 sets of animation specifications An (n=0, 1, . . ., n) corresponding to the cases of the facial image size Fw*Fh<Z(0), the cases of Z(k-1)≦Fw*Fh<Z(k) (where k = 1, 2, . . ., n-1), and the cases of Z(n-1)≦Fw*Fh.

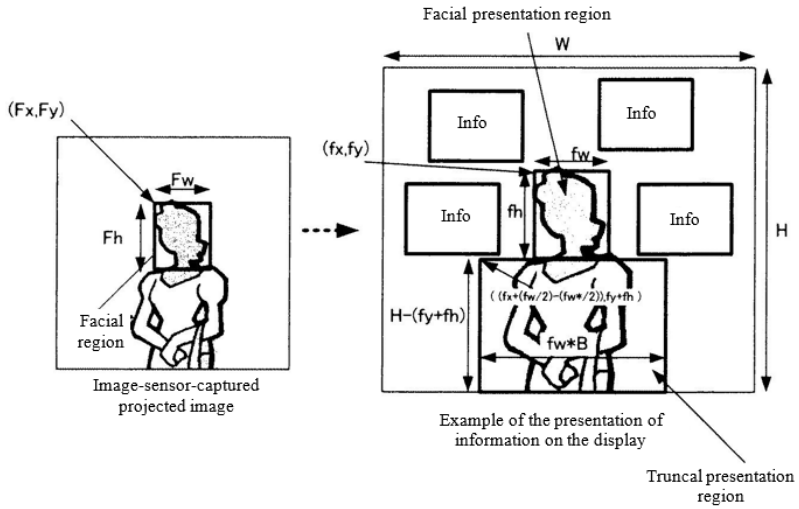
Asserted Claim of the '110 Patent	Exemplary Citations to Miyaoku
	The content of the processing is the same as the steps described in Embodiment 1, except that the animation specifications are used in place of the character display specifications and that the subject of the control is animation, not the text display, as shown in Table 3 below by way of example. Through such processing, it becomes possible to control the animation, for example, in such a way that the motion speed of the animation gradually slows down as the size of the facial region Fw*Fh increases." *See* paras. [0063]-[0066]. Table 3: Name of specification item / Description of specification Image display size / 320×240 Image blinking pattern / Blink with difference brightness levels Image blinking speed / 5 times per second Image behavior pattern / Vertical movement Image movement range / Upper/lower ±100 pixels Image movement speed / 100 pixels per second . . . "Incidentally, presented-information control means 32 may be implemented in such a way that it manages multiple sets of character display specifications Dn (n = 0, 1, . . ., n) and animation specifications An (n = 0, 1, . . ., n) concurrently so that the text display control and the animation control described in embodiments 1 and 2 are performed concurrently. (Embodiment 3) Control Based on Size Variation of Facial region Presented-information control means 32 presets a threshold value V for the size variation of the facial region. It retains, in memory 34, facial region position/shape

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	information [(Fx(i), Fy(i), Fw(i), and Fh(i)], which is sequentially received from facial detection means 31. Each time the facial region position/shape information is received, the facial-region size variation value is calculated as follows: ((Fw(i)*Fh(i))/(Fw(i-1)*Fh(i-1))) The facial-region size variation value represents the ratio of the most recently detected size Fw(i)*Fh(i) of the facial region to the size Fw(i-1)*Fh(i-1) of the facial region detected one before said most recent size. If it is greater than 1, the facial region size has become larger. If it is less than 1, the facial region's size has become smaller. The direction in which the user moves can be estimated based on the variation in the size of the facial region. That is, if the size of a user's facial region increases, it can be determined that the user is approaching the environmental information-presentation device. The threshold V for the facial-region size variation is used as an indicator to determine whether the user’s movement is intentional. Suppose the facial-region size variation value is somewhat high, indicating a value equal to or greater than 1. In that case, it can be determined that the user is approaching the environmental information-presentation device at a relatively fast speed. In other words, it is determined that the user is intentionally moving toward the environmental information-presentation device. As such, the presented-information control means determines that the user is approaching the device because he or she is interested in the presented information and thus performs the processing required to alter, e.g., expand, the presented information when the following condition is satisfied: ((Fw(i)*Fh(i))/(Fw(i-1)*Fh(i-1)))≧V It should be noted that the above illustration is an example of the present embodiment. Presented-information control means 32 may set a threshold value V’, which is less than 1, so as to perform the processing required to present a message to attract the user's

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	interest when the following condition is satisfied, i.e., when the user is moving in the direction away from the environmental information-presentation device: ((Fw(i)*Fh(i))/(Fw(i-1)*Fh(i-1)))<V'" *See* paras. [0067]-[0072]. "(Embodiment 4) Control Based on the Position of Facial region in Mirror-type Environmental Information-Presentation Device Figure 6 shows an example configuration of the mirror-type environmental information-presentation device. In the example configuration shown in the figure, a video mirror acts as display 10A. Computer 30A horizontally flips the projected image formed by image sensor 20, converts the size to fit the display size, and thus presents the image on display 10A. As such, it virtually acts as a mirror. Information such as thumbnail images presented by presented-information control means 32 is superimposed and thus presented on the image projected from image sensor 20. For this purpose, the present mirror-type environmental information-presentation device is equipped with an image horizontal-flip means 36 and image superimposition means 37, in addition to each means constituting the environmental information-presentation device shown in Figure 1. When a mirror-type environmental information-presentation device presents information, it is expected that the information thus presented does not interfere with the user's own figure projected in the mirror. Given this factor, presented-information control means 32 performs the following processing steps: First, upon receipt of facial region position/shape information [(Fx, Fy), Fw, and Fh] from facial detection means 31, the facial presentation region in the viewport on display 10A is calculated based on said facial region position/shape information thus received. For example, suppose that the resolution of the projected image, as formed by image sensor 20, is 500 × 400, and the resolution of the display viewport is 1000 × 800. In this case, the facial presentation region of the display viewport that corresponds to the facial region position/shape information [(Fx, Fy), Fw, and Fh] is a rectangular region with the

Asserted Claim of the ’110 Patent	Exemplary Citations to Miyaoku
	upper-right-corner coordinates of (Fx*2, Fy*2), the width of Fw*2, and the height of Fh*2. The user won't be able to see his or her own face projected in the mirror if an image or other information is displayed in the facial presentation region. Accordingly, presented-information control means 32 prevents information from being presented in the facial presentation region. Additionally, if any information has already been presented in the facial presentation region, presented-information control means 32 changes the position of the information to a position outside the facial presentation region. Furthermore, presented-information control means 32 may be configured to control the presentation of information by estimating the truncal presentation region in the display viewport based on the facial region detected by facial detection means 31 so as to present information in regions other than the facial presentation region and the truncal presentation region. Figure 7 shows an example presentation of information in such a case. Additionally, an example content of the processing performed by presented-information control means 32 is described below: Suppose that the resolution of the viewport on display 10A is W × H, and the facial presentation region calculated by presented-information control means 32 is a rectangular region with the upper-right-corner coordinates of the display viewport being (Fx, Fy), the width being fw, and the height being fh. In this case, the trunk is located below the facial region. It also occupies a region that is wider than the facial region. Accordingly, presented-information control means 32 uses a prescribed value B (value representing (Width of the truncal presentation region / Width of the facial presentation region)) to estimate that the truncal presentation region is a rectangular region with the upper right corner coordinate of ((fx+(fw/2)-(fw*B/2)), fy+fh), the width of fw*B, and the height of H-(fy+fh). Presented-information control means 32 performs the steps described above to thereby prevent information from being presented in the facial and truncal presentation regions

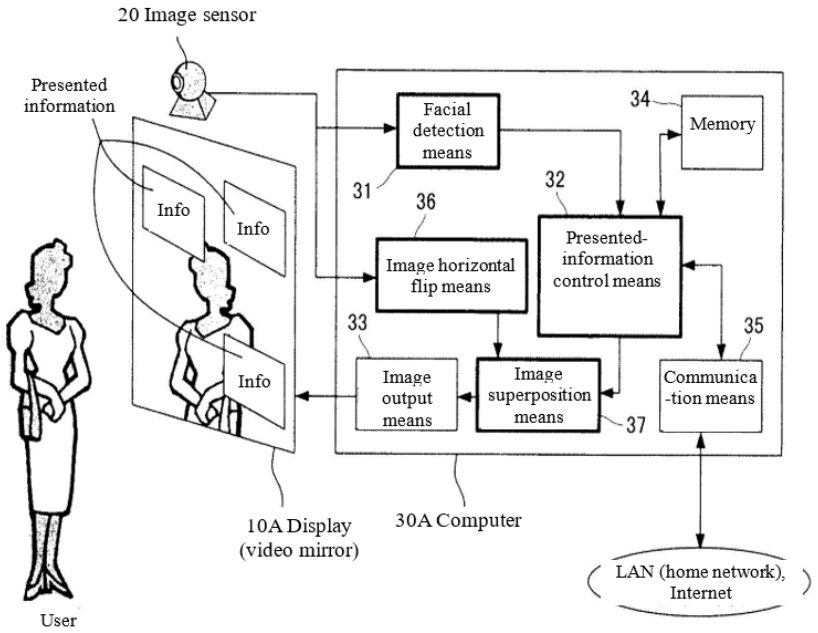
Asserted Claim of the ’110 Patent	Exemplary Citations to Miyaoku
	thus calculated. Additionally, if any information has already been presented in the facial or truncal presentation region, presented-information control means 32 changes the position of the information to a position outside the facial presentation region.” *See* paras. [0073]-[0080]. Figure 6:  Figure 7:

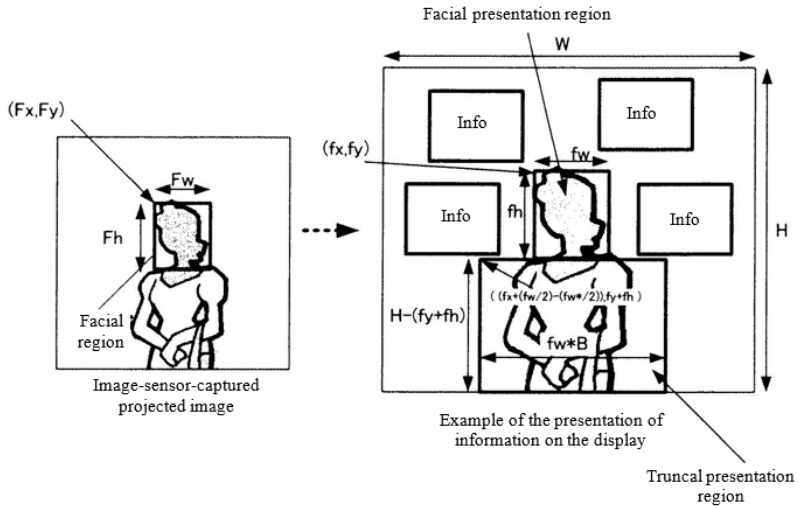
Asserted Claim of the '110 Patent	Exemplary Citations to Miyaoku
	 This limitation would have been obvious to a person of ordinary skill in the art based on (1) Miyaoku alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

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Claim 10	
10. The method of claim 1, further comprising operating the processor to augment the modified images by	Miyaoku expressly and/or inherently discloses and/or renders obvious operating the processor to augment the modified images by overlaying virtual objects on a user's image appearing within the modified images. *See*, *e.g.*, disclosures below.

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overlaying virtual objects on a user's image appearing within the modified images.	“Furthermore, it is important that the mirror-type environmental information-presentation device has both the original function of a mirror and the ability to present information. To begin with, a mirror is a tool the user uses to confirm his or her appearance based on his or her own reflection in the mirror. Such an original function of the mirror will be hindered if any information is superimposed on the same position as the user's reflection. The mirror-type environmental information-presentation device must have an information presentation mechanism that takes this point into account.” *See* para. [0011]. “In particular, the size of the facial region detected is associated with the distance between the user and the device. Accordingly, the aforementioned presented-information control means presents information suitable for viewing from a distance when the size of the facial region detected by the facial detection means is small. However, when the size of the facial region detected by the facial detection means is large, the presented-information control means presents information suitable for viewing from a close range. Users far away from the environmental information-presentation device cannot visually recognize details in a text shown on the display screen. Animation is a possible option to express information in such a way that it is easy to understand for users located far away from the device. Objects displayed on the screen can convey simple attributes of information to the user by making characteristic motions (gestures) consisting of combinations of rotations, position changes, etc. Animation is also effective for making users at a distance aware of the existence of the information. However, nearby users can read text, etc., to obtain more specific information. In this case, it is not advisable to apply animation (i.e., a moving object, including text), as it will interfere with the user’s visual recognition of the text. In other words, when using animation, its behavior must be controlled according to the distance from the user.

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	Accordingly, the environmental information-presentation device according to the present invention has a means that allows for the following option when the presented-information control means uses animation to present information: The use of animation that moves at a fast speed when the size of the facial region detected by the facial detection means is small, or The use of animation that moves at a slow speed or the cessation of the motion of the animation when the size of the facial region detected by the facial detection means is large." *See* paras. [0016]-[0019]. "That is, in the environmental information-presentation device according to the present invention, the aforementioned presented-information control means calculates the facial presentation region and the truncal presentation region in the display viewport based on the facial region detected by the aforementioned facial detection means and then presents information in regions within the viewport other than the facial and truncal presentation regions." *See* para. [0023]. "(Embodiment 4) Control Based on the Position of Facial region in Mirror-type Environmental Information-Presentation Device Figure 6 shows an example configuration of the mirror-type environmental information-presentation device. In the example configuration shown in the figure, a video mirror acts as display 10A. Computer 30A horizontally flips the projected image formed by image sensor 20, converts the size to fit the display size, and thus presents the image on display 10A. As such, it virtually acts as a mirror. Information such as thumbnail images presented by presented-information control means 32 is superimposed and thus presented on the image projected from image sensor 20. For this purpose, the present mirror-type environmental information-presentation device is equipped with an image horizontal-flip means 36 and image superimposition means 37, in addition to each means constituting the environmental information-presentation device shown in Figure 1.

Asserted Claim of the ’110 Patent	Exemplary Citations to Miyaoku
	When a mirror-type environmental information-presentation device presents information, it is expected that the information thus presented does not interfere with the user's own figure projected in the mirror. Given this factor, presented-information control means 32 performs the following processing steps:” *See* paras. [0073]-[0074]. Figure 6:  Figure 7:

Asserted Claim of the '110 Patent	Exemplary Citations to Miyaoku
	 This limitation would have been obvious to a person of ordinary skill in the art based on (1) Miyaoku alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

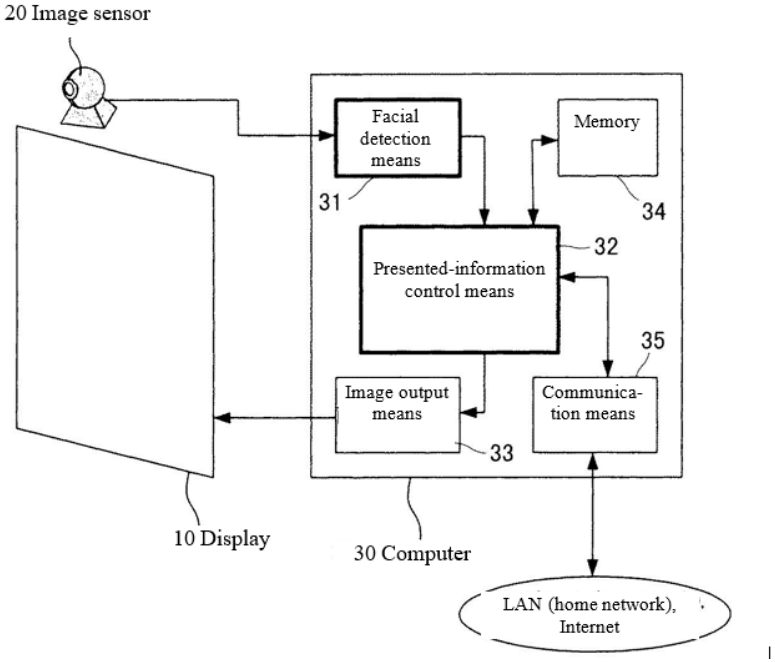
Asserted Claim of the '110 Patent	Exemplary Citations to Miyaoku
Claim 11	
11. The method of claim 1, further comprising operating the processor to	Miyaoku expressly and/or inherently discloses and/or renders obvious operating the processor to transmit the modified image over a network. *See*, *e.g.*, disclosures below.

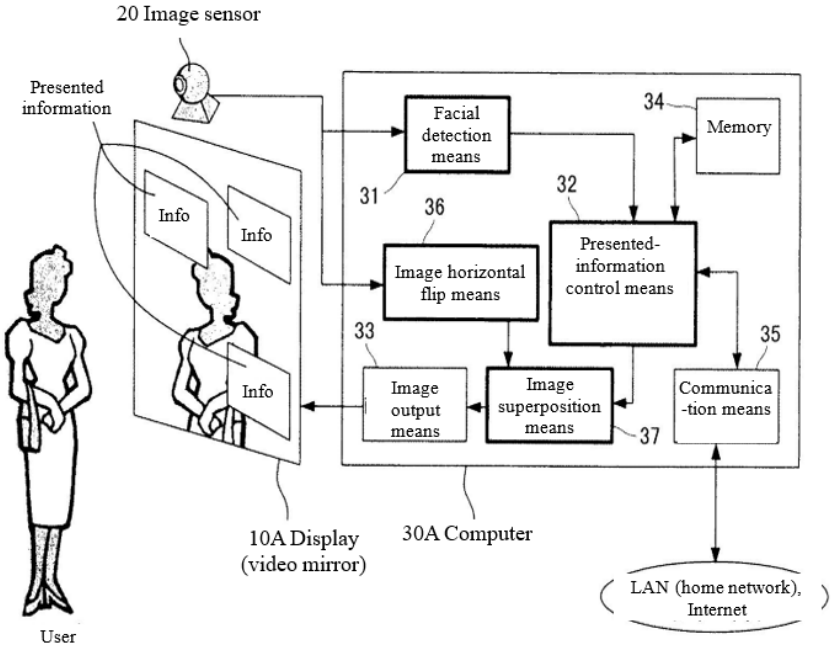
Asserted Claim of the '110 Patent	Exemplary Citations to Miyaoku
transmit the modified image over a network.	"Systems that provide information to users through displays embedded in indoor walls and furniture have been proposed in the field of ubiquitous computing research. Such systems are intended to spontaneously increase the opportunities for users to notice such information throughout their everyday lives. Here, such systems shall be referred to as the "environmental information-presentation devices. The most basic example configuration of an environmental information-presentation device is a wall-mounted display. It is a thin display with built-in computer and network communication features, such a thin display being mountable on an indoor wall. The wall-mounted display acquires and presents information sequentially from a prescribed server on the network. For example, it regularly accesses a server that provides weather forecast information and presents that information. The wall-mounted displays can not only present information but also have features for interactions. The wall-mounted displays are essentially the same as ordinary computers. If an input device, such as a button or a touch panel, is provided, the user can use it to manipulate the information to be displayed. Videophones, which have become popular in recent years, can be used as a type of environmental information-presentation device. Videophones based on VoIP (Voice Over Internet Protocol) have the ability to obtain information from the Internet. This makes it possible for the videophones' displays to present information environmentally when not on a call. Furthermore, according to some systems that have been developed so far, the existing functions of household goods are extended with computers so that household goods can be used as environmental information-presentation devices. In particular, some mirror systems have been developed with additional features that allow the mirrors to act as wall-mounted displays, given that mirrors are often subject to users' attention in their daily lives and also comprise surface areas suitable for presenting information.

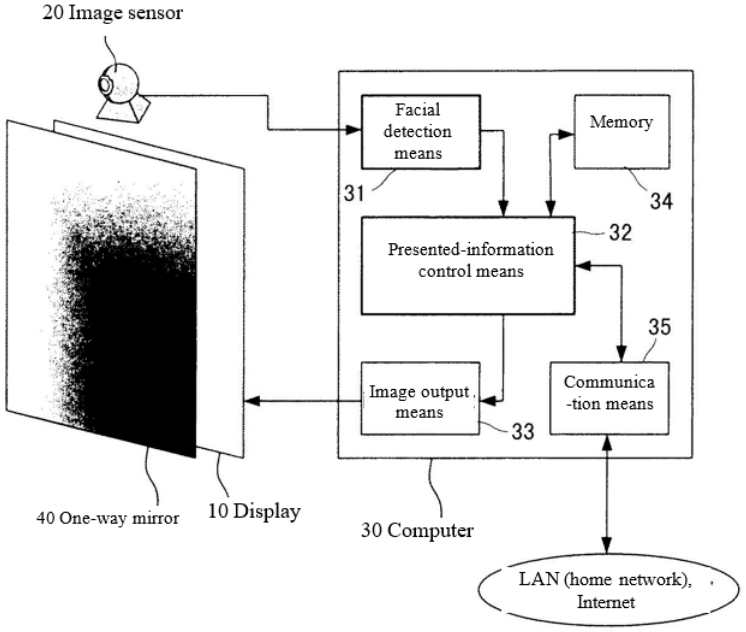
Asserted Claim of the ’110 Patent	Exemplary Citations to Miyaoku
	For example, Non-Patent Literature 1 describes a system that presents information on a display placed behind a one-way mirror. Said system has an image sensor and also a feature that allows for the reception of optical signals from mobile terminals and the manipulation of information according to the content of the signals. Additionally, Non-Patent Literature 2 proposes a system that allows the user to manipulate image information that is virtually presented in a mirror, doing by pointing the image with the hand of his or her own image projected in the mirror. In order to calculate the positional relationship between the user's own figure and the image information presented on the mirror, this system uses a video mirror, whereby an image projected from a camera capturing the front of the system is displayed on the display.” *See* paras. [0002]-[0008]. “An environmental information-presentation device is a system that continues to present information perpetually. Unlike systems actively used by the user with the purpose of using information, the present system presents information to users who have no intention of using information. Therefore, the method used to present information must differ from that of ordinary web browsers. In particular, because the distance between a user and the environmental information-presentation device is not fixed, the present system must take into account the distance from the user when displaying information. For example, it is meaningless to present detailed information that contains a large amount of text in a small font to a user who is far away from the device because the user cannot read it. The environmental information-presentation device is useless unless one can visually recognize the content of the presented information when he or she happens to turn their eyes toward the device. Accordingly, it must be able to present information in a form that is easy for the user to visually recognize according to the distance. Furthermore, it is important that the mirror-type environmental information-presentation device has both the original function of a mirror and the ability to present information. To begin with, a mirror is a tool the user uses to confirm his or her

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	appearance based on his or her own reflection in the mirror. Such an original function of the mirror will be hindered if any information is superimposed on the same position as the user's reflection. The mirror-type environmental information-presentation device must have an information presentation mechanism that takes this point into account. Furthermore, in order to make environmental information-presentation devices available to a wider range of consumers, it is important that they can be configured at low cost. In particular, videophones and the system according to Non-Patented Literature 1 are equipped with image sensors. Therefore, if the aforementioned problems can be resolved through the use of image sensors, the cost burden can be reduced. In view of the points listed above, the present invention is intended to provide an environmental information-presentation device, a method for the environmental presentation of information, and a program for said method, with which the above-mentioned requirements are fulfilled, doing so through the use of a system that uses an image sensor.” *See* paras. [0009]-[0013]. “Additionally, because the present invention uses an image sensor, it can be implemented in existing devices that are already equipped with an image sensor, e.g., videophones, thus lowering the cost.” *See* para. [0027]. “The basic example configuration of the environmental information-presentation device according to the present invention is shown in Figure 1. The figure consists of at least display 10, image sensor 20 that forms images of the area from which one can view said display (generally the area in front of the display), and computer 30 that processes projected images input from the image sensor and controls the information presented on the display. Here, computer 30 internally comprises facial detection means 31 that detects a facial region in the image projected from image sensor 20, and presented-information control means 32 that controls the presented information based on the position and shape of the facial region thus detected.

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	Facial detection means 31 and presented-information control means 32 may be implemented as software that runs on the OS of computer 30. In this case, computer 10 is equipped with an input/output interface means (e.g., image processing means 33, which is an interface device used to output images onto a display or the like) — such an input/output interface means being provided in order to enable each means (which is software) to process projected images as formed by image sensor 20 and control the output toward display 10 — and memory 34. Furthermore, facial detection means 31, in particular, can be implemented using hardware dedicated to processing projected images to improve processing speed. The information displayed on display 10 via presented-information control means 32 may be pre-stored in memory 34 of computer 30. Additionally, because a particularly important role of an environmental information-presentation device is to inform users of new information, the device may be configured so as to receive information over a network and present the information thus received. For this purpose, computer 30 is equipped with a communication means 35 for communicating with LAN and the Internet. In this case, presented-information control means 32 basically downloads information from a prescribed server in a sequential manner, converts it into a prescribed form suitable for the environmental information presentation, displays it on display 10, and perpetually repeats these steps. The following is an explanation of the operation of the environmental information-presentation device according to the present invention: Image sensor 20 forms the image of the front area of display 10, as described above. Facial detection means 31 processes the projected image in real-time as it is formed by image sensor 20. First, it detects the presence of a human face. And, if a face is detected, it detects the region of the face (the facial region) in the projected image. For example, the technique described in Non-Patent Literature 3 below can be used for such processing. Furthermore, facial detection means 31 sends information about the position and shape of the facial region to presented-information control means 32." *See* paras. [0028]-[0031].

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	Figure 1:  Figure 6:

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	 Figure 8:

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	 This limitation would have been obvious to a person of ordinary skill in the art based on (1) Miyaoku alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

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Claim 12	

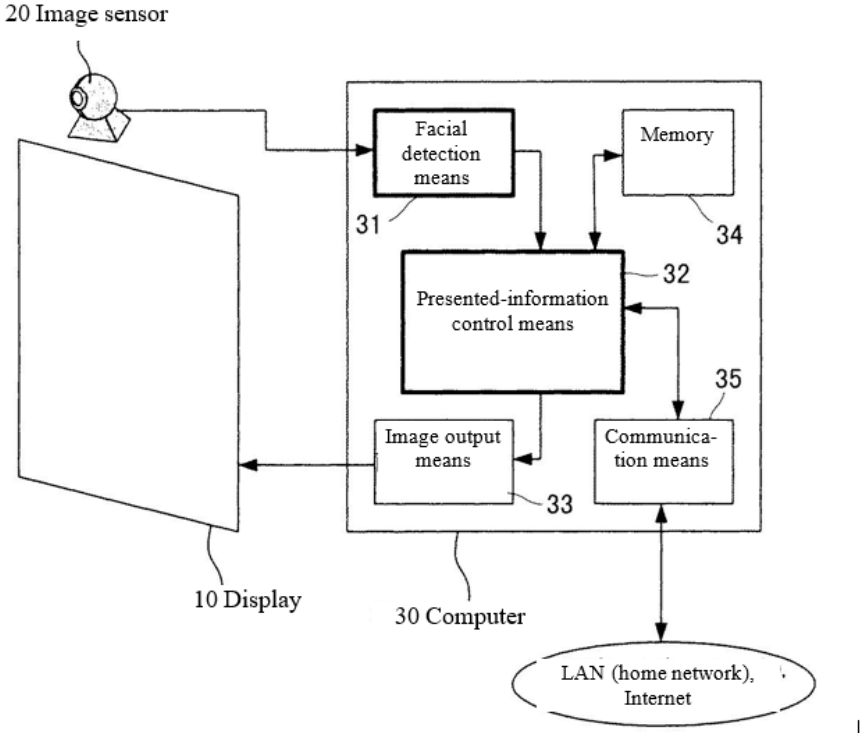
Asserted Claim of the '110 Patent	Exemplary Citations to Miyaoku
12. The method of claim 1, further comprising displaying the modified image on a remote screen for video telepresence.	To the extent the preamble is limiting, Miyaoku expressly and/or inherently discloses and/or renders obvious displaying the modified image on a remote screen for video telepresence. *See*, *e.g.*, disclosures below. "OBJECTIVE: To perpetually present information in a form that is easy for the user to notice and visually recognize and further present information without hindering the original functions of the mirror. MEANS FOR ACHIEVING THE OBJECTIVE: Facial detection means 31 detects the region representing a human face in the image projected from image sensor 20 that forms the image of the front region of display 10. And presented-information control means 32 alters the information presented and thus displayed on said display based on the position and shape of the facial region thus detected. The means for achieving the objective include presenting information in ways suitable for the user's visual recognition according to the distance between the user and the display, presenting animation that moves at a faster or slower speed or stops moving depending on whether the distance to the user is close or far, and altering the magnification ratio of the information according to the variation in the distance between the user and the display." *See* Abstract. "Systems that provide information to users through displays embedded in indoor walls and furniture have been proposed in the field of ubiquitous computing research. Such systems are intended to spontaneously increase the opportunities for users to notice such information throughout their everyday lives. Here, such systems shall be referred to as the "environmental information-presentation devices. The most basic example configuration of an environmental information-presentation device is a wall-mounted display. It is a thin display with built-in computer and network communication features, such a thin display being mountable on an indoor wall. The wall-mounted display acquires and presents information sequentially from a prescribed

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	server on the network. For example, it regularly accesses a server that provides weather forecast information and presents that information. The wall-mounted displays can not only present information but also have features for interactions. The wall-mounted displays are essentially the same as ordinary computers. If an input device, such as a button or a touch panel, is provided, the user can use it to manipulate the information to be displayed. Videophones, which have become popular in recent years, can be used as a type of environmental information-presentation device. Videophones based on VoIP (Voice Over Internet Protocol) have the ability to obtain information from the Internet. This makes it possible for the videophones’ displays to present information environmentally when not on a call. Furthermore, according to some systems that have been developed so far, the existing functions of household goods are extended with computers so that household goods can be used as environmental information-presentation devices. In particular, some mirror systems have been developed with additional features that allow the mirrors to act as wall-mounted displays, given that mirrors are often subject to users’ attention in their daily lives and also comprise surface areas suitable for presenting information. For example, Non-Patent Literature 1 describes a system that presents information on a display placed behind a one-way mirror. Said system has an image sensor and also a feature that allows for the reception of optical signals from mobile terminals and the manipulation of information according to the content of the signals. Additionally, Non-Patent Literature 2 proposes a system that allows the user to manipulate image information that is virtually presented in a mirror, doing by pointing the image with the hand of his or her own image projected in the mirror. In order to calculate the positional relationship between the user's own figure and the image information presented on the mirror, this system uses a video mirror, whereby an image

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	projected from a camera capturing the front of the system is displayed on the display." *See* paras. [0002]-[0008]. "Furthermore, it is important that the mirror-type environmental information-presentation device has both the original function of a mirror and the ability to present information. To begin with, a mirror is a tool the user uses to confirm his or her appearance based on his or her own reflection in the mirror. Such an original function of the mirror will be hindered if any information is superimposed on the same position as the user's reflection. The mirror-type environmental information-presentation device must have an information presentation mechanism that takes this point into account." *See* para. [0011]. "Given this factor, the environmental information-presentation device according to the present invention is characterized by comprising a display, an image sensor, a means for detecting faces, and a means for controlling the information presented, wherein: The facial detection means detects the region representing a human face in the image projected from the image sensor that forms the image of the front region of the display; and The presented-information control means alters the information presented and thus displayed on the display based on the position and shape of the facial region thus detected." *See* para. [0015]. "Furthermore, the mirror-type environmental information-presentation device has the following mechanism to prevent any interference with the user's act of viewing the mirror. That is, in the environmental information-presentation device according to the present invention, the aforementioned presented-information control means calculates the facial presentation region and the truncal presentation region in the display viewport based on the facial region detected by the aforementioned facial detection means and then presents

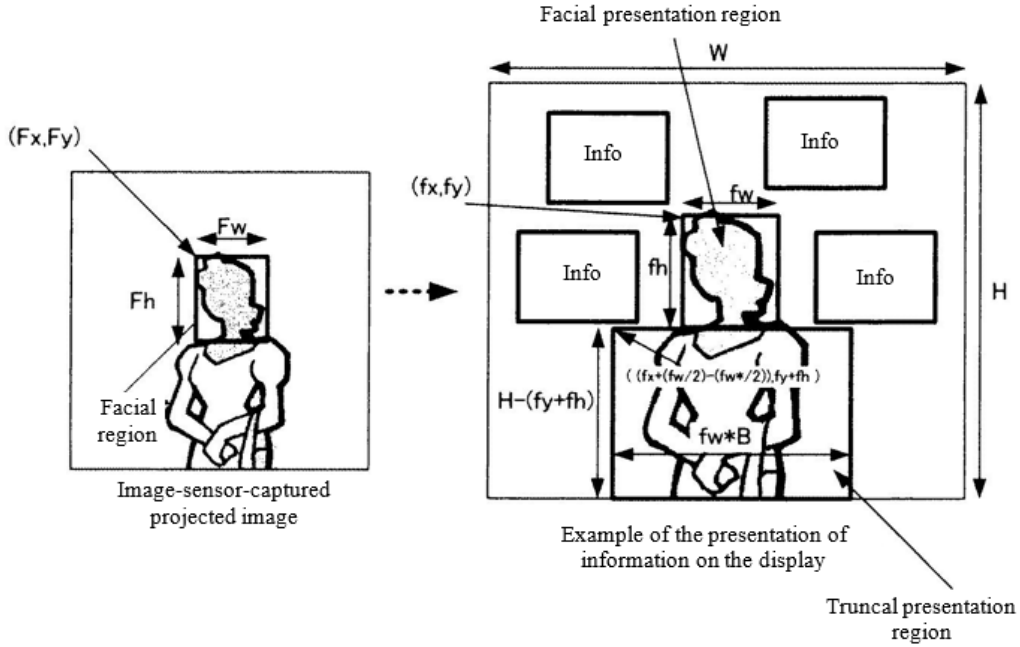
Asserted Claim of the '110 Patent	Exemplary Citations to Miyaoku
	information in regions within the viewport other than the facial and truncal presentation regions. Additionally, the environmental information-presentation method according to the present invention is characterized by being adapted to devices equipped with a display, an image sensor, a facial detection means, and a presented-information control means and comprising each processing step performed in the above-mentioned processing means so as to achieve the presentation of environmental information. Additionally, the program according to the present invention is characterized by being configured so as to allow the aforementioned environmental information-presentation method to be executed on a computer." [0022]-[0025]. "The basic example configuration of the environmental information-presentation device according to the present invention is shown in Figure 1. The figure consists of at least display 10, image sensor 20 that forms images of the area from which one can view said display (generally the area in front of the display), and computer 30 that processes projected images input from the image sensor and controls the information presented on the display. Here, computer 30 internally comprises facial detection means 31 that detects a facial region in the image projected from image sensor 20, and presented-information control means 32 that controls the presented information based on the position and shape of the facial region thus detected. Facial detection means 31 and presented-information control means 32 may be implemented as software that runs on the OS of computer 30. In this case, computer 10 is equipped with an input/output interface means (e.g., image processing means 33, which is an interface device used to output images onto a display or the like) — such an input/output interface means being provided in order to enable each means (which is software) to process projected images as formed by image sensor 20 and control the output toward display 10 — and memory 34. Furthermore, facial detection means 31, in

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	particular, can be implemented using hardware dedicated to processing projected images to improve processing speed. The information displayed on display 10 via presented-information control means 32 may be pre-stored in memory 34 of computer 30. Additionally, because a particularly important role of an environmental information-presentation device is to inform users of new information, the device may be configured so as to receive information over a network and present the information thus received. For this purpose, computer 30 is equipped with a communication means 35 for communicating with LAN and the Internet. In this case, presented-information control means 32 basically downloads information from a prescribed server in a sequential manner, converts it into a prescribed form suitable for the environmental information presentation, displays it on display 10, and perpetually repeats these steps. The following is an explanation of the operation of the environmental information-presentation device according to the present invention: Image sensor 20 forms the image of the front area of display 10, as described above. Facial detection means 31 processes the projected image in real-time as it is formed by image sensor 20. First, it detects the presence of a human face. And, if a face is detected, it detects the region of the face (the facial region) in the projected image. For example, the technique described in Non-Patent Literature 3 below can be used for such processing. Furthermore, facial detection means 31 sends information about the position and shape of the facial region to presented-information control means 32." *See* paras. [0028]-[0031]. Figure 1:

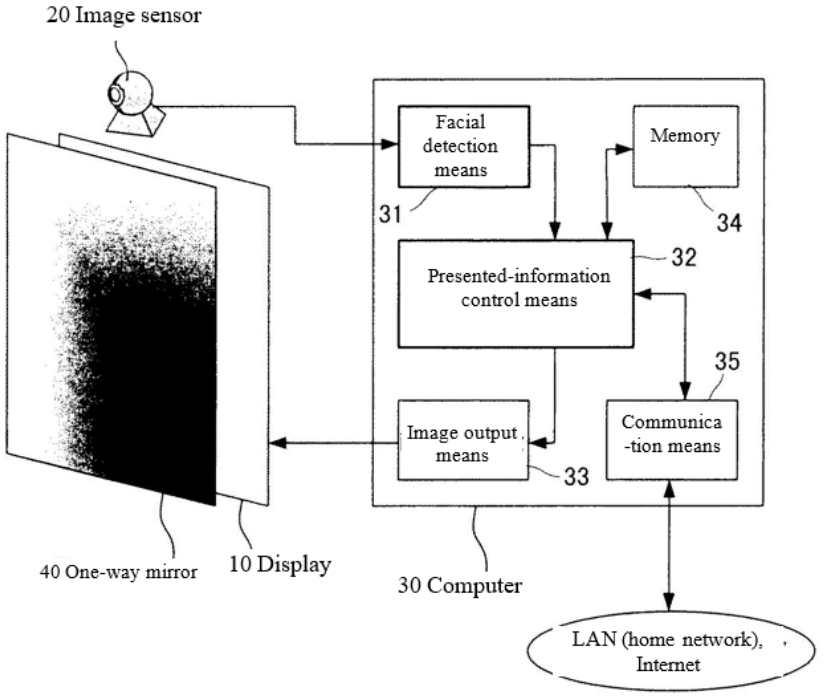
Asserted Claim of the ’110 Patent	Exemplary Citations to Miyaoku
	 “(Embodiment 4) Control Based on the Position of Facial region in Mirror-type Environmental Information-Presentation Device Figure 6 shows an example configuration of the mirror-type environmental information-presentation device. In the example configuration shown in the figure, a video mirror acts as display 10A. Computer 30A horizontally flips the projected image formed by image sensor 20, converts the size to fit the display size, and thus presents the image on display 10A. As such, it virtually acts as a mirror. Information such as thumbnail images

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	presented by presented-information control means 32 is superimposed and thus presented on the image projected from image sensor 20. For this purpose, the present mirror-type environmental information-presentation device is equipped with an image horizontal-flip means 36 and image superimposition means 37, in addition to each means constituting the environmental information-presentation device shown in Figure 1. When a mirror-type environmental information-presentation device presents information, it is expected that the information thus presented does not interfere with the user's own figure projected in the mirror. Given this factor, presented-information control means 32 performs the following processing steps: First, upon receipt of facial region position/shape information [(Fx, Fy), Fw, and Fh] from facial detection means 31, the facial presentation region in the viewport on display 10A is calculated based on said facial region position/shape information thus received. For example, suppose that the resolution of the projected image, as formed by image sensor 20, is 500 × 400, and the resolution of the display viewport is 1000 × 800. In this case, the facial presentation region of the display viewport that corresponds to the facial region position/shape information [(Fx, Fy), Fw, and Fh] is a rectangular region with the upper-right-corner coordinates of (Fx*2, Fy*2), the width of Fw*2, and the height of Fh*2. The user won't be able to see his or her own face projected in the mirror if an image or other information is displayed in the facial presentation region. Accordingly, presented-information control means 32 prevents information from being presented in the facial presentation region. Additionally, if any information has already been presented in the facial presentation region, presented-information control means 32 changes the position of the information to a position outside the facial presentation region. Furthermore, presented-information control means 32 may be configured to control the presentation of information by estimating the truncal presentation region in the display viewport based on the facial region detected by facial detection means 31 so as to present information in regions other than the facial presentation region and the truncal

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	presentation region. Figure 7 shows an example presentation of information in such a case. Additionally, an example content of the processing performed by presented-information control means 32 is described below: Suppose that the resolution of the viewport on display 10A is W × H, and the facial presentation region calculated by presented-information control means 32 is a rectangular region with the upper-right-corner coordinates of the display viewport being (Fx, Fy), the width being fw, and the height being fh. In this case, the trunk is located below the facial region. It also occupies a region that is wider than the facial region. Accordingly, presented-information control means 32 uses a prescribed value B (value representing (Width of the truncal presentation region / Width of the facial presentation region)) to estimate that the truncal presentation region is a rectangular region with the upper right corner coordinate of ((fx+(fw/2)-(fw*B/2)), fy+fh), the width of fw*B, and the height of H-(fy+fh). Presented-information control means 32 performs the steps described above to thereby prevent information from being presented in the facial and truncal presentation regions thus calculated. Additionally, if any information has already been presented in the facial or truncal presentation region, presented-information control means 32 changes the position of the information to a position outside the facial presentation region.” *See* paras. [0073]-[0080]. Figure 7:

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	 “ Figure 8 shows another example configuration of the mirror-type environmental information-presentation device. The present mirror-type environmental information-presentation device has the same basic configuration as that of the environmental information-presentation device shown in Figure 1, except that one-way mirror 40 is affixed to the surface of display 10. Technically speaking, it is extremely difficult to calculate where on the mirror’s surface the user's figure is projected as viewed from the user’s perspective. However, when the above-described steps performed by presented-information control means 32 in the mirror-type environmental information-presentation device that uses a video mirror is applied in the as-is state to the configuration shown in Figure 8, it becomes possible to present information in regions that do not overlap with the user's figure on the mirror. In

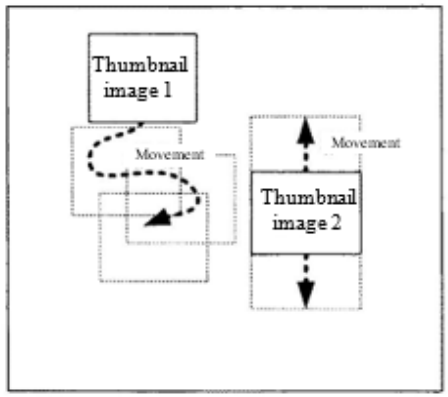
Asserted Claim of the ’110 Patent	Exemplary Citations to Miyaoku
	other words, presented-information control means 32 of the mirror-type environmental information-presentation device shown in Figure 8 can also control the position of presented information, doing so through the steps described with reference to figures 6 and 7. The embodiments of the environmental information-presentation device according to the present invention are as described above. The environmental information-presentation method according to the present invention corresponds to each presented-information control step performed by the presented-information control means in the environmental information-presentation device described above. The application of the environmental information-presentation method according to the present invention is not limited to the devices illustrated with reference to figures 1, 6, and 8. The environmental information-presentation method according to the present invention may be applied to any device that is equipped with an image sensor, a display, and a computer. For example, a mobile terminal equipped with an image sensor may further comprise facial detection means 31 and presented-information control means 32 in the form of software, etc., so as to present information according to the distance between the terminal and the user's face through the above-described steps. Additionally, a part or all of the processing functions of the environmental information-presentation method according to the present invention can be configured as a program that can be executed on a computer.” *See* paras. [0081]-[0084]. Figure 8:

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	 This limitation would have been obvious to a person of ordinary skill in the art based on (1) Miyaoku alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

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Claim 16	

Asserted Claim of the '110 Patent	Exemplary Citations to Miyaoku
16. The method of claim 1, wherein the processor operates on the images from the camera to generate background segmentation, and replaces segments on the images by replacement segments.	Miyaoku expressly and/or inherently discloses and/or renders obvious wherein the processor operates on the images from the camera to generate background segmentation, and replaces segments on the images by replacement segments. *See*, *e.g.*, disclosures below. "The display of text information is described in the embodiment above. It should be noted that, in addition to text, the present invention can also control the presentation of images, videos, or media, such as multimedia content that combines text, images, video, and 3D graphics. In these cases, presented-information control means 32 pre-defines media display specifications corresponding to the aforementioned character display specifications for the respective media, doing so for each Fw*Fh-value range. Then, the corresponding media display specifications are selected based on the detected Fw*Fh value, after which the display form of the prescribed media is altered according to the media display specifications thus selected. (Embodiment 2) Control Based on Facial region Size and Application to Animation Presented-information control means 32 may use animation when presenting information. Human vision is responsive to moving objects. By nature, it instinctively fixates on a moving object that is present in the field of view. Therefore, animation is a useful means for attracting the attention of users located in the vicinity of the environmental information-presentation device. Given this factor, presented-information control means 32 may, for example, present multiple thumbnail images and apply animation in such a way that each thumbnail moves through the viewport on display 10. Figure 5 shows an example of the animation of moving thumbnails. Additionally, various types of animation can be used. Examples include animated text, images, and other objects that expand and shrink in size in a repetitive manner, appear and disappear in a repetitive manner, and so on. Furthermore, the animated motion of objects in the viewport on display 10 is easy to visually recognize from a distance. For example, the characteristic position-shifting patterns, such as vertical movement, horizontal movement, etc., as well as actions, such

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	as zooming in/out action, showing/hiding action (blinking), can catch one's eye even from a distance at which images and text information presented within an object may not be visible. The inclusion of information in animated motions can be said to be one of the information presentation forms suggested for viewing from a distance. By including information in animated motions, it becomes possible, for example, to express the importance of the information by the speed of the movement or the blinking speed. It becomes also possible to associate a specific behavior pattern to a specific meaning, for example, to a type of information. In this way, animation can be used to draw users' attention and make distant users recognize the attributes of the information. Also, by presenting images of fish instead of thumbnail images and animating each image of fish as if swimming in water, it becomes possible to add an aquarium-like anesthetic value to the environmental information-presentation device. In this case, it is also possible to make the users recognize the attributes of the information by means of the color and movement of the fish." *See* paras. [0051]-[0056]. "First, presented-information control means 32 presets a threshold Z associated with the facial region size. Furthermore, presented-information control means 32 manages animation specifications A0 predefined for the cases of Fw*Fh<Z and animation specifications A1 predefined for the cases of Fw*Fh≧Z, doing so in a memory accessible by said presented-information control means 32. Incidentally, the term "animation specifications" refers to a description of the specifications of animation to be displayed in the display viewport. In the case of animated thumbnail images shown in Figure 5, the animation specifications include information such as the image display size, image blinking pattern, image blinking speed, image motion pattern, image motion range, image motion speed,

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	etc. Presented-information control means 32 executes the animation of each thumbnail image according to such animation specifications. Presented-information control means 32 calculates the facial region size (area size of the rectangular facial region) Fw*Fh upon receipt of facial region position/shape information [(Fx, Fy), Fw, and Fh] from facial detection means 31. If Fw*Fh<Z, presented-information control means 32 controls the presentation of thumbnail images according to animation specifications A0. However, if Fw*Fh≧Z, it controls the presentation of thumbnail images according to animation specifications A1." *See* paras. [0059]-[0061]. Figure 5:  Example of animation of moving thumbnail images "(Embodiment 3) Control Based on Size Variation of Facial region Presented-information control means 32 presets a threshold value V for the size variation of the facial region. It retains, in memory 34, facial region position/shape information [(Fx(i), Fy(i), Fw(i), and Fh(i)], which is sequentially received from facial

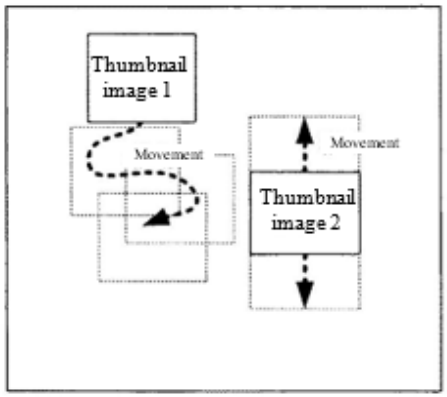
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	detection means 31. Each time the facial region position/shape information is received, the facial-region size variation value is calculated as follows: ((Fw(i)*Fh(i))/(Fw(i-1)*Fh(i-1))) The facial-region size variation value represents the ratio of the most recently detected size Fw(i)*Fh(i) of the facial region to the size Fw(i-1)*Fh(i-1) of the facial region detected one before said most recent size. If it is greater than 1, the facial region size has become larger. If it is less than 1, the facial region's size has become smaller." *See* paras. [0068]-[0069]. "First, upon receipt of facial region position/shape information [(Fx, Fy), Fw, and Fh] from facial detection means 31, the facial presentation region in the viewport on display 10A is calculated based on said facial region position/shape information thus received. For example, suppose that the resolution of the projected image, as formed by image sensor 20, is 500 × 400, and the resolution of the display viewport is 1000 × 800. In this case, the facial presentation region of the display viewport that corresponds to the facial region position/shape information [(Fx, Fy), Fw, and Fh] is a rectangular region with the upper-right-corner coordinates of (Fx*2, Fy*2), the width of Fw*2, and the height of Fh*2. The user won't be able to see his or her own face projected in the mirror if an image or other information is displayed in the facial presentation region. Accordingly, presented-information control means 32 prevents information from being presented in the facial presentation region. Additionally, if any information has already been presented in the facial presentation region, presented-information control means 32 changes the position of the information to a position outside the facial presentation region." *See* paras. [0075]-[0076]. "Presented-information control means 32 performs the steps described above to thereby prevent information from being presented in the facial and truncal presentation regions

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	thus calculated. Additionally, if any information has already been presented in the facial or truncal presentation region, presented-information control means 32 changes the position of the information to a position outside the facial presentation region." *See* para. [0080]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Miyaoku alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

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Claim 17	
17. The method of claim 16, wherein the replacement segments comprise virtual background or background that was captured in a different setting.	Miyaoku expressly and/or inherently discloses and/or renders obvious wherein the replacement segments comprise virtual background or background that was captured in a different setting. *See*, *e.g.*, disclosures below. "The display of text information is described in the embodiment above. It should be noted that, in addition to text, the present invention can also control the presentation of images, videos, or media, such as multimedia content that combines text, images, video, and 3D graphics. In these cases, presented-information control means 32 pre-defines media display specifications corresponding to the aforementioned character display specifications for the respective media, doing so for each Fw*Fh-value range. Then, the corresponding media display specifications are selected based on the detected Fw*Fh value, after which the display form of the prescribed media is altered according to the media display specifications thus selected. (Embodiment 2) Control Based on Facial region Size and Application to Animation

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	Presented-information control means 32 may use animation when presenting information. Human vision is responsive to moving objects. By nature, it instinctively fixates on a moving object that is present in the field of view. Therefore, animation is a useful means for attracting the attention of users located in the vicinity of the environmental information-presentation device. Given this factor, presented-information control means 32 may, for example, present multiple thumbnail images and apply animation in such a way that each thumbnail moves through the viewport on display 10. Figure 5 shows an example of the animation of moving thumbnails. Additionally, various types of animation can be used. Examples include animated text, images, and other objects that expand and shrink in size in a repetitive manner, appear and disappear in a repetitive manner, and so on. Furthermore, the animated motion of objects in the viewport on display 10 is easy to visually recognize from a distance. For example, the characteristic position-shifting patterns, such as vertical movement, horizontal movement, etc., as well as actions, such as zooming in/out action, showing/hiding action (blinking), can catch one’s eye even from a distance at which images and text information presented within an object may not be visible. The inclusion of information in animated motions can be said to be one of the information presentation forms suggested for viewing from a distance. By including information in animated motions, it becomes possible, for example, to express the importance of the information by the speed of the movement or the blinking speed. It becomes also possible to associate a specific behavior pattern to a specific meaning, for example, to a type of information. In this way, animation can be used to draw users' attention and make distant users recognize the attributes of the information. Also, by presenting images of fish instead of thumbnail images and animating each image of fish as if swimming in water, it becomes possible to add an aquarium-like anesthetic value to the environmental information-presentation device. In this case, it is also possible to make the users recognize the

Asserted Claim of the '110 Patent	Exemplary Citations to Miyaoku
	attributes of the information by means of the color and movement of the fish." *See* paras. [0051]-[0056]. "First, presented-information control means 32 presets a threshold Z associated with the facial region size. Furthermore, presented-information control means 32 manages animation specifications A0 predefined for the cases of Fw*Fh<Z and animation specifications A1 predefined for the cases of Fw*Fh≧Z, doing so in a memory accessible by said presented-information control means 32. Incidentally, the term "animation specifications" refers to a description of the specifications of animation to be displayed in the display viewport. In the case of animated thumbnail images shown in Figure 5, the animation specifications include information such as the image display size, image blinking pattern, image blinking speed, image motion pattern, image motion range, image motion speed, etc. Presented-information control means 32 executes the animation of each thumbnail image according to such animation specifications. Presented-information control means 32 calculates the facial region size (area size of the rectangular facial region) Fw*Fh upon receipt of facial region position/shape information [(Fx, Fy), Fw, and Fh] from facial detection means 31. If Fw*Fh<Z, presented-information control means 32 controls the presentation of thumbnail images according to animation specifications A0. However, if Fw*Fh≧Z, it controls the presentation of thumbnail images according to animation specifications A1." *See* paras. [0059]-[0061]. Figure 5:

Asserted Claim of the ’110 Patent	Exemplary Citations to Miyaoku
	 Example of animation of moving thumbnail images “(Embodiment 3) Control Based on Size Variation of Facial region Presented-information control means 32 presets a threshold value V for the size variation of the facial region. It retains, in memory 34, facial region position/shape information [(Fx(i), Fy(i), Fw(i), and Fh(i)], which is sequentially received from facial detection means 31. Each time the facial region position/shape information is received, the facial-region size variation value is calculated as follows: ((Fw(i)*Fh(i))/(Fw(i-1)*Fh(i-1))) The facial-region size variation value represents the ratio of the most recently detected size Fw(i)*Fh(i) of the facial region to the size Fw(i-1)*Fh(i-1) of the facial region detected one before said most recent size. If it is greater than 1, the facial region size has become larger. If it is less than 1, the facial region's size has become smaller.” *See* paras. [0068]-[0069].

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	“First, upon receipt of facial region position/shape information [(Fx, Fy), Fw, and Fh] from facial detection means 31, the facial presentation region in the viewport on display 10A is calculated based on said facial region position/shape information thus received. For example, suppose that the resolution of the projected image, as formed by image sensor 20, is 500 × 400, and the resolution of the display viewport is 1000 × 800. In this case, the facial presentation region of the display viewport that corresponds to the facial region position/shape information [(Fx, Fy), Fw, and Fh] is a rectangular region with the upper-right-corner coordinates of (Fx*2, Fy*2), the width of Fw*2, and the height of Fh*2. The user won't be able to see his or her own face projected in the mirror if an image or other information is displayed in the facial presentation region. Accordingly, presented-information control means 32 prevents information from being presented in the facial presentation region. Additionally, if any information has already been presented in the facial presentation region, presented-information control means 32 changes the position of the information to a position outside the facial presentation region.” *See* paras. [0075]-[0076]. “Presented-information control means 32 performs the steps described above to thereby prevent information from being presented in the facial and truncal presentation regions thus calculated. Additionally, if any information has already been presented in the facial or truncal presentation region, presented-information control means 32 changes the position of the information to a position outside the facial presentation region.” *See* para. [0080]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Miyaoku alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Exhibit B-10: Invalidity of U.S. Patent No. 8,982,110 in view of U.S. Patent No. 7,999,843 ("Ohba")

This chart is subject to all reservations, objections, and disclaimers in Defendant's Invalidity Contentions and any amendment, supplement, or modification thereof, which are incorporated herein by reference in their entirety.

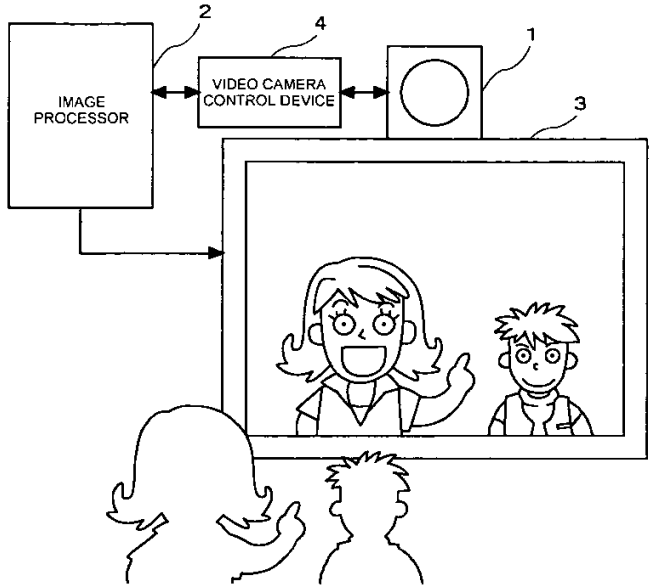
Ohba was originally filed January 28, 2005 and issued on August 16, 2011, and thus is available as prior art to U.S. Patent No. 8,982,110 (the "'110 Patent") under at least 35 U.S.C. §§ 102(a), (b), and (e).

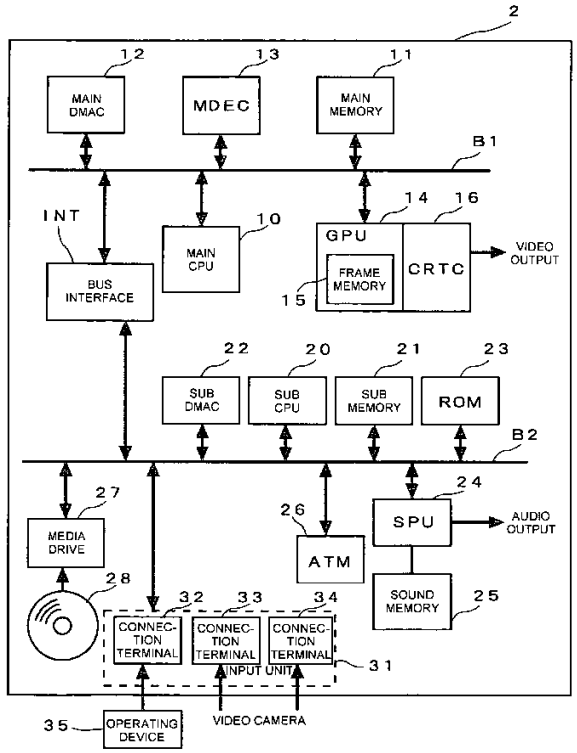
Ohba anticipates the Asserted Claims of the '110 Patent. To the extent it is found Ohba does not expressly disclose certain limitations in the asserted claim, such limitations are at least implicitly or inherently disclosed. Moreover, to the extent it is found that Ohba does not anticipate the asserted claim, Ohba renders obvious the asserted claim, either alone or in combination with other prior art identified in the cover pleading or herein, and/or in combination with the general knowledge of a person having ordinary skill in the art.

In these contentions, Defendant has relied in part on Plaintiff's infringement contentions. In those contentions, Plaintiff appears to pursue overly broad claim constructions in an effort to assert infringement where none exists, and to accuse products that do not infringe the claims. Defendant's assertion that a particular limitation is disclosed by a prior art reference and/or is disclosed in a particular manner may be based in part on Plaintiff's apparent claim interpretations. In relying on Plaintiff's apparent claim interpretations, Defendant does not admit that Plaintiff's apparent claim interpretations are supportable or proper or that the claim limitations in question are definite or otherwise amenable to construction.

Defendant has endeavored to provide as much detail as possible in these contentions and, in doing so, have exceeded the level of detail required. The inclusion of specific details in some areas is not a concession that such details are required or that the omission of similar details in other areas is a defect. These citations to portions of any reference in this chart are exemplary only. Defendants will rely on the entirety of the references cited in this chart to show that the asserted claims are invalid.

Asserted Claim of the '110 Patent	Exemplary Citations to Ohba
Claim 1	
1[pre]. A computerized method for operating a display system, the display system having a camera, a monitor, and a processor, the method comprising:	To the extent the preamble is limiting, Ohba expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. "This image processing system comprises an analog or digital video camera 1 which is an example of an image capturing device, an image processor 2, a display device 3, and a video camera control device 4. The image processing system captures, with the video camera 1, pictures of a candidate operator facing against the display device 3, and continuously supplies the resulting video image features to the image processor 2 in time series to generate mirrored video image features as well as combines the mirrored video image features with an object image associated with an object such as a menu or a cursor to generate combined images (which also serve as video image features), to thereby achieve real-time production of the combined images on the display device 3. The object image is combined so that it is displayed in a certain range where the candidate operator in the mirrored video image feature can access." *See* 5:14-29. "The image processor 2 is implemented by a computer that provides a desired function based on a computer program." *See* 5:52-53 "To the main bus B1 connected are a main CPU 10, which is a main semiconductor device, a main memory 11 formed of a RAM, a main DMAC (Direct Memory Access Controller) 12, an MPEG (Moving Picture Experts Group) decoder (MDEC) 13, and a graphic processing unit (Graphic Processing Unit, hereinafter "GPU") having therein a frame memory 15 which serves as a graphic memory." *See* 5:60-66.

Asserted Claim of the ’110 Patent	Exemplary Citations to Ohba
	 FIG. 1 *See* Fig. 1.

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	 FIG. 2 *See* Fig. 2. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Ohba alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II. B of the cover document.

Asserted Claim of the '110 Patent	Exemplary Citations to Ohba
1[a]. operating the camera to generate a stream of images of the user;	Ohba expressly and/or inherently discloses and/or renders obvious operating the camera to generate a stream of images of the user. *See*, *e.g.*, disclosures below. "This image processing system comprises an analog or digital video camera 1 which is an example of an image capturing device, an image processor 2, a display device 3, and a video camera control device 4. The image processing system captures, with the video camera 1, pictures of a candidate operator facing against the display device 3, and continuously supplies the resulting video image features to the image processor 2 in time series to generate mirrored video image features as well as combines the mirrored video image features with an object image associated with an object such as a menu or a cursor to generate combined images (which also serve as video image features), to thereby achieve real-time production of the combined images on the display device 3. The object image is combined so that it is displayed in a certain range where the candidate operator in the mirrored video image feature can access." *See* 5:14-29. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Ohba alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II. B of the cover document.
1[b]. operating the processor to detect the presence of the user in the stream of image;	Ohba expressly and/or inherently discloses and/or renders obvious operating the processor to detect the presence of the user in the stream of image. *See*, *e.g.*, disclosures below. "An image processor of the present invention that solves the aforementioned problem comprises object image generating means for generating an object image of an object that is associated with a predetermined event, and image combining means for superimposing said object image on top of a mirrored video image feature that includes an image of an operator as a portion thereof to generate a combined image, the image processor being adapted to provide production of the combined image on a predetermined display device, the image processor comprising detection means for

Asserted Claim of the '110 Patent	Exemplary Citations to Ohba
	detecting the position of the image of said operator included in said mirrored video image feature; said image combining means being adapted to combine said object image and said mirrored video image feature in such a manner that said object image is displayed in an area that an image of a hand of said operator can reach, depending on the position of the image of said operator detected by said detection means." *See* 1:59-2:8. "The operator detector section 109 is for detecting, for example, the position and the size of the face of the candidate operator in the mirrored video image feature. For example, a known face sensing technique is used to detect, for example, the position and the size of the face of the candidate operator. Examples of the face sensing technique that can be used include a support vector machine (SVM), boosting (boosting), neural network, and eigenface technique (Eigen Face). The operator detector section 109 is for selecting a single operator from a plurality of candidate operators. The choice of the operator is determined when, for example, the candidate operator accesses an object image such as a menu image." *See* 8:22-34. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Ohba alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II. B of the cover document.
1[c]. operating the processor to apply adaptive transformation mapping to the stream of images captured by the camera to generate modified images that appear to be captured from a different point of view of the camera's actual point of view; and	Ohba expressly and/or inherently discloses and/or renders obvious operating the processor to apply adaptive transformation mapping to the stream of images captured by the camera to generate modified images that appear to be captured from a different point of view of the camera's actual point of view. *See*, *e.g.*, disclosures below. "The mirrored video image features may be generated by means of mirroring (interchanging the right and left sides of the image) the video image features received from the video camera 1, by the image processor 2. Alternatively, a mirror may be placed in front of the video camera 1 and the video image features on the mirror in which the candidate operator(s) is/are reflected may be captured to generate the mirrored video

Asserted Claim of the '110 Patent	Exemplary Citations to Ohba
	image features. Alternatively, the video camera 1 itself may have a function to generate mirrored video image features. In any way, a combined image of the mirrored video image features and the object image, of which display appearance changes in real time depending on the motion of the operator, is displayed on the display device 3." *See* 5:34-46. "The image reversing section 102 performs mirroring processing, that is, interchanging the right and left sides of the captured image received by the image input section 101, to form a mirrored video image feature. It should be noted that no image reversing section 102 is required when a captured image received by the image processor 2 is a mirrored video image feature because a mirror is placed in front of the video camera 1 for the picture capturing with the video camera 1 or because the video camera 1 has a function of generating a mirrored image." *See* 7:25-34. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Ohba alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II. B of the cover document.
1[d]. displaying the modified images on the monitor;	Ohba expressly and/or inherently discloses and/or renders obvious displaying the modified images on the monitor. *See*, *e.g.*, disclosures below. "This image processing system comprises an analog or digital video camera 1 which is an example of an image capturing device, an image processor 2, a display device 3, and a video camera control device 4. The image processing system captures, with the video camera 1, pictures of a candidate operator facing against the display device 3, and continuously supplies the resulting video image features to the image processor 2 in time series to generate mirrored video image features as well as combines the mirrored video image features with an object image associated with an object such as a menu or a cursor to generate combined images (which also serve as video image features), to thereby achieve real-time production of the combined images on the display device 3. The object

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	image is combined so that it is displayed in a certain range where the candidate operator in the mirrored video image feature can access." "The display controller section 108 converts the combined image generated by the image combining section 106 to a video signal and supplies it to the display device 3. In addition, the display controller section 108 is for zooming, panning, and tilting on the operator selected by the operator detector section 109. The zooming, panning, and tilting operations may be done by digital processing of the image drawn in the frame memory. Alternatively, zooming, panning, and tilting of the video camera 1 may be done by the video camera control device 4. "The display device 3 displays the combined images (video image features) on a screen using this video signal supplied from the display controller section 108." *See* 8:34-43. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Ohba alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II. B of the cover document.
1[e]. wherein the different point of view corresponds to an image taken from a different angle and a different distance than the actual images captured by the camera; and	Ohba expressly and/or inherently discloses and/or renders obvious wherein the different point of view corresponds to an image taken from a different angle and a different distance than the actual images captured by the camera. *See*, *e.g.*, disclosures below. "When an operator is selected out of the multiple candidate operators, said display control means may do zooming, panning and/or tilting the image of the selected candidate operator by digital processing or by controlling the image capturing device for capturing said mirrored video image feature, in order to provide clear distinction of the operator with the operator being allowed to be displayed larger at the center of the screen." *See* 3:40-47.

Asserted Claim of the '110 Patent	Exemplary Citations to Ohba
	"The display controller section 108 converts the combined image generated by the image combining section 106 to a video signal and supplies it to the display device 3. In addition, the display controller section 108 is for zooming, panning, and tilting on the operator selected by the operator detector section 109. The zooming, panning, and tilting operations may be done by digital processing of the image drawn in the frame memory. Alternatively, zooming, panning, and tilting of the video camera 1 may be done by the video camera control device 4." *See* 8:34-43. "When the operator who actually performs the operation is determined, the display controller section 108 enlarges the selected operator and produces him or her at the center of the screen, as shown in FIG. 11 (step S106). In addition, the menu image is accessed by the operator so that a pull-down image highlighting one of "select1", "select2" or "select3" at the lower layer is displayed." *See* 10:51-57. "In the Example 1, the candidate operator who accesses the menu image earlier is selected as the operator who actually performs the operation. However, the operator who actually performs operation may be selected by using a stereo-matching technique as described below. In the Example 2, two sets of mirrored video image features are provided by means of, for example, preparing two video cameras 1. FIGS. 12 and 13 are views showing an example of combined images in which a menu image is superimposed on top of two mirrored video image features." "Two mirrored video image features are, for example, stereo images for right and left eyes. In the example shown in FIGS. 12 and 13, FIG. 12 shows a right eye image component while FIG. 13 shows a left eye image component. The operator detector section 109 compares these two combined images and selects the candidate operator who is closer to the menu image as the operator. In the example shown in FIGS. 12 and 13, the candidate operator on the left side is closer to the menu image in both cases, so the left one is determined as the operator who actually performs the operation." *See* 10:66-11:18.

Asserted Claim of the '110 Patent	Exemplary Citations to Ohba
	This limitation would have been obvious to a person of ordinary skill in the art based on (1) Ohba alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II. B of the cover document.
1[f]. wherein the non-ordered steps are performed on a series of images of a live video feed from the camera;	Ohba expressly and/or inherently discloses and/or renders obvious wherein the non-ordered steps are performed on a series of images of a live video feed from the camera. *See*, *e.g.*, disclosures below. "This image processing system comprises an analog or digital video camera 1 which is an example of an image capturing device, an image processor 2, a display device 3, and a video camera control device 4. The image processing system captures, with the video camera 1, pictures of a candidate operator facing against the display device 3, and continuously supplies the resulting video image features to the image processor 2 in time series to generate mirrored video image features as well as combines the mirrored video image features with an object image associated with an object such as a menu or a cursor to generate combined images (which also serve as video image features), to thereby achieve real-time production of the combined images on the display device 3. The object image is combined so that it is displayed in a certain range where the candidate operator in the mirrored video image feature can access." *See* 5:14-29. "The mirrored video image features may be generated by means of mirroring (interchanging the right and left sides of the image) the video image features received from the video camera 1, by the image processor 2. Alternatively, a mirror may be placed in front of the video camera 1 and the video image features on the mirror in which the candidate operator(s) is/are reflected may be captured to generate the mirrored video image features. Alternatively, the video camera 1 itself may have a function to generate mirrored video image features. In any way, a combined image of the mirrored video image features and the object image, of which display appearance changes in real time

Asserted Claim of the '110 Patent	Exemplary Citations to Ohba
	depending on the motion of the operator, is displayed on the display device 3." *See* 5:34-46. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Ohba alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II. B of the cover document.
1[g]. wherein during mirror tracking mode the processor utilizes the angle of the images captured by the camera and applies parametric input for a mapping transformation that changes imaging perspective of the images captured by the camera.	Ohba expressly and/or inherently discloses and/or renders obvious wherein during mirror tracking mode the processor utilizes the angle of the images captured by the camera and applies parametric input for a mapping transformation that changes imaging perspective of the images captured by the camera. *See*, *e.g.*, disclosures below. "When an operator is selected out of the multiple candidate operators, said display control means may do zooming, panning and/or tilting the image of the selected candidate operator by digital processing or by controlling the image capturing device for capturing said mirrored video image feature, in order to provide clear distinction of the operator with the operator being allowed to be displayed larger at the center of the screen." *See* 3:40-47. "The mirrored video image features may be generated by means of mirroring (interchanging the right and left sides of the image) the video image features received from the video camera 1, by the image processor 2. Alternatively, a mirror may be placed in front of the video camera 1 and the video image features on the mirror in which the candidate operator(s) is/are reflected may be captured to generate the mirrored video image features. Alternatively, the video camera 1 itself may have a function to generate mirrored video image features. In any way, a combined image of the mirrored video image features and the object image, of which display appearance changes in real time depending on the motion of the operator, is displayed on the display device 3." *See* 5:34-46.

Asserted Claim of the '110 Patent	Exemplary Citations to Ohba
	"The display controller section 108 converts the combined image generated by the image combining section 106 to a video signal and supplies it to the display device 3. In addition, the display controller section 108 is for zooming, panning, and tilting on the operator selected by the operator detector section 109. The zooming, panning, and tilting operations may be done by digital processing of the image drawn in the frame memory. Alternatively, zooming, panning, and tilting of the video camera 1 may be done by the video camera control device 4." *See* 8:34-43. "The mirrored video image feature is generated by supplying a video image feature captured by the video camera 1 to the image processor 2 and interchanging the right and left sides of the image by the image reversing section 102. The image of which right and left sides have been interchanged is produced on the display device, which results in the production of the mirrored video image feature as shown in FIG. 1." *See* 8:64-9:3. "When the operator who actually performs the operation is determined, the display controller section 108 enlarges the selected operator and produces him or her at the center of the screen, as shown in FIG. 11 (step S106). In addition, the menu image is accessed by the operator so that a pull-down image highlighting one of "select1", "select2" or "select3" at the lower layer is displayed." *See* 10:51-57. "In the Example 1, the candidate operator who accesses the menu image earlier is selected as the operator who actually performs the operation. However, the operator who actually performs operation may be selected by using a stereo-matching technique as described below. In the Example 2, two sets of mirrored video image features are provided by means of, for example, preparing two video cameras 1. FIGS. 12 and 13 are views showing an example of combined images in which a menu image is superimposed on top of two mirrored video image features. "Two mirrored video image features are, for example, stereo images for right and left eyes. In the example shown in FIGS. 12 and 13, FIG. 12 shows a right eye image component while FIG. 13 shows a left eye image component. The operator detector section 109 compares these two combined images and selects the candidate operator who

Asserted Claim of the '110 Patent	Exemplary Citations to Ohba
	is closer to the menu image as the operator. In the example shown in FIGS. 12 and 13, the candidate operator on the left side is closer to the menu image in both cases, so the left one is determined as the operator who actually performs the operation." *See* 10:66-11:18. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Ohba alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II. B of the cover document.

Asserted Claim of the '110 Patent	Exemplary Citations to Ohba
Claim 2	
2. The method of claim 1, wherein the mapping transformation comprises a combination of at least two of the following transformations: vertical flips about a vertical axis, a projection transformation, rotation, resize, two-dimensional offset, optic distortion correction, and polynomial mapping on part or entire captured image.	Ohba expressly and/or inherently discloses and/or renders obvious wherein the mapping transformation comprises a combination of at least two of the following transformations: vertical flips about a vertical axis, a projection transformation, rotation, resize, two-dimensional offset, optic distortion correction, and polynomial mapping on part or entire captured image. *See*, *e.g.*, disclosures below. "The mirrored video image features may be generated by means of mirroring (interchanging the right and left sides of the image) the video image features received from the video camera 1, by the image processor 2. Alternatively, a mirror may be placed in front of the video camera 1 and the video image features on the mirror in which the candidate operator(s) is/are reflected may be captured to generate the mirrored video image features. Alternatively, the video camera 1 itself may have a function to generate mirrored video image features. In any way, a combined image of the mirrored video image features and the object image, of which display appearance changes in real time

Asserted Claim of the '110 Patent	Exemplary Citations to Ohba
	depending on the motion of the operator, is displayed on the display device 3." *See* 5:34-46. "The image reversing section 102 performs mirroring processing, that is, interchanging the right and left sides of the captured image received by the image input section 101, to form a mirrored video image feature. It should be noted that no image reversing section 102 is required when a captured image received by the image processor 2 is a mirrored video image feature because a mirror is placed in front of the video camera 1 for the picture capturing with the video camera 1 or because the video camera 1 has a function of generating a mirrored image." *See* 7:25-34. "This image processing system comprises an analog or digital video camera 1 which is an example of an image capturing device, an image processor 2, a display device 3, and a video camera control device 4. The image processing system captures, with the video camera 1, pictures of a candidate operator facing against the display device 3, and continuously supplies the resulting video image features to the image processor 2 in time series to generate mirrored video image features as well as combines the mirrored video image features with an object image associated with an object such as a menu or a cursor to generate combined images (which also serve as video image features), to thereby achieve real-time production of the combined images on the display device 3. The object image is combined so that it is displayed in a certain range where the candidate operator in the mirrored video image feature can access." "The display controller section 108 converts the combined image generated by the image combining section 106 to a video signal and supplies it to the display device 3. In addition, the display controller section 108 is for zooming, panning, and tilting on the operator selected by the operator detector section 109. The zooming, panning, and tilting operations may be done by digital processing of the image drawn in the frame memory. Alternatively, zooming, panning, and tilting of the video camera 1 may be done by the video camera control device 4.

Asserted Claim of the '110 Patent	Exemplary Citations to Ohba
	"The display device 3 displays the combined images (video image features) on a screen using this video signal supplied from the display controller section 108." *See* 8:34-43. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Ohba alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II. B of the cover document.

Asserted Claim of the '110 Patent	Exemplary Citations to Ohba
Claim 3	
3. The method of claim 1, wherein during idle mode the camera continuously sends captured images to the processor, and the user presence is identified by the processor detecting a body part in the images.	Ohba expressly and/or inherently discloses and/or renders obvious wherein during idle mode the camera continuously sends captured images to the processor, and the user presence is identified by the processor detecting a body part in the images. *See*, *e.g.*, disclosures below. "An image processor of the present invention that solves the aforementioned problem comprises object image generating means for generating an object image of an object that is associated with a predetermined event, and image combining means for superimposing said object image on top of a mirrored video image feature that includes an image of an operator as a portion thereof to generate a combined image, the image processor being adapted to provide production of the combined image on a predetermined display device, the image processor comprising detection means for detecting the position of the image of said operator included in said mirrored video image feature; said image combining means being adapted to combine said object image and said mirrored video image feature in such a manner that said object image is displayed in an area that an image of a hand of said operator can reach, depending on the position of the image of said operator detected by said detection means." *See* 1:59-2:8.