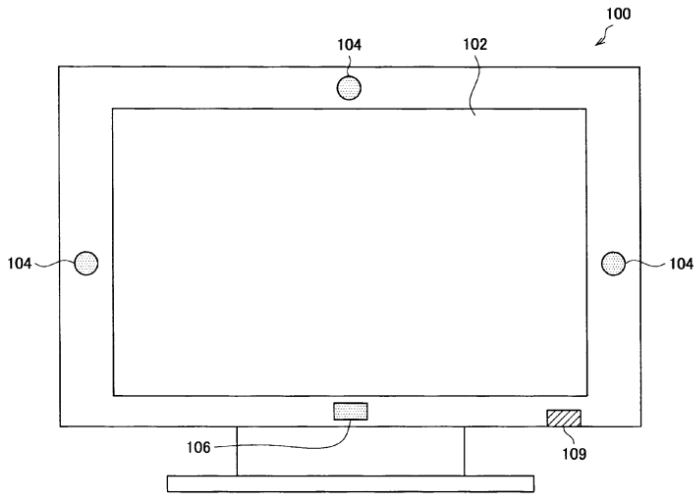
Asserted Claim of the '109 Patent	Exemplary Citations to Ooi
Claim 1	
1[pre]. A method for operating a system having a monitor, a camera, and a processor, so as to display a mirror-mimicking image on the monitor, by performing non-ordered steps comprising:	To the extent the preamble is limiting, Ooi expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. "The present invention relates to a display device and a control method." *See* para. [0001]. "However, in the power save control using only face detection, there has been a problem in that even when it is desired to continuously view the display device, for example, when it is difficult to detect the user's face due to an installation environment of the television or when the user looks away during a certain time period, it is ultimately judged that viewing, that is, the face, is not present, and thus the display is turned off. Further, since the face detection process requires a relatively long image processing time compared to moving body detection, in an environment in which a computation rate or a resource is restricted, there has been a problem in that a response from when the user comes in front of the display device for viewing to when the image is displayed is delayed. Further, there is a display device in which power save control is performed by detecting a moving body or the user's action through an imaging device or a pyroelectric infrared element and analyzing the user's viewing state. However, there has been a problem in that when the user keeps viewing without moving, it is erroneously judged that the user is not present, and the screen display is turned off. In order to avoid such a malfunction, it is necessary to increase a time until the power save control starts, which in turn deteriorates a power save effect. The present invention is made in view of the above-mentioned issues, and aims to provide a display device and a control method which are novel and improved, and which are capable of efficiently executing the power save control with a high degree of accuracy by combining the user's moving body detection and face detection." *See* paras. [0005]-[0007].

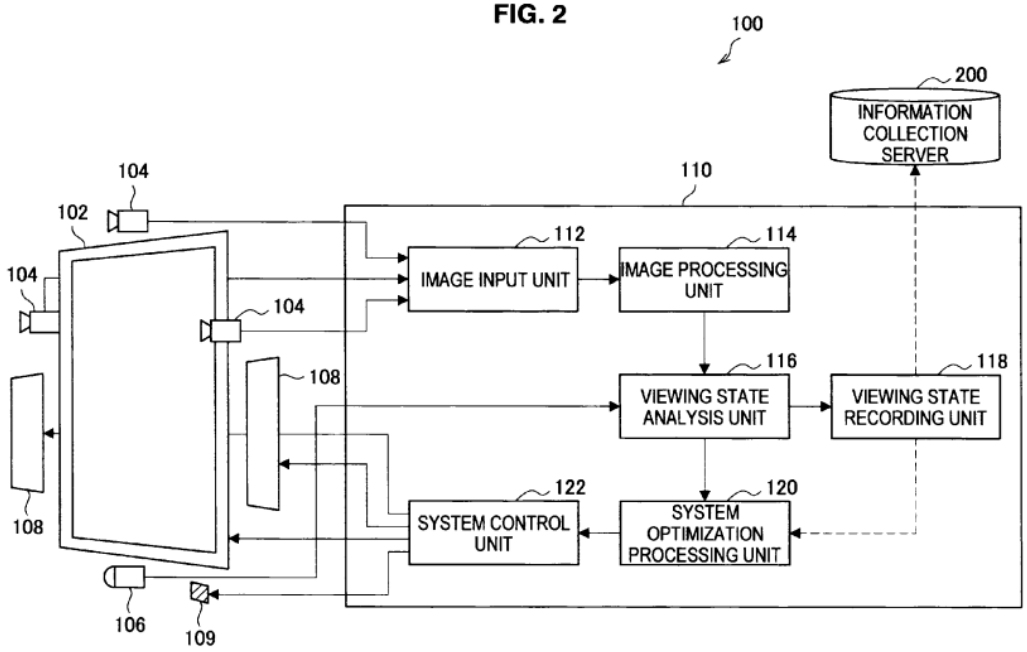
Asserted Claim of the '109 Patent	Exemplary Citations to Ooi
	"According to an aspect of the present invention in order to achieve the above-mentioned object, there is provided a display device including an imaging unit that captures a moving image in a predetermined range in an image display direction, a moving body detection unit that detects whether or not a moving body is present in a predetermined range in the image display direction, an image analysis unit that analyzes the moving image captured by the imaging unit to detect whether or not a face is present, and a power control unit that controls power consumption with different patterns according to a plurality of modes that are set by combining whether or not the face detected by the image analysis unit is present and whether or not the moving body detected by the detection unit is present." *See* para. [0008]. "[1-1. Configuration of Image Display Device] First, a configuration of an image display device according to an embodiment of the present invention will be described. FIG. 1 is an explanation diagram for explaining an appearance of an image display device 100 according to an embodiment of the present invention. FIG. 1 is a front view in which the image display device 100 is viewed from the front. An appearance of the image display device 100 according to an embodiment of the present invention will be described below with reference to FIG. 1. As illustrated in FIG. 1, the image display device 100 according to an embodiment of the present invention includes an imaging unit 104, which captures a moving image, disposed in an upper-central part and left and right central parts of a display panel 102 that displays a still image or a moving image. The imaging unit 104 captures the moving image in a direction in which the image display device 100 displays the still image or the moving image through the display panel 102. The image display device 100 according to the present embodiment analyzes an image captured by the imaging unit 104 and detects a user's face reflected on the image. The image display device 100 is characterized in that its internal operation state changes depending on whether or not the user's face is included in the image captured by the imaging unit 104.

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	Further, the image display device 100 according to an embodiment of the present invention includes a sensor 106 disposed in a lower central part of the display panel 102. The sensor 106 detects whether or not a person is present in front of the image display device 100. The image display device 100 is also characterized in that its internal operation state changes depending on whether or not a person is present in front of the image display device 100. Further, the image display device 100 according to an embodiment of the present invention includes a light emitting diode (LED) 109. The LED 109 notifies the user of a status of the image display device 100 through a lighting status or an emission color. Further, in the image display device 100 illustrated in FIG. 1, the imaging unit 104 that captures the moving image is disposed at three positions around the display panel 102 of the image. It should be understood that in the present invention, an image input position at which the moving image is captured is not limited to the example. For example, a device separate from the image display device 100 may be disposed, the corresponding device may be connected with the image display device 100, and the moving picture may be captured by the corresponding device. Further, it should be understood that the number of image input units is not limited to three, and two or fewer or four or more image input units may be disposed to capture an image. Further, it should be understood that the number of the sensors 106 is not limited to one, and two or more sensors may be disposed to detect the presence of a person." *See* paras. [0039]-[0044].

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	FIG. 1  "FIG. 2 is an explanation view illustrating a configuration of the image display device 100 according to an embodiment of the present invention. A configuration of the image display device 100 according to an embodiment of the present invention will be described below with reference to FIG. 2. As illustrated in FIG. 2, the image display device 100 according to an embodiment of the present invention includes the display panel 102, the imaging unit 104, the sensor 106, a speaker 108, and a control unit 110. The control unit 110 includes an image input unit 112, an image processing unit 114, a viewing state analysis unit 116, a viewing state recording unit 118, a system optimization processing unit 120, and a system control unit 122.

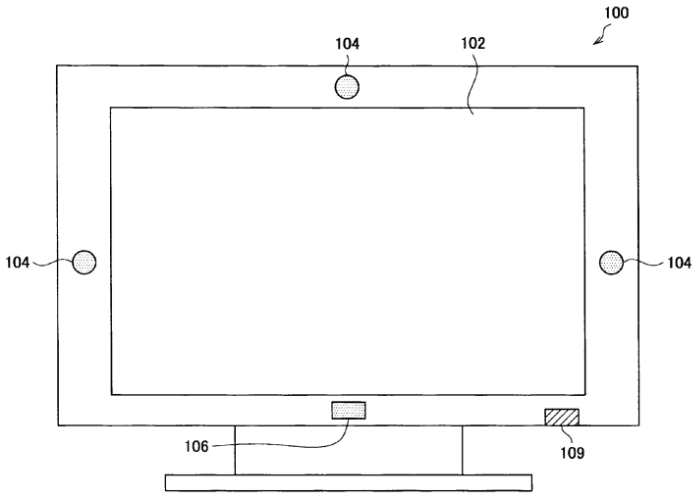
Asserted Claim of the '109 Patent	Exemplary Citations to Ooi
	The display panel 102 displays a still image or a moving image based on a panel drive signal. In the present embodiment, the display panel 102 displays the still image or the moving image through a liquid crystal. Of course, it should be understood that the present invention is not limited to the example. The display panel 102 may display the still image or the moving image by a display device of a light-emitting type such as an organic electroluminescence (EL). The imaging unit 104 is disposed in the upper central part and the left and right central parts of the display panel 102 that displays the still image or the moving image as described above. When the panel drive signal is supplied to the display panel 102 and the moving image is displayed on the display panel 102, the imaging unit 104 acquires the moving image in a direction in which the image display device 100 displays the moving image through the display panel 102. The imaging unit 104 may capture the moving image by a charge coupled device (CCD) sensor or a complementary metal oxide semiconductor (CMOS) sensor. The moving image captured by the imaging unit 104 is transmitted to the control unit 110. The sensor 106 is displayed in the lower central part of the display panel 102 that displays the still image or the moving image as described above. The sensor 106 detects whether or not a person is present in front of the image display device 100. Further, when a person is present in front of the image display device 100, the sensor 106 can detect the distance between the image display device 100 and the person. The detection result and the distance information obtained by the sensor 106 are transmitted to the control unit 110. The speaker 108 outputs a voice based on a voice output signal. The control unit 110 controls an operation of the respective components of the image display device 100. The respective components of the control unit 110 will be described below. The image input unit 112 receives the moving image captured by the imaging unit 104. The moving image received through the image input unit 112 is transmitted to the image

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	processing unit 114 and used for image processing performed by the image processing unit 114. The image processing unit 114 is an example of an image analysis unit of the present invention and executes a variety of image processing on the moving image, which is captured by the imaging unit 104, received from the image input unit 112. The image processing executed by the image processing unit 114 includes a detection process of a moving body included in the moving image captured by the imaging unit 104, a detection process of the number of people included in the moving image, and a detection process of a face and a facial expression included in the moving image. A result of a variety of image processing performed by the image processing unit 114 is transmitted to the viewing state analysis unit 116 and used for analysis on the presence of a person who is viewing the image display device 100 or a state of a person who is viewing the image display device 100." *See* paras. [0047]-[0055].

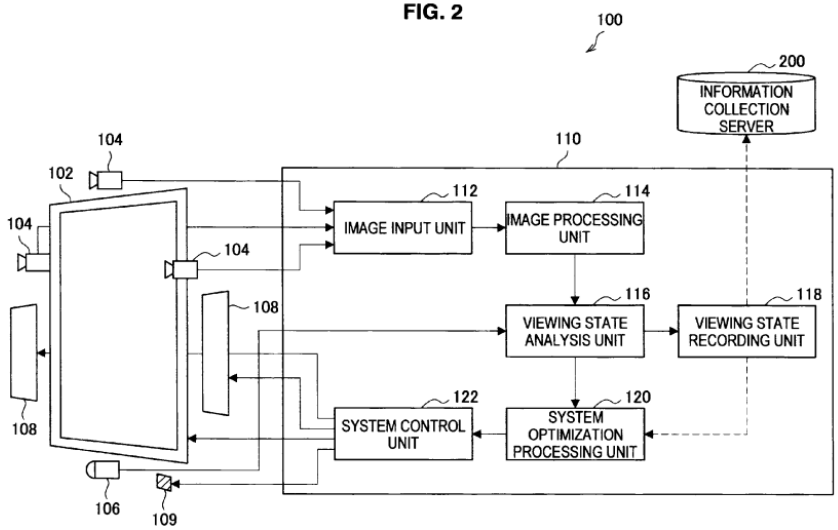
Asserted Claim of the '109 Patent	Exemplary Citations to Ooi
	FIG. 2  "The system control unit 122 executes the system optimization process on the respective components of the image display device 100 based on the system control information calculated by the system optimization processing unit 120. Specifically, the system control unit 122 executes brightness control of the display panel 102, direction control of the display panel 102, display content control of the display panel 102, and sound volume control of the voice output from the speaker 108 based on the system control information calculated by the system optimization processing unit 120. A configuration of the image display device 100 according to an embodiment of the present invention has been described above with reference to FIG. 2. As described above, the image display device 100 according to an embodiment of the present invention analyzes the user's viewing state through the imaging unit 104 and the sensor 106. In the

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	conventional art, the imaging process is performed by the imaging unit 104, and the user's viewing state is analyzed only through the face detection process that judges whether or not a face is included in the image captured by the imaging unit 104. However, when the user's viewing state is analyzed only through the face detection process, there has been a problem in that even when it is desired to continuously view the display device, for example, when it is difficult to detect the user's face or when the user looks away during a certain time period, it is ultimately judged that viewing is not present, and thus the display is turned off. Further, since the face detection process requires a relatively long image processing time compared to the moving body detection process using the sensor or the like, in an environment in which a computation rate or a resource is restricted, a response from when the user comes in front of the display device for viewing to when the image is displayed has been delayed." *See* paras. [0066]-[0067]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Ooi 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;	Ooi expressly and/or inherently discloses and/or renders obvious obtaining a digital image from a camera. *See*, *e.g.*, disclosures below. "According to an aspect of the present invention in order to achieve the above-mentioned object, there is provided a display device including an imaging unit that captures a moving image in a predetermined range in an image display direction, a moving body detection unit that detects whether or not a moving body is present in a predetermined range in the image display direction, an image analysis unit that analyzes the moving image captured by the imaging unit to detect whether or not a face is present, and a power control unit that controls power consumption with different patterns according to a plurality of modes that are set by combining whether or not the face detected by the

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	image analysis unit is present and whether or not the moving body detected by the detection unit is present." *See* para. [0008]. "[1-1. Configuration of Image Display Device] First, a configuration of an image display device according to an embodiment of the present invention will be described. FIG. 1 is an explanation diagram for explaining an appearance of an image display device 100 according to an embodiment of the present invention. FIG. 1 is a front view in which the image display device 100 is viewed from the front. An appearance of the image display device 100 according to an embodiment of the present invention will be described below with reference to FIG. 1. As illustrated in FIG. 1, the image display device 100 according to an embodiment of the present invention includes an imaging unit 104, which captures a moving image, disposed in an upper-central part and left and right central parts of a display panel 102 that displays a still image or a moving image. The imaging unit 104 captures the moving image in a direction in which the image display device 100 displays the still image or the moving image through the display panel 102. The image display device 100 according to the present embodiment analyzes an image captured by the imaging unit 104 and detects a user's face reflected on the image. The image display device 100 is characterized in that its internal operation state changes depending on whether or not the user's face is included in the image captured by the imaging unit 104." *See* paras. [0039]-[0041].

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	FIG. 1  “The imaging unit 104 is disposed in the upper central part and the left and right central parts of the display panel 102 that displays the still image or the moving image as described above. When the panel drive signal is supplied to the display panel 102 and the moving image is displayed on the display panel 102, the imaging unit 104 acquires the moving image in a direction in which the image display device 100 displays the moving image through the display panel 102. The imaging unit 104 may capture the moving image by a charge coupled device (CCD) sensor or a complementary metal oxide semiconductor (CMOS) sensor. The moving image captured by the imaging unit 104 is transmitted to the control unit 110. The sensor 106 is displayed in the lower central part of the display panel 102 that displays the still image or the moving image as described above. The sensor 106 detects whether or not a person is present in front of the image display device 100. Further, when a person

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	is present in front of the image display device 100, the sensor 106 can detect the distance between the image display device 100 and the person. The detection result and the distance information obtained by the sensor 106 are transmitted to the control unit 110. The speaker 108 outputs a voice based on a voice output signal. The control unit 110 controls an operation of the respective components of the image display device 100. The respective components of the control unit 110 will be described below. The image input unit 112 receives the moving image captured by the imaging unit 104. The moving image received through the image input unit 112 is transmitted to the image processing unit 114 and used for image processing performed by the image processing unit 114. The image processing unit 114 is an example of an image analysis unit of the present invention and executes a variety of image processing on the moving image, which is captured by the imaging unit 104, received from the image input unit 112. The image processing executed by the image processing unit 114 includes a detection process of a moving body included in the moving image captured by the imaging unit 104, a detection process of the number of people included in the moving image, and a detection process of a face and a facial expression included in the moving image. A result of a variety of image processing performed by the image processing unit 114 is transmitted to the viewing state analysis unit 116 and used for analysis on the presence of a person who is viewing the image display device 100 or a state of a person who is viewing the image display device 100." *See* paras. [0051]-[0055].

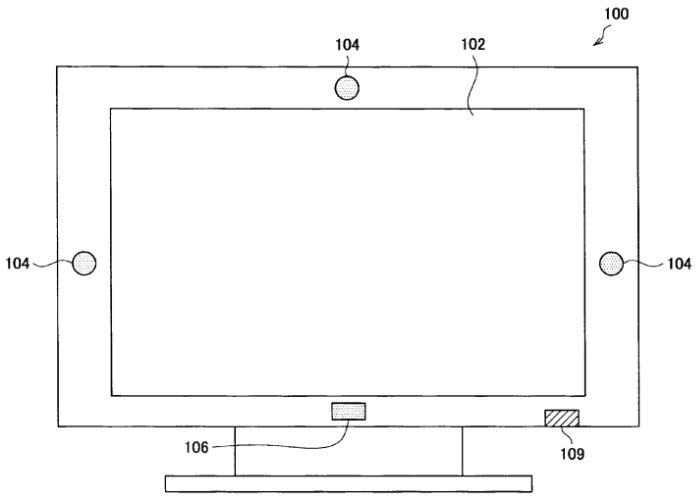
Asserted Claim of the '109 Patent	Exemplary Citations to Ooi
	FIG. 2  This limitation would have been obvious to a person of ordinary skill in the art based on (1) Ooi alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed 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;	Ooi 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) Ooi 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;	Ooi 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 system optimization processing unit 120 is an example of a power control unit of the present invention. The system optimization processing unit 120 calculates system control information for executing the system optimization process on the respective components of the image display device 100 using the analysis result obtained by the analysis process of the viewing state analysis unit 116. The system optimization process on the respective components of the image display device 100 includes power control of the image display device 100, brightness control of the display panel 102, direction control of the display panel 102, display content control of the display panel 102, sound volume control of a voice output from the speaker 108, and operation control of a circuitry (not shown) configured to increase the image quality of the moving image displayed on the display panel 102. As the circuitry configured to increase the image quality of the moving image displayed on the display panel 102, for example, a speed increasing circuit that increases a frame rate twice, three times, or the like may be used. Power consumption of the image display device 100 may be controlled by stopping a part or all of a circuit operation of the circuitry configured to increase the image quality of the moving image such as the speed increasing circuit." *See* paras. [0062]-[0063]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Ooi 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]. resizing the image to reduce variations caused by changes in object's distance to the camera;	Ooi expressly and/or inherently discloses and/or renders obvious this limitation. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Ooi 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 DefendZOants' 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;	To the extent the preamble is limiting, Ooi 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 present invention relates to a display device and a control method." *See* para. [0001]. "However, in the power save control using only face detection, there has been a problem in that even when it is desired to continuously view the display device, for example, when it is difficult to detect the user's face due to an installation environment of the television or when the user looks away during a certain time period, it is ultimately judged that viewing, that is, the face, is not present, and thus the display is turned off. Further, since the face detection process requires a relatively long image processing time compared to moving body detection, in an environment in which a computation rate or a resource is restricted, there has been a problem in that a response from when the user comes in front of the display device for viewing to when the image is displayed is delayed. Further, there is a display device in which power save control is performed by detecting a moving body or the user's action through an imaging device or a pyroelectric infrared element and analyzing the user's viewing state. However, there has been a problem in that when the user keeps viewing without moving, it is erroneously judged that the user is not present, and the screen display is turned off. In order to avoid such a malfunction,

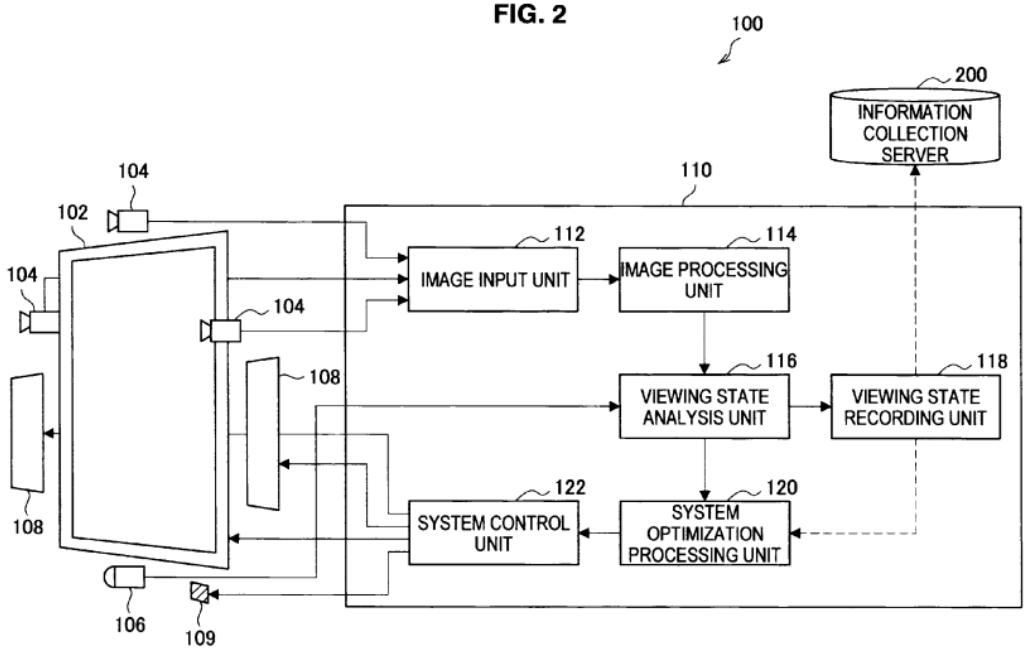
Asserted Claim of the '109 Patent	Exemplary Citations to Ooi
	it is necessary to increase a time until the power save control starts, which in turn deteriorates a power save effect. The present invention is made in view of the above-mentioned issues, and aims to provide a display device and a control method which are novel and improved, and which are capable of efficiently executing the power save control with a high degree of accuracy by combining the user's moving body detection and face detection." *See* paras. [0005]-[0007]. "According to an aspect of the present invention in order to achieve the above-mentioned object, there is provided a display device including an imaging unit that captures a moving image in a predetermined range in an image display direction, a moving body detection unit that detects whether or not a moving body is present in a predetermined range in the image display direction, an image analysis unit that analyzes the moving image captured by the imaging unit to detect whether or not a face is present, and a power control unit that controls power consumption with different patterns according to a plurality of modes that are set by combining whether or not the face detected by the image analysis unit is present and whether or not the moving body detected by the detection unit is present." *See* para. [0008]. "[1-1. Configuration of Image Display Device] First, a configuration of an image display device according to an embodiment of the present invention will be described. FIG. 1 is an explanation diagram for explaining an appearance of an image display device 100 according to an embodiment of the present invention. FIG. 1 is a front view in which the image display device 100 is viewed from the front. An appearance of the image display device 100 according to an embodiment of the present invention will be described below with reference to FIG. 1. As illustrated in FIG. 1, the image display device 100 according to an embodiment of the present invention includes an imaging unit 104, which captures a moving image, disposed in an upper-central part and left and right central parts of a display panel 102

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	that displays a still image or a moving image. The imaging unit 104 captures the moving image in a direction in which the image display device 100 displays the still image or the moving image through the display panel 102. The image display device 100 according to the present embodiment analyzes an image captured by the imaging unit 104 and detects a user's face reflected on the image. The image display device 100 is characterized in that its internal operation state changes depending on whether or not the user's face is included in the image captured by the imaging unit 104. Further, the image display device 100 according to an embodiment of the present invention includes a sensor 106 disposed in a lower central part of the display panel 102. The sensor 106 detects whether or not a person is present in front of the image display device 100. The image display device 100 is also characterized in that its internal operation state changes depending on whether or not a person is present in front of the image display device 100. Further, the image display device 100 according to an embodiment of the present invention includes a light emitting diode (LED) 109. The LED 109 notifies the user of a status of the image display device 100 through a lighting status or an emission color. Further, in the image display device 100 illustrated in FIG. 1, the imaging unit 104 that captures the moving image is disposed at three positions around the display panel 102 of the image. It should be understood that in the present invention, an image input position at which the moving image is captured is not limited to the example. For example, a device separate from the image display device 100 may be disposed, the corresponding device may be connected with the image display device 100, and the moving picture may be captured by the corresponding device. Further, it should be understood that the number of image input units is not limited to three, and two or fewer or four or more image input units may be disposed to capture an image. Further, it should be understood that the number of the sensors 106 is not limited to one, and two or more sensors may be disposed to detect the presence of a person.” *See* paras. [0039]-[0044].

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	FIG. 1  “FIG. 2 is an explanation view illustrating a configuration of the image display device 100 according to an embodiment of the present invention. A configuration of the image display device 100 according to an embodiment of the present invention will be described below with reference to FIG. 2. As illustrated in FIG. 2, the image display device 100 according to an embodiment of the present invention includes the display panel 102, the imaging unit 104, the sensor 106, a speaker 108, and a control unit 110. The control unit 110 includes an image input unit 112, an image processing unit 114, a viewing state analysis unit 116, a viewing state recording unit 118, a system optimization processing unit 120, and a system control unit 122.

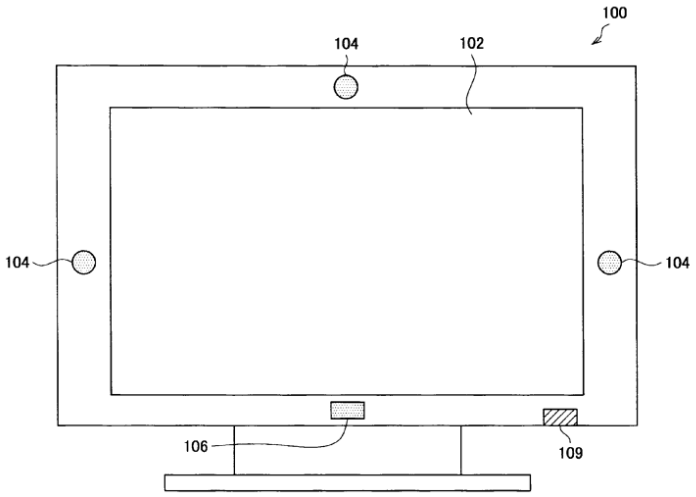
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	The display panel 102 displays a still image or a moving image based on a panel drive signal. In the present embodiment, the display panel 102 displays the still image or the moving image through a liquid crystal. Of course, it should be understood that the present invention is not limited to the example. The display panel 102 may display the still image or the moving image by a display device of a light-emitting type such as an organic electroluminescence (EL). The imaging unit 104 is disposed in the upper central part and the left and right central parts of the display panel 102 that displays the still image or the moving image as described above. When the panel drive signal is supplied to the display panel 102 and the moving image is displayed on the display panel 102, the imaging unit 104 acquires the moving image in a direction in which the image display device 100 displays the moving image through the display panel 102. The imaging unit 104 may capture the moving image by a charge coupled device (CCD) sensor or a complementary metal oxide semiconductor (CMOS) sensor. The moving image captured by the imaging unit 104 is transmitted to the control unit 110. The sensor 106 is displayed in the lower central part of the display panel 102 that displays the still image or the moving image as described above. The sensor 106 detects whether or not a person is present in front of the image display device 100. Further, when a person is present in front of the image display device 100, the sensor 106 can detect the distance between the image display device 100 and the person. The detection result and the distance information obtained by the sensor 106 are transmitted to the control unit 110. The speaker 108 outputs a voice based on a voice output signal. The control unit 110 controls an operation of the respective components of the image display device 100. The respective components of the control unit 110 will be described below. The image input unit 112 receives the moving image captured by the imaging unit 104. The moving image received through the image input unit 112 is transmitted to the image

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	processing unit 114 and used for image processing performed by the image processing unit 114. The image processing unit 114 is an example of an image analysis unit of the present invention and executes a variety of image processing on the moving image, which is captured by the imaging unit 104, received from the image input unit 112. The image processing executed by the image processing unit 114 includes a detection process of a moving body included in the moving image captured by the imaging unit 104, a detection process of the number of people included in the moving image, and a detection process of a face and a facial expression included in the moving image. A result of a variety of image processing performed by the image processing unit 114 is transmitted to the viewing state analysis unit 116 and used for analysis on the presence of a person who is viewing the image display device 100 or a state of a person who is viewing the image display device 100." *See* paras. [0047]-[0055].

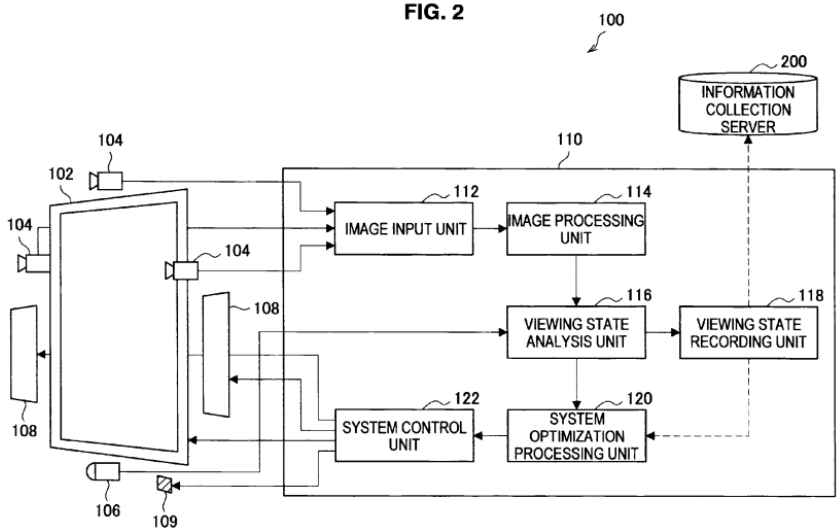
Asserted Claim of the ’109 Patent	Exemplary Citations to Ooi
	FIG. 2  “The system control unit 122 executes the system optimization process on the respective components of the image display device 100 based on the system control information calculated by the system optimization processing unit 120. Specifically, the system control unit 122 executes brightness control of the display panel 102, direction control of the display panel 102, display content control of the display panel 102, and sound volume control of the voice output from the speaker 108 based on the system control information calculated by the system optimization processing unit 120. A configuration of the image display device 100 according to an embodiment of the present invention has been described above with reference to FIG. 2. As described above, the image display device 100 according to an embodiment of the present invention analyzes the user's viewing state through the imaging unit 104 and the sensor 106. In the

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	conventional art, the imaging process is performed by the imaging unit 104, and the user's viewing state is analyzed only through the face detection process that judges whether or not a face is included in the image captured by the imaging unit 104. However, when the user's viewing state is analyzed only through the face detection process, there has been a problem in that even when it is desired to continuously view the display device, for example, when it is difficult to detect the user's face or when the user looks away during a certain time period, it is ultimately judged that viewing is not present, and thus the display is turned off. Further, since the face detection process requires a relatively long image processing time compared to the moving body detection process using the sensor or the like, in an environment in which a computation rate or a resource is restricted, a response from when the user comes in front of the display device for viewing to when the image is displayed has been delayed." *See* paras. [0066]-[0067]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Ooi 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;	Ooi 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. "According to an aspect of the present invention in order to achieve the above-mentioned object, there is provided a display device including an imaging unit that captures a moving image in a predetermined range in an image display direction, a moving body detection unit that detects whether or not a moving body is present in a predetermined range in the image display direction, an image analysis unit that analyzes the moving image captured by the imaging unit to detect whether or not a face is present, and a power control unit that controls power consumption with different patterns according to a plurality of modes that are set by combining whether or not the face detected by the

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	image analysis unit is present and whether or not the moving body detected by the detection unit is present." *See* para. [0008]. "[1-1. Configuration of Image Display Device] First, a configuration of an image display device according to an embodiment of the present invention will be described. FIG. 1 is an explanation diagram for explaining an appearance of an image display device 100 according to an embodiment of the present invention. FIG. 1 is a front view in which the image display device 100 is viewed from the front. An appearance of the image display device 100 according to an embodiment of the present invention will be described below with reference to FIG. 1. As illustrated in FIG. 1, the image display device 100 according to an embodiment of the present invention includes an imaging unit 104, which captures a moving image, disposed in an upper-central part and left and right central parts of a display panel 102 that displays a still image or a moving image. The imaging unit 104 captures the moving image in a direction in which the image display device 100 displays the still image or the moving image through the display panel 102. The image display device 100 according to the present embodiment analyzes an image captured by the imaging unit 104 and detects a user's face reflected on the image. The image display device 100 is characterized in that its internal operation state changes depending on whether or not the user's face is included in the image captured by the imaging unit 104." *See* paras. [0039]-[0041].

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	FIG. 1  “The imaging unit 104 is disposed in the upper central part and the left and right central parts of the display panel 102 that displays the still image or the moving image as described above. When the panel drive signal is supplied to the display panel 102 and the moving image is displayed on the display panel 102, the imaging unit 104 acquires the moving image in a direction in which the image display device 100 displays the moving image through the display panel 102. The imaging unit 104 may capture the moving image by a charge coupled device (CCD) sensor or a complementary metal oxide semiconductor (CMOS) sensor. The moving image captured by the imaging unit 104 is transmitted to the control unit 110. The sensor 106 is displayed in the lower central part of the display panel 102 that displays the still image or the moving image as described above. The sensor 106 detects whether or not a person is present in front of the image display device 100. Further, when a person

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	is present in front of the image display device 100, the sensor 106 can detect the distance between the image display device 100 and the person. The detection result and the distance information obtained by the sensor 106 are transmitted to the control unit 110. The speaker 108 outputs a voice based on a voice output signal. The control unit 110 controls an operation of the respective components of the image display device 100. The respective components of the control unit 110 will be described below. The image input unit 112 receives the moving image captured by the imaging unit 104. The moving image received through the image input unit 112 is transmitted to the image processing unit 114 and used for image processing performed by the image processing unit 114. The image processing unit 114 is an example of an image analysis unit of the present invention and executes a variety of image processing on the moving image, which is captured by the imaging unit 104, received from the image input unit 112. The image processing executed by the image processing unit 114 includes a detection process of a moving body included in the moving image captured by the imaging unit 104, a detection process of the number of people included in the moving image, and a detection process of a face and a facial expression included in the moving image. A result of a variety of image processing performed by the image processing unit 114 is transmitted to the viewing state analysis unit 116 and used for analysis on the presence of a person who is viewing the image display device 100 or a state of a person who is viewing the image display device 100." *See* paras. [0051]-[0055].

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	FIG. 2  This limitation would have been obvious to a person of ordinary skill in the art based on (1) Ooi 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	Ooi 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. "The sensor 106 is displayed in the lower central part of the display panel 102 that displays the still image or the moving image as described above. The sensor 106 detects whether or not a person is present in front of the image display device 100. Further, when a person is present in front of the image display device 100, the sensor 106 can detect the distance between the image display device 100 and the person. The detection result and the distance information obtained by the sensor 106 are transmitted to the control

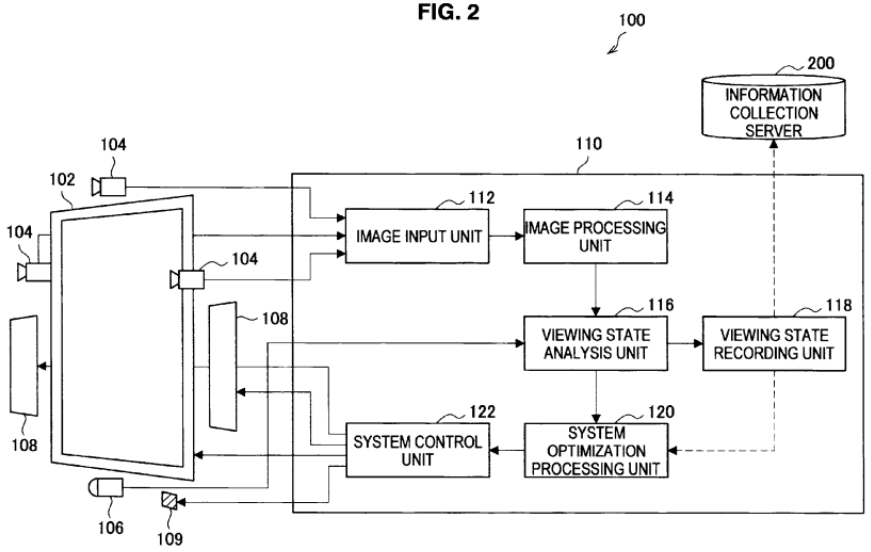
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	unit 110. The speaker 108 outputs a voice based on a voice output signal." *See* para. [0052]. "The viewing state analysis unit 116 receives the result of the various image processing performed by the image processing unit 114 and the detection result and the distance information obtained by detection of the sensor 106. The viewing state analysis unit 116 analyzes the presence or a state of a person who is viewing the image displayed by the image display device 100 using the result of the various image processing performed by the image processing unit 114 and the detection result and the distance information obtained by detection of the sensor 106. Since the viewing state analysis unit 116 analyzes the presence of a person or a state of a viewer, the image display device 100 can decrease brightness of the display panel 102 or control the direction of the display panel 102 depending on whether or not a person who is viewing the image display device 100 is present. An analysis result of the analysis process performed by the viewing state analysis unit 116 is transmitted to the viewing state recording unit 118 and the system optimization processing unit 120. Further, the viewing state analysis unit 116 can detect the moving body based on the detection result and the distance information obtained by detection of the sensor 106, but when the distance between the sensor 106 and the moving body is equal to or more than a predetermined distance, the moving body can be excluded from a detection target." *See* paras. [0059]-[0060]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Ooi 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[h]. varying rate at which the non-ordered steps are performed on the series of images according to the distance.	Ooi 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. "However, in the power save control using only face detection, there has been a problem in that even when it is desired to continuously view the display device, for example, when it is difficult to detect the user's face due to an installation environment of the television or when the user looks away during a certain time period, it is ultimately judged that viewing, that is, the face, is not present, and thus the display is turned off. Further, since the face detection process requires a relatively long image processing time compared to moving body detection, in an environment in which a computation rate or a resource is restricted, there has been a problem in that a response from when the user comes in front of the display device for viewing to when the image is displayed is delayed. Further, there is a display device in which power save control is performed by detecting a moving body or the user's action through an imaging device or a pyroelectric infrared element and analyzing the user's viewing state. However, there has been a problem in that when the user keeps viewing without moving, it is erroneously judged that the user is not present, and the screen display is turned off. In order to avoid such a malfunction, it is necessary to increase a time until the power save control starts, which in turn deteriorates a power save effect. The present invention is made in view of the above-mentioned issues, and aims to provide a display device and a control method which are novel and improved, and which are capable of efficiently executing the power save control with a high degree of accuracy by combining the user's moving body detection and face detection." *See* paras. [0005]-[0007]. "As illustrated in FIG. 1, the image display device 100 according to an embodiment of the present invention includes an imaging unit 104, which captures a moving image, disposed in an upper-central part and left and right central parts of a display panel 102

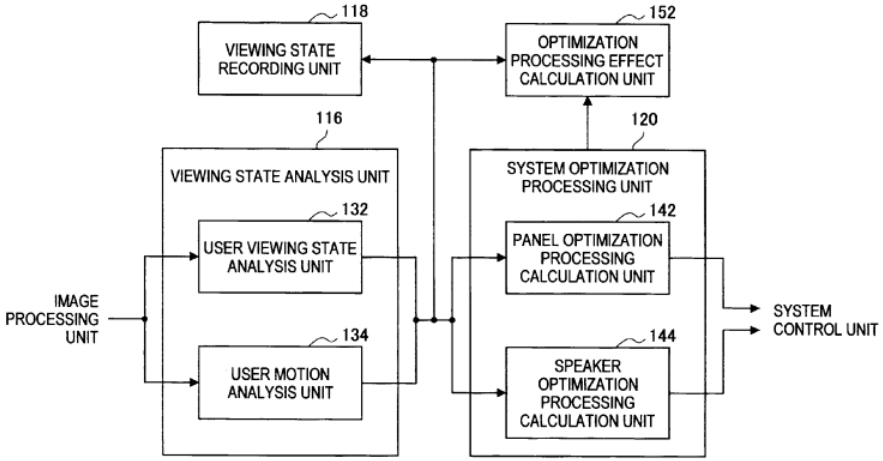
Asserted Claim of the '109 Patent	Exemplary Citations to Ooi
	that displays a still image or a moving image. The imaging unit 104 captures the moving image in a direction in which the image display device 100 displays the still image or the moving image through the display panel 102. The image display device 100 according to the present embodiment analyzes an image captured by the imaging unit 104 and detects a user's face reflected on the image. The image display device 100 is characterized in that its internal operation state changes depending on whether or not the user's face is included in the image captured by the imaging unit 104. Further, the image display device 100 according to an embodiment of the present invention includes a sensor 106 disposed in a lower central part of the display panel 102. The sensor 106 detects whether or not a person is present in front of the image display device 100. The image display device 100 is also characterized in that its internal operation state changes depending on whether or not a person is present in front of the image display device 100." *See* paras. [0041]-[0042]. "Further, the viewing state analysis unit 116 can detect the moving body based on the detection result and the distance information obtained by detection of the sensor 106, but when the distance between the sensor 106 and the moving body is equal to or more than a predetermined distance, the moving body can be excluded from a detection target. The viewing state recording unit 118 records the analysis result obtained by the analysis process performed by the viewing state analysis unit 116. The analysis result of the viewing state analysis unit 116 recorded in the viewing state recording unit 118 is used for a system optimization process in the system optimization processing unit 120. Further, the analysis result of the viewing state analysis unit 116 recorded in the viewing state recording unit 118 may be transmitted to an external information collection server 200. The system optimization processing unit 120 is an example of a power control unit of the present invention. The system optimization processing unit 120 calculates system control information for executing the system optimization process on the respective components of the image display device 100 using the analysis result obtained by the

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	analysis process of the viewing state analysis unit 116. The system optimization process on the respective components of the image display device 100 includes power control of the image display device 100, brightness control of the display panel 102, direction control of the display panel 102, display content control of the display panel 102, sound volume control of a voice output from the speaker 108, and operation control of a circuitry (not shown) configured to increase the image quality of the moving image displayed on the display panel 102. As the circuitry configured to increase the image quality of the moving image displayed on the display panel 102, for example, a speed increasing circuit that increases a frame rate twice, three times, or the like may be used. Power consumption of the image display device 100 may be controlled by stopping a part or all of a circuit operation of the circuitry configured to increase the image quality of the moving image such as the speed increasing circuit. The image display device 100 can execute a power save process based on the system control information calculated by the system optimization processing unit 120. The system control information calculated by the system optimization processing unit 120 is transmitted to the system control unit 122. Further, the image display device 100 according to the present embodiment executes a power save operation according to a plurality of power save modes which will be described later. In each power save mode, the power save operation is executed based on the system control information that is created, by the system optimization processing unit 120, to have a different pattern according to the analysis result of the viewing state analysis unit 116. The system control unit 122 executes the system optimization process on the respective components of the image display device 100 based on the system control information calculated by the system optimization processing unit 120. Specifically, the system control unit 122 executes brightness control of the display panel 102, direction control of the display panel 102, display content control of the display panel 102, and sound

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	volume control of the voice output from the speaker 108 based on the system control information calculated by the system optimization processing unit 120. A configuration of the image display device 100 according to an embodiment of the present invention has been described above with reference to FIG. 2. As described above, the image display device 100 according to an embodiment of the present invention analyzes the user's viewing state through the imaging unit 104 and the sensor 106. In the conventional art, the imaging process is performed by the imaging unit 104, and the user's viewing state is analyzed only through the face detection process that judges whether or not a face is included in the image captured by the imaging unit 104. However, when the user's viewing state is analyzed only through the face detection process, there has been a problem in that even when it is desired to continuously view the display device, for example, when it is difficult to detect the user's face or when the user looks away during a certain time period, it is ultimately judged that viewing is not present, and thus the display is turned off. Further, since the face detection process requires a relatively long image processing time compared to the moving body detection process using the sensor or the like, in an environment in which a computation rate or a resource is restricted, a response from when the user comes in front of the display device for viewing to when the image is displayed has been delayed. Meanwhile, there is a display device in which power save control is performed by detecting the moving body or the user's action through a pyroelectric infrared element or other sensors and analyzing the user's viewing state. However, there has been a problem in that when the user keeps viewing without moving, it is judged that the user is not present, and thus the screen display is turned off. In order to avoid such a malfunction, it is necessary to increase a time until the power save control starts, which in turn deteriorates a power save effect. The image display device 100 according to an embodiment of the present invention combines the face detection process on the image captured by the imaging unit 104 and

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	the moving body detection process performed by the sensor 106. Thus, the user's viewing state can be more effectively analyzed." *See* paras. [0060]-[0069]. FIG. 2  "[1-2. Configuration of Control Unit] FIG. 3 is an explanation view for explaining a configuration of the control unit 110 included in the image display device 100 according to an embodiment of the present invention. Particularly, FIG. 3 illustrates configurations of the viewing state analysis unit 116 and the system optimization processing unit 120 among the components included in the control unit 110. The configurations of the viewing state analysis unit 116 and the system optimization processing unit 120 will be described below with reference to FIG. 3. As illustrated in FIG. 3, the viewing state analysis unit 116 includes a user viewing state analysis unit 132 and a user motion analysis unit 134. The system optimization

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	processing unit 120 includes a panel optimization processing calculation unit 142 and a speaker optimization processing calculation unit 144. The user viewing state analysis unit 132 receives the result of the various image processing performed by the image processing unit 114, and the detection result and the distance information obtained by detection of the sensor 106. The user viewing state analysis unit 132 detects whether or not a person who is viewing the image display device 100 is present, and a direction or a size of a face of a person who is viewing the image display device 100 using the result of the various image processing performed by the image processing unit 114, and the detection result and the distance information obtained by detection of the sensor 106. The user motion analysis unit 134 receives the result of the various image processing performed by the image processing unit 114, and the detection result and the distance information obtained by detection of the sensor 106. The user motion analysis unit 134 analyzes whether or not a person who is viewing the image display device 100 is present, based on time-series or special state or record of the user's motion, using the result of the various image processing performed by the image processing unit 114, and the detection result and the distance information obtained by detection of the sensor 106. Here, the image processing unit 114 transmits the captured image, face detection information (for example, information such as central coordinates [a1,b1], the size of a face [w1,h1], and a direction of a face [i1]) of each user who is using the image display device 100 in the captured image, and moving body information (for example, information such as central coordinates [c1,d1], the size of a facial area [s1]) to the viewing state analysis unit 116. The viewing state analysis unit 116 performs the analysis process on whether or not a person who is viewing the image display device 100 is present using the information received from the image processing unit 114 through the user viewing state analysis unit 132 and the user motion analysis unit 134. The panel optimization processing calculation unit 142 calculates a process (a power save implementation process) capable of implementing optimum power save in the

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	display panel 102 using the result of the analysis process performed by the user viewing state analysis unit 132 and the user motion analysis unit 134. For example, the process capable of implementing optimum power save in the display panel 102 may include a process of controlling power consumption by increasing or decreasing brightness of the display panel 102 according to whether or a person who is viewing the image display device 100 is present and a time in which a person who is viewing the image display device 100 is not present, or controlling power consumption by increasing or decreasing the sound volume of the voice output from the speaker 106. The power save implementation process calculated by the panel optimization processing calculation unit 142 is transmitted to the system control unit 122 and used in the power save process of the display panel 102.” *See* paras. [0071]-[0077]. **FIG. 3**  “Further, for calculation of the power wave implementation process in the system optimization processing unit 120, an optimization processing effect calculation unit 152 may be used. The optimization processing effect calculation unit 152 calculates control information for the optimum power save process corresponding to the user's viewing

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	state using the analysis result of the viewing state analysis unit 116 and the calculation result of the power save implementation process performed by the system optimization processing unit 120." *See* para. [0079]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Ooi 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.	Ooi 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. "The sensor 106 is displayed in the lower central part of the display panel 102 that displays the still image or the moving image as described above. The sensor 106 detects whether or not a person is present in front of the image display device 100. Further, when a person is present in front of the image display device 100, the sensor 106 can detect the distance between the image display device 100 and the person. The detection result and the distance information obtained by the sensor 106 are transmitted to the control unit 110. The speaker 108 outputs a voice based on a voice output signal. The control unit 110 controls an operation of the respective components of the image display device 100. The respective components of the control unit 110 will be described below.

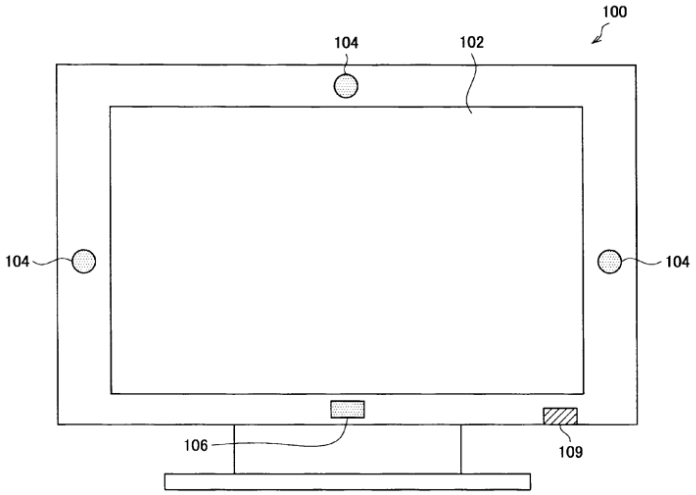
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	The image input unit 112 receives the moving image captured by the imaging unit 104. The moving image received through the image input unit 112 is transmitted to the image processing unit 114 and used for image processing performed by the image processing unit 114. The image processing unit 114 is an example of an image analysis unit of the present invention and executes a variety of image processing on the moving image, which is captured by the imaging unit 104, received from the image input unit 112. The image processing executed by the image processing unit 114 includes a detection process of a moving body included in the moving image captured by the imaging unit 104, a detection process of the number of people included in the moving image, and a detection process of a face and a facial expression included in the moving image. A result of a variety of image processing performed by the image processing unit 114 is transmitted to the viewing state analysis unit 116 and used for analysis on the presence of a person who is viewing the image display device 100 or a state of a person who is viewing the image display device 100. For example, the image processing unit 114 may use a technique disclosed in Japanese Patent Application Laid-Open (JP-A) Nos. 2007-65766 and 2005-44330 for the face detection process of detecting the face included in the image. The face detection process will be simply described below. In order to detect the user's face from the image, the position of the face, the size of the face, and a direction of the face in the supplied image are detected, respectively. When the position and the size of the face are detected, a face image part can be cut from the image. Feature parts (facial feature positions) of the face such as an eyebrow, an eye, a neck, a nose, and a mouse are detected based on the cut face image and information of the direction of the face. The facial feature positions may be detected by detecting the feature positions, for example, using a technique called active appearance models (AAM).

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	When the facial feature positions are detected, a local feature quantity is calculated on each of the detected facial feature positions. The local feature quantity is calculated, and the calculated local feature quantity is stored in conjunction with the face image, and thus the face can be distinguished from the image captured by the imaging unit 104. As the face distinguishing method, for example, a technique disclosed in JP-A Nos. 2007-65766 and 2005-44330 may be used, and thus a detailed description thereof will be omitted. Further, it can be judged based on the face image or the facial feature positions whether a face appearing in the supplied image is a man or a woman or whether a face appearing in the supplied image is an adult or a child. Further, since face information is previously recorded, it is possible to search for a person appearing in the supplied image from recorded faces and specify an individual. The viewing state analysis unit 116 receives the result of the various image processing performed by the image processing unit 114 and the detection result and the distance information obtained by detection of the sensor 106. The viewing state analysis unit 116 analyzes the presence or a state of a person who is viewing the image displayed by the image display device 100 using the result of the various image processing performed by the image processing unit 114 and the detection result and the distance information obtained by detection of the sensor 106. Since the viewing state analysis unit 116 analyzes the presence of a person or a state of a viewer, the image display device 100 can decrease brightness of the display panel 102 or control the direction of the display panel 102 depending on whether or not a person who is viewing the image display device 100 is present. An analysis result of the analysis process performed by the viewing state analysis unit 116 is transmitted to the viewing state recording unit 118 and the system optimization processing unit 120. Further, the viewing state analysis unit 116 can detect the moving body based on the detection result and the distance information obtained by detection of the sensor 106, but when the distance between the sensor 106 and the moving body is equal to or more than a predetermined distance, the moving body can be excluded from a detection target." *See* paras. [0052]-[0060].

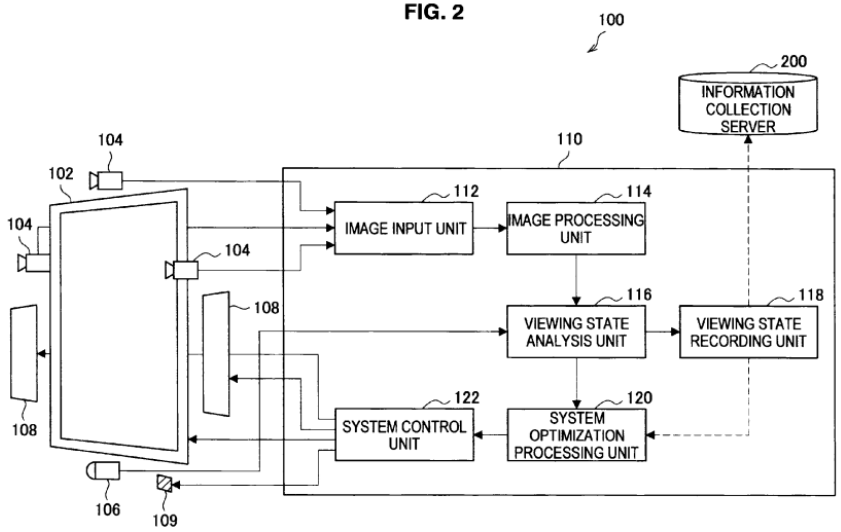
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	"The system optimization processing unit 120 is an example of a power control unit of the present invention. The system optimization processing unit 120 calculates system control information for executing the system optimization process on the respective components of the image display device 100 using the analysis result obtained by the analysis process of the viewing state analysis unit 116. The system optimization process on the respective components of the image display device 100 includes power control of the image display device 100, brightness control of the display panel 102, direction control of the display panel 102, display content control of the display panel 102, sound volume control of a voice output from the speaker 108, and operation control of a circuitry (not shown) configured to increase the image quality of the moving image displayed on the display panel 102. As the circuitry configured to increase the image quality of the moving image displayed on the display panel 102, for example, a speed increasing circuit that increases a frame rate twice, three times, or the like may be used. Power consumption of the image display device 100 may be controlled by stopping a part or all of a circuit operation of the circuitry configured to increase the image quality of the moving image such as the speed increasing circuit." *See* paras. [0062]-[0063]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Ooi 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 7	

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7[pre]. The method of claim 1, further comprising the steps:	To the extent the preamble is limiting, Ooi 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) Ooi 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;	Ooi expressly and/or inherently discloses and/or renders obvious obtaining a reference image. *See*, *e.g.*, disclosures below. "According to an aspect of the present invention in order to achieve the above-mentioned object, there is provided a display device including an imaging unit that captures a moving image in a predetermined range in an image display direction, a moving body detection unit that detects whether or not a moving body is present in a predetermined range in the image display direction, an image analysis unit that analyzes the moving image captured by the imaging unit to detect whether or not a face is present, and a power control unit that controls power consumption with different patterns according to a plurality of modes that are set by combining whether or not the face detected by the image analysis unit is present and whether or not the moving body detected by the detection unit is present." *See* para. [0008]. "[1-1. Configuration of Image Display Device] First, a configuration of an image display device according to an embodiment of the present invention will be described. FIG. 1 is an explanation diagram for explaining an appearance of an image display device 100 according to an embodiment of the present invention. FIG. 1 is a front view in which the image display device 100 is viewed from

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	the front. An appearance of the image display device 100 according to an embodiment of the present invention will be described below with reference to FIG. 1. As illustrated in FIG. 1, the image display device 100 according to an embodiment of the present invention includes an imaging unit 104, which captures a moving image, disposed in an upper-central part and left and right central parts of a display panel 102 that displays a still image or a moving image. The imaging unit 104 captures the moving image in a direction in which the image display device 100 displays the still image or the moving image through the display panel 102. The image display device 100 according to the present embodiment analyzes an image captured by the imaging unit 104 and detects a user's face reflected on the image. The image display device 100 is characterized in that its internal operation state changes depending on whether or not the user's face is included in the image captured by the imaging unit 104.” *See* paras. [0039]-[0041]. FIG. 1 

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	"The imaging unit 104 is disposed in the upper central part and the left and right central parts of the display panel 102 that displays the still image or the moving image as described above. When the panel drive signal is supplied to the display panel 102 and the moving image is displayed on the display panel 102, the imaging unit 104 acquires the moving image in a direction in which the image display device 100 displays the moving image through the display panel 102. The imaging unit 104 may capture the moving image by a charge coupled device (CCD) sensor or a complementary metal oxide semiconductor (CMOS) sensor. The moving image captured by the imaging unit 104 is transmitted to the control unit 110. The sensor 106 is displayed in the lower central part of the display panel 102 that displays the still image or the moving image as described above. The sensor 106 detects whether or not a person is present in front of the image display device 100. Further, when a person is present in front of the image display device 100, the sensor 106 can detect the distance between the image display device 100 and the person. The detection result and the distance information obtained by the sensor 106 are transmitted to the control unit 110. The speaker 108 outputs a voice based on a voice output signal. The control unit 110 controls an operation of the respective components of the image display device 100. The respective components of the control unit 110 will be described below. The image input unit 112 receives the moving image captured by the imaging unit 104. The moving image received through the image input unit 112 is transmitted to the image processing unit 114 and used for image processing performed by the image processing unit 114. The image processing unit 114 is an example of an image analysis unit of the present invention and executes a variety of image processing on the moving image, which is captured by the imaging unit 104, received from the image input unit 112. The image

Asserted Claim of the '109 Patent	Exemplary Citations to Ooi
	processing executed by the image processing unit 114 includes a detection process of a moving body included in the moving image captured by the imaging unit 104, a detection process of the number of people included in the moving image, and a detection process of a face and a facial expression included in the moving image. A result of a variety of image processing performed by the image processing unit 114 is transmitted to the viewing state analysis unit 116 and used for analysis on the presence of a person who is viewing the image display device 100 or a state of a person who is viewing the image display device 100." *See* paras. [0051]-[0055]. FIG. 2  This limitation would have been obvious to a person of ordinary skill in the art based on (1) Ooi 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 Ooi
7[b]. performing registration of the digital image with the reference image;	Ooi 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 sensor 106 is displayed in the lower central part of the display panel 102 that displays the still image or the moving image as described above. The sensor 106 detects whether or not a person is present in front of the image display device 100. Further, when a person is present in front of the image display device 100, the sensor 106 can detect the distance between the image display device 100 and the person. The detection result and the distance information obtained by the sensor 106 are transmitted to the control unit 110. The speaker 108 outputs a voice based on a voice output signal. The control unit 110 controls an operation of the respective components of the image display device 100. The respective components of the control unit 110 will be described below. The image input unit 112 receives the moving image captured by the imaging unit 104. The moving image received through the image input unit 112 is transmitted to the image processing unit 114 and used for image processing performed by the image processing unit 114. The image processing unit 114 is an example of an image analysis unit of the present invention and executes a variety of image processing on the moving image, which is captured by the imaging unit 104, received from the image input unit 112. The image processing executed by the image processing unit 114 includes a detection process of a moving body included in the moving image captured by the imaging unit 104, a detection process of the number of people included in the moving image, and a detection process of a face and a facial expression included in the moving image. A result of a variety of image processing performed by the image processing unit 114 is transmitted to the viewing state analysis unit 116 and used for analysis on the presence of a person who is viewing the image display device 100 or a state of a person who is viewing the image display device 100.

Asserted Claim of the '109 Patent	Exemplary Citations to Ooi
	For example, the image processing unit 114 may use a technique disclosed in Japanese Patent Application Laid-Open (JP-A) Nos. 2007-65766 and 2005-44330 for the face detection process of detecting the face included in the image. The face detection process will be simply described below. In order to detect the user's face from the image, the position of the face, the size of the face, and a direction of the face in the supplied image are detected, respectively. When the position and the size of the face are detected, a face image part can be cut from the image. Feature parts (facial feature positions) of the face such as an eyebrow, an eye, a neck, a nose, and a mouse are detected based on the cut face image and information of the direction of the face. The facial feature positions may be detected by detecting the feature positions, for example, using a technique called active appearance models (AAM). When the facial feature positions are detected, a local feature quantity is calculated on each of the detected facial feature positions. The local feature quantity is calculated, and the calculated local feature quantity is stored in conjunction with the face image, and thus the face can be distinguished from the image captured by the imaging unit 104. As the face distinguishing method, for example, a technique disclosed in JP-A Nos. 2007-65766 and 2005-44330 may be used, and thus a detailed description thereof will be omitted. Further, it can be judged based on the face image or the facial feature positions whether a face appearing in the supplied image is a man or a woman or whether a face appearing in the supplied image is an adult or a child. Further, since face information is previously recorded, it is possible to search for a person appearing in the supplied image from recorded faces and specify an individual. The viewing state analysis unit 116 receives the result of the various image processing performed by the image processing unit 114 and the detection result and the distance information obtained by detection of the sensor 106. The viewing state analysis unit 116 analyzes the presence or a state of a person who is viewing the image displayed by the image display device 100 using the result of the various image processing performed by the image processing unit 114 and the detection result and the distance information

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	obtained by detection of the sensor 106. Since the viewing state analysis unit 116 analyzes the presence of a person or a state of a viewer, the image display device 100 can decrease brightness of the display panel 102 or control the direction of the display panel 102 depending on whether or not a person who is viewing the image display device 100 is present. An analysis result of the analysis process performed by the viewing state analysis unit 116 is transmitted to the viewing state recording unit 118 and the system optimization processing unit 120. Further, the viewing state analysis unit 116 can detect the moving body based on the detection result and the distance information obtained by detection of the sensor 106, but when the distance between the sensor 106 and the moving body is equal to or more than a predetermined distance, the moving body can be excluded from a detection target." *See* paras. [0052]-[0060]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Ooi 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.	Ooi 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 system optimization processing unit 120 is an example of a power control unit of the present invention. The system optimization processing unit 120 calculates system control information for executing the system optimization process on the respective components of the image display device 100 using the analysis result obtained by the analysis process of the viewing state analysis unit 116. The system optimization process on the respective components of the image display device 100 includes power control of the image display device 100, brightness control of the display panel 102, direction control of the display panel 102, display content control of the display panel 102, sound

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	volume control of a voice output from the speaker 108, and operation control of a circuitry (not shown) configured to increase the image quality of the moving image displayed on the display panel 102. As the circuitry configured to increase the image quality of the moving image displayed on the display panel 102, for example, a speed increasing circuit that increases a frame rate twice, three times, or the like may be used. Power consumption of the image display device 100 may be controlled by stopping a part or all of a circuit operation of the circuitry configured to increase the image quality of the moving image such as the speed increasing circuit." *See* paras. [0062]-[0063]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Ooi 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 8	
8. The method of claim 1, further comprising applying a translation transformation to move the image within display area of the monitor.	Ooi 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. "As illustrated in FIG. 1, the image display device 100 according to an embodiment of the present invention includes an imaging unit 104, which captures a moving image, disposed in an upper-central part and left and right central parts of a display panel 102 that displays a still image or a moving image. The imaging unit 104 captures the moving image in a direction in which the image display device 100 displays the still image or the moving image through the display panel 102. The image display device 100

Asserted Claim of the '109 Patent	Exemplary Citations to Ooi
	according to the present embodiment analyzes an image captured by the imaging unit 104 and detects a user's face reflected on the image. The image display device 100 is characterized in that its internal operation state changes depending on whether or not the user's face is included in the image captured by the imaging unit 104." *See* para. [0041]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Ooi 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.

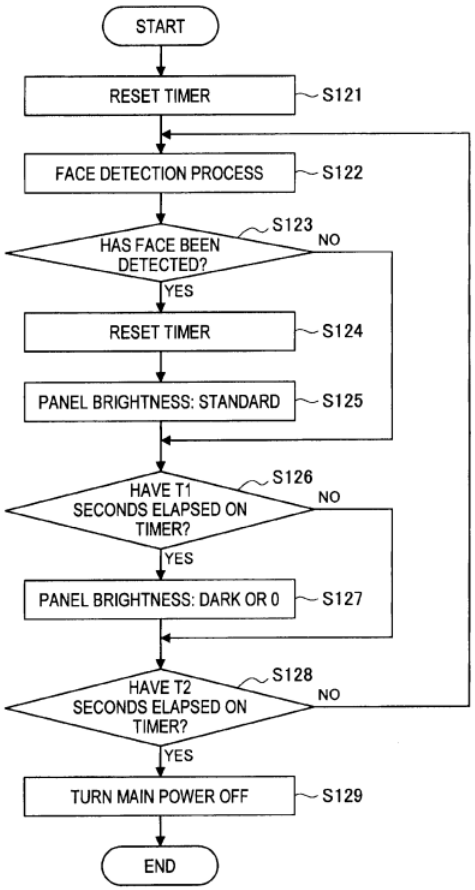
Asserted Claim of the '109 Patent	Exemplary Citations to Ooi
Claim 9	
9. The method of claim 1, further comprising changing illumination intensity of individual or groups of pixels of the monitor, so as to enhance shading or illumination in the image.	Ooi expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. "The power control unit may control power consumption of the display device by increasing or decreasing brightness of a display panel that display an image." *See* para. [0012]. "Further, the image display device 100 according to an embodiment of the present invention includes a light emitting diode (LED) 109. The LED 109 notifies the user of a status of the image display device 100 through a lighting status or an emission color." *See* para. [0043]. "The viewing state analysis unit 116 receives the result of the various image processing performed by the image processing unit 114 and the detection result and the distance information obtained by detection of the sensor 106. The viewing state analysis unit 116 analyzes the presence or a state of a person who is viewing the image displayed by the

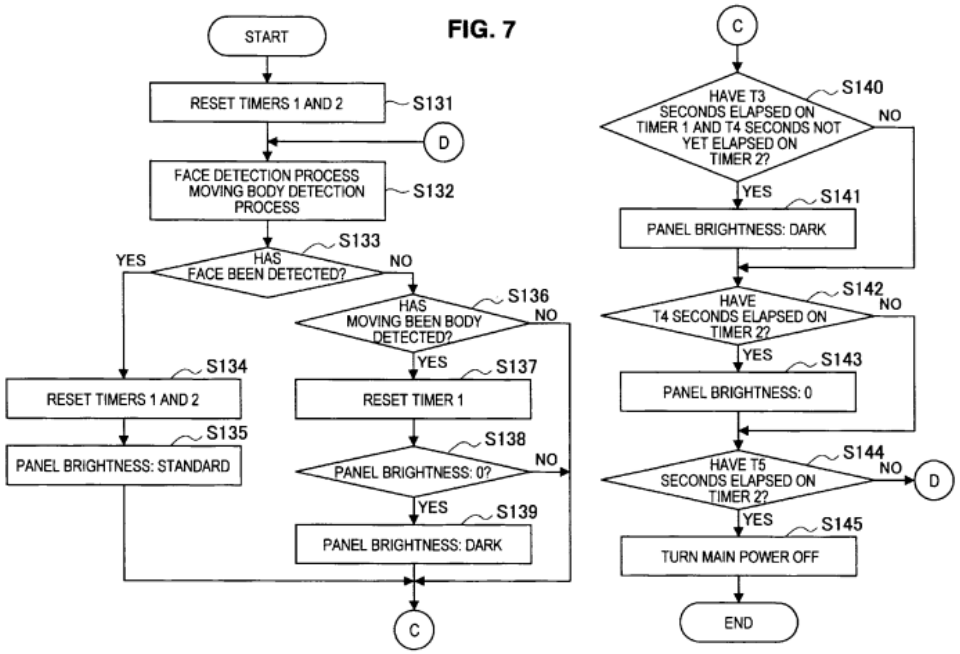
Asserted Claim of the '109 Patent	Exemplary Citations to Ooi
	image display device 100 using the result of the various image processing performed by the image processing unit 114 and the detection result and the distance information obtained by detection of the sensor 106. Since the viewing state analysis unit 116 analyzes the presence of a person or a state of a viewer, the image display device 100 can decrease brightness of the display panel 102 or control the direction of the display panel 102 depending on whether or not a person who is viewing the image display device 100 is present. An analysis result of the analysis process performed by the viewing state analysis unit 116 is transmitted to the viewing state recording unit 118 and the system optimization processing unit 120." *See* para. [0059]. "The system control unit 122 executes the system optimization process on the respective components of the image display device 100 based on the system control information calculated by the system optimization processing unit 120. Specifically, the system control unit 122 executes brightness control of the display panel 102, direction control of the display panel 102, display content control of the display panel 102, and sound volume control of the voice output from the speaker 108 based on the system control information calculated by the system optimization processing unit 120." *See* para. [0066]. "The panel optimization processing calculation unit 142 calculates a process (a power save implementation process) capable of implementing optimum power save in the display panel 102 using the result of the analysis process performed by the user viewing state analysis unit 132 and the user motion analysis unit 134. For example, the process capable of implementing optimum power save in the display panel 102 may include a process of controlling power consumption by increasing or decreasing brightness of the display panel 102 according to whether or a person who is viewing the image display device 100 is present and a time in which a person who is viewing the image display device 100 is not present, or controlling power consumption by increasing or decreasing the sound volume of the voice output from the speaker 106. The power save implementation process calculated by the panel optimization processing calculation unit

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	142 is transmitted to the system control unit 122 and used in the power save process of the display panel 102." *See* para. [0077]. "As illustrated in FIG. 5, when the power save mode is "High," if the viewing state analysis unit 116 cannot recognize the face during a specific time (for example, between 3 seconds and 10 seconds), power consumption is steadily suppressed, for example, by decreasing the brightness of the display panel 102 or decreasing the sound volume of the speaker 108. However, when the viewing state analysis unit 116 can recognize the face or when an operation on the image display device 100 has been performed by the remote controller, the power save mode is released. Further, when the power save mode is "Middle," if the viewing state analysis unit 116 cannot recognize the face during a specific time (for example, between 10 seconds and 30 seconds), power consumption is steadily suppressed up to about half, for example, by decreasing the brightness of the display panel 102 or decreasing the sound volume of the speaker 108. Further, if the viewing state analysis unit 116 cannot recognize the face and the moving body during a specific time (for example, between 1 minute and 3 minutes), power consumption is further suppressed, for example, by decreasing the brightness of the display panel 102 or decreasing the sound volume of the speaker 108. However, when the viewing state analysis unit 116 can recognize the face or when an operation on the image display device 100 has been performed by the remote controller, the power save mode is released. Further, when the power save mode is "Low," if the viewing state analysis unit 116 cannot recognize the face and the moving body during a specific time (for example, between 3 minutes and 10 minutes), power consumption is steadily suppressed, for example, by decreasing the brightness of the display panel 102 or decreasing the sound volume of the speaker 108. However, when the viewing state analysis unit 116 can recognize the face or when an operation on the image display device 100 has been performed by the remote controller, the power save mode is released." *See* paras. [0095]-[0097].

Asserted Claim of the '109 Patent	Exemplary Citations to Ooi
	"FIG. 6 is a flowchart illustrating the power save operation when the power save mode in the image display device 100 according to an embodiment of the present invention is "High." The power save operation when the power save mode in the image display device 100 according to an embodiment of the present invention is "High" will be described below with reference to FIG. 6. First, a timer retained in the image display device 100 is reset in advance before starting the power save operation (step S121). For example, resetting of the timer in step S121 may be executed by the viewing state analysis unit 116. Subsequently, the viewing state analysis unit 116 executes the face detection process (step S122). The viewing state analysis unit 116 judges whether or not a human face is included in the image transmitted to the image input unit 112 as a result of executing the face detection process through the viewing state analysis unit 116 (step S123). When the viewing state analysis unit 116 judges that a human face is included in the image transmitted to the image input unit 112 in step S123, the timer retained in the image display device 100 is reset again (step S124). For example, resetting of the timer in step S124 may be executed by the viewing state analysis unit 116 similarly to resetting of the timer in step S121. When the timer is reset in step S124, the system optimization processing unit 120 sets the brightness of the display panel 102 to standard brightness (brightness at the time of ordinary use) (step S125). However, when the viewing state analysis unit 116 judges that a human face is not included in the image transmitted to the image input unit 112 in step S123, the system optimization processing unit 120 judges whether or not T1 seconds (for example, 10 seconds) have elapsed on the timer (step S126).

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	When the system optimization processing unit 120 judges that T1 seconds have elapsed on the timer in step S126, the system optimization processing unit 120 sets the brightness of the display panel 102 to be dark or zero (0) (step S127). When the system optimization processing unit 120 sets the brightness of the display panel 102 to be zero or darkest in step S127 or when the system optimization processing unit 120 judges that T1 seconds have not elapsed on the timer yet in step S126, the system optimization processing unit 120 judges whether or not T2 seconds have elapsed on the timer (here, T2>T1) (step S128)." *See* paras. [0105]-[0112].

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	FIG. 6 

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	 This limitation would have been obvious to a person of ordinary skill in the art based on (1) Ooi 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	

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11[pre]. The method of claim 1, further comprising:	To the extent the preamble is limiting, Ooi 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) Ooi 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,	Ooi 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*: "The sensor 106 is displayed in the lower central part of the display panel 102 that displays the still image or the moving image as described above. The sensor 106 detects whether or not a person is present in front of the image display device 100. Further, when a person is present in front of the image display device 100, the sensor 106 can detect the distance between the image display device 100 and the person. The detection result and the distance information obtained by the sensor 106 are transmitted to the control unit 110. The speaker 108 outputs a voice based on a voice output signal." *See* para. [0052]. "The viewing state analysis unit 116 receives the result of the various image processing performed by the image processing unit 114 and the detection result and the distance information obtained by detection of the sensor 106. The viewing state analysis unit 116 analyzes the presence or a state of a person who is viewing the image displayed by the image display device 100 using the result of the various image processing performed by the image processing unit 114 and the detection result and the distance information obtained by detection of the sensor 106. Since the viewing state analysis unit 116

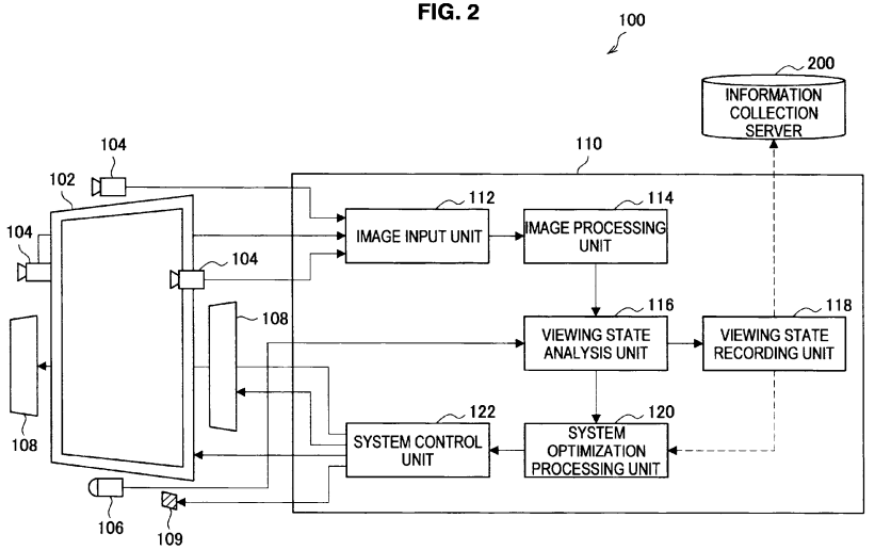
Asserted Claim of the '109 Patent	Exemplary Citations to Ooi
	analyzes the presence of a person or a state of a viewer, the image display device 100 can decrease brightness of the display panel 102 or control the direction of the display panel 102 depending on whether or not a person who is viewing the image display device 100 is present. An analysis result of the analysis process performed by the viewing state analysis unit 116 is transmitted to the viewing state recording unit 118 and the system optimization processing unit 120. Further, the viewing state analysis unit 116 can detect the moving body based on the detection result and the distance information obtained by detection of the sensor 106, but when the distance between the sensor 106 and the moving body is equal to or more than a predetermined distance, the moving body can be excluded from a detection target." *See* paras. [0059]-[0060]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Ooi 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.	Ooi expressly and/or inherently discloses and/or renders obvious varying resolution of the image according to the distance. *See*, *e.g.*, disclosures below. "However, in the power save control using only face detection, there has been a problem in that even when it is desired to continuously view the display device, for example, when it is difficult to detect the user's face due to an installation environment of the television or when the user looks away during a certain time period, it is ultimately judged that viewing, that is, the face, is not present, and thus the display is turned off. Further, since the face detection process requires a relatively long image processing time compared to moving body detection, in an environment in which a computation rate or a resource is restricted, there has been a problem in that a response from when the user

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	comes in front of the display device for viewing to when the image is displayed is delayed. Further, there is a display device in which power save control is performed by detecting a moving body or the user's action through an imaging device or a pyroelectric infrared element and analyzing the user's viewing state. However, there has been a problem in that when the user keeps viewing without moving, it is erroneously judged that the user is not present, and the screen display is turned off. In order to avoid such a malfunction, it is necessary to increase a time until the power save control starts, which in turn deteriorates a power save effect. The present invention is made in view of the above-mentioned issues, and aims to provide a display device and a control method which are novel and improved, and which are capable of efficiently executing the power save control with a high degree of accuracy by combining the user's moving body detection and face detection.” *See* paras. [0005]-[0007]. “As illustrated in FIG. 1, the image display device 100 according to an embodiment of the present invention includes an imaging unit 104, which captures a moving image, disposed in an upper-central part and left and right central parts of a display panel 102 that displays a still image or a moving image. The imaging unit 104 captures the moving image in a direction in which the image display device 100 displays the still image or the moving image through the display panel 102. The image display device 100 according to the present embodiment analyzes an image captured by the imaging unit 104 and detects a user's face reflected on the image. The image display device 100 is characterized in that its internal operation state changes depending on whether or not the user's face is included in the image captured by the imaging unit 104. Further, the image display device 100 according to an embodiment of the present invention includes a sensor 106 disposed in a lower central part of the display panel 102. The sensor 106 detects whether or not a person is present in front of the image display device 100. The image display device 100 is also characterized in that its internal

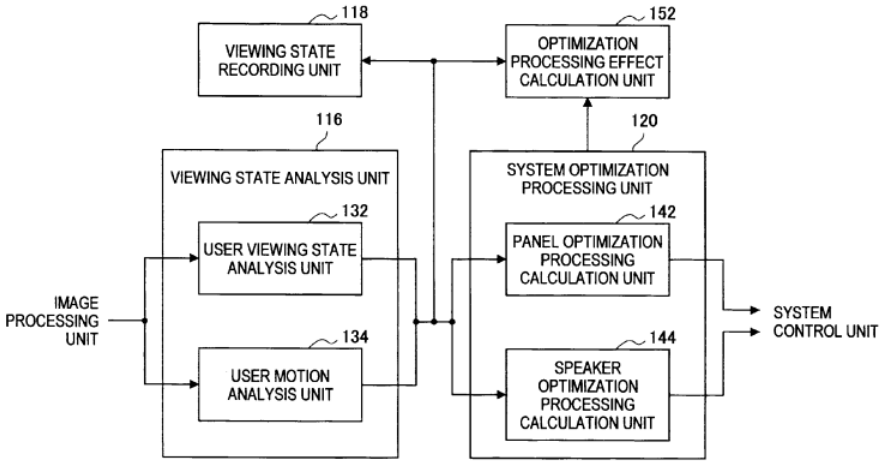
Asserted Claim of the '109 Patent	Exemplary Citations to Ooi
	operation state changes depending on whether or not a person is present in front of the image display device 100." *See* paras. [0041]-[0042]. "Further, the viewing state analysis unit 116 can detect the moving body based on the detection result and the distance information obtained by detection of the sensor 106, but when the distance between the sensor 106 and the moving body is equal to or more than a predetermined distance, the moving body can be excluded from a detection target. The viewing state recording unit 118 records the analysis result obtained by the analysis process performed by the viewing state analysis unit 116. The analysis result of the viewing state analysis unit 116 recorded in the viewing state recording unit 118 is used for a system optimization process in the system optimization processing unit 120. Further, the analysis result of the viewing state analysis unit 116 recorded in the viewing state recording unit 118 may be transmitted to an external information collection server 200. The system optimization processing unit 120 is an example of a power control unit of the present invention. The system optimization processing unit 120 calculates system control information for executing the system optimization process on the respective components of the image display device 100 using the analysis result obtained by the analysis process of the viewing state analysis unit 116. The system optimization process on the respective components of the image display device 100 includes power control of the image display device 100, brightness control of the display panel 102, direction control of the display panel 102, display content control of the display panel 102, sound volume control of a voice output from the speaker 108, and operation control of a circuitry (not shown) configured to increase the image quality of the moving image displayed on the display panel 102. As the circuitry configured to increase the image quality of the moving image displayed on the display panel 102, for example, a speed increasing circuit that increases a frame rate twice, three times, or the like may be used. Power consumption of the image display device 100 may be controlled by stopping a part or all of a circuit operation of the

Asserted Claim of the ’109 Patent	Exemplary Citations to Ooi
	circuitry configured to increase the image quality of the moving image such as the speed increasing circuit. The image display device 100 can execute a power save process based on the system control information calculated by the system optimization processing unit 120. The system control information calculated by the system optimization processing unit 120 is transmitted to the system control unit 122. Further, the image display device 100 according to the present embodiment executes a power save operation according to a plurality of power save modes which will be described later. In each power save mode, the power save operation is executed based on the system control information that is created, by the system optimization processing unit 120, to have a different pattern according to the analysis result of the viewing state analysis unit 116. The system control unit 122 executes the system optimization process on the respective components of the image display device 100 based on the system control information calculated by the system optimization processing unit 120. Specifically, the system control unit 122 executes brightness control of the display panel 102, direction control of the display panel 102, display content control of the display panel 102, and sound volume control of the voice output from the speaker 108 based on the system control information calculated by the system optimization processing unit 120. A configuration of the image display device 100 according to an embodiment of the present invention has been described above with reference to FIG. 2. As described above, the image display device 100 according to an embodiment of the present invention analyzes the user's viewing state through the imaging unit 104 and the sensor 106. In the conventional art, the imaging process is performed by the imaging unit 104, and the user's viewing state is analyzed only through the face detection process that judges whether or not a face is included in the image captured by the imaging unit 104. However, when the user's viewing state is analyzed only through the face detection process, there has been a problem in that even when it is desired to continuously view

Asserted Claim of the ’109 Patent	Exemplary Citations to Ooi
	the display device, for example, when it is difficult to detect the user's face or when the user looks away during a certain time period, it is ultimately judged that viewing is not present, and thus the display is turned off. Further, since the face detection process requires a relatively long image processing time compared to the moving body detection process using the sensor or the like, in an environment in which a computation rate or a resource is restricted, a response from when the user comes in front of the display device for viewing to when the image is displayed has been delayed. Meanwhile, there is a display device in which power save control is performed by detecting the moving body or the user's action through a pyroelectric infrared element or other sensors and analyzing the user's viewing state. However, there has been a problem in that when the user keeps viewing without moving, it is judged that the user is not present, and thus the screen display is turned off. In order to avoid such a malfunction, it is necessary to increase a time until the power save control starts, which in turn deteriorates a power save effect. The image display device 100 according to an embodiment of the present invention combines the face detection process on the image captured by the imaging unit 104 and the moving body detection process performed by the sensor 106. Thus, the user's viewing state can be more effectively analyzed.” *See* paras. [0060]-[0069].

Asserted Claim of the '109 Patent	Exemplary Citations to Ooi
	FIG. 2  "[1-2. Configuration of Control Unit] FIG. 3 is an explanation view for explaining a configuration of the control unit 110 included in the image display device 100 according to an embodiment of the present invention. Particularly, FIG. 3 illustrates configurations of the viewing state analysis unit 116 and the system optimization processing unit 120 among the components included in the control unit 110. The configurations of the viewing state analysis unit 116 and the system optimization processing unit 120 will be described below with reference to FIG. 3. As illustrated in FIG. 3, the viewing state analysis unit 116 includes a user viewing state analysis unit 132 and a user motion analysis unit 134. The system optimization processing unit 120 includes a panel optimization processing calculation unit 142 and a speaker optimization processing calculation unit 144.

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	The user viewing state analysis unit 132 receives the result of the various image processing performed by the image processing unit 114, and the detection result and the distance information obtained by detection of the sensor 106. The user viewing state analysis unit 132 detects whether or not a person who is viewing the image display device 100 is present, and a direction or a size of a face of a person who is viewing the image display device 100 using the result of the various image processing performed by the image processing unit 114, and the detection result and the distance information obtained by detection of the sensor 106. The user motion analysis unit 134 receives the result of the various image processing performed by the image processing unit 114, and the detection result and the distance information obtained by detection of the sensor 106. The user motion analysis unit 134 analyzes whether or not a person who is viewing the image display device 100 is present, based on time-series or special state or record of the user's motion, using the result of the various image processing performed by the image processing unit 114, and the detection result and the distance information obtained by detection of the sensor 106. Here, the image processing unit 114 transmits the captured image, face detection information (for example, information such as central coordinates [a1,b1], the size of a face [w1,h1], and a direction of a face [i1]) of each user who is using the image display device 100 in the captured image, and moving body information (for example, information such as central coordinates [c1,d1], the size of a facial area [s1]) to the viewing state analysis unit 116. The viewing state analysis unit 116 performs the analysis process on whether or not a person who is viewing the image display device 100 is present using the information received from the image processing unit 114 through the user viewing state analysis unit 132 and the user motion analysis unit 134. The panel optimization processing calculation unit 142 calculates a process (a power save implementation process) capable of implementing optimum power save in the display panel 102 using the result of the analysis process performed by the user viewing state analysis unit 132 and the user motion analysis unit 134. For example, the process capable of implementing optimum power save in the display panel 102 may include a

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	process of controlling power consumption by increasing or decreasing brightness of the display panel 102 according to whether or a person who is viewing the image display device 100 is present and a time in which a person who is viewing the image display device 100 is not present, or controlling power consumption by increasing or decreasing the sound volume of the voice output from the speaker 106. The power save implementation process calculated by the panel optimization processing calculation unit 142 is transmitted to the system control unit 122 and used in the power save process of the display panel 102." *See* paras. [0071]-[0077]. **FIG. 3**  "Further, for calculation of the power wave implementation process in the system optimization processing unit 120, an optimization processing effect calculation unit 152 may be used. The optimization processing effect calculation unit 152 calculates control information for the optimum power save process corresponding to the user's viewing state using the analysis result of the viewing state analysis unit 116 and the calculation

Asserted Claim of the '109 Patent	Exemplary Citations to Ooi
	result of the power save implementation process performed by the system optimization processing unit 120." *See* para. [0079]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Ooi 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-13: Invalidity of U.S. Patent No. 8,982,109 in view of U.S. Patent Pub. No. 2007/0040033 ("Rosenberg")

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.

Rosenberg was originally filed September 26, 2006 and was published on February 22, 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(a), (b) and (e).

Rosenberg anticipates the Asserted Claims of the '109 Patent. To the extent it is found Rosenberg 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 Rosenberg does not anticipate the Asserted Claims, Rosenberg 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.

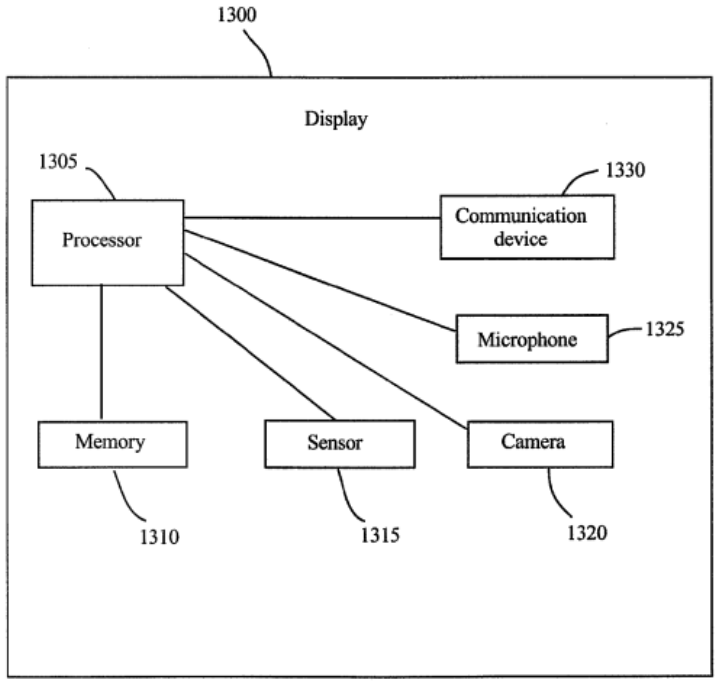
Asserted Claim of the '109 Patent	Exemplary Citations to Rosenberg
Claim 1	
1[pre]. A method for operating a system having a monitor, a camera, and a processor, so as to display a mirror-mimicking image on the monitor, by performing non-ordered steps comprising:	To the extent the preamble is limiting, Rosenberg expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. "According to an embodiment of the invention, a digital mirror system is provided that has a digital mirror display to display at least one image. A camera captures the at least one image. The camera is mounted onto the digital mirror display. A hands-free sensor detects a user input. A processor controls the camera to capture the at least one image in response to the user input. The digital mirror system is adapted to provide real-time captured images that approximate what a user would see when viewing an ordinary mirror, with the addition of various other image processing features. According to an embodiment of the invention, a method is provided that includes capturing at least one image of a user located in front of a camera mounted onto a digital mirror display. A hands-free user input is detected and the capturing is performed in response to the detecting. The at least one image is displayed on the digital mirror display. According to at least one function the at least one image is displayed substantially in real-time. According to an embodiment of the invention, a digital mirror is provided that includes a display to display at least one image. A camera captures the at least one image. At least one hands-free sensor detects a user input. Electronics control the display and the camera in response to the user input. A housing stores the display, camera, electronics, and at the least one hands-free sensor." *See* paras. [0006]-[0008]. "Embodiments of the present invention replace the common household wall mirror with a digital mirror system that provides numerous inventive features and functions. The system employs electronic imaging hardware and software components to provide a diverse range of user-selectable mirroring capabilities to a person who stands before the wall mounted display. For example, the integrated digital mirror of the present invention enables users to quickly and easily view not only a mirror image of themselves (i.e., a

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	left-right inverted representation) as is displayed by a traditional mirror, but also a non-inverted image of themselves (i.e. a view similar to that which a third person would see if standing across from the user at the location of the mirror). Also, the integrated digital mirror of the present invention enables users to quickly and easily view not only their frontal image when looking in the digital mirror, but also profile images and rear images. The digital mirror also enables the user to view composite images that include a concurrent display of current and previous reflective images, thereby allowing users to view changes over time in their appearance. The digital mirror further enables users to quickly and easily adjust zoom-in and zoom-out the reflective image, enabling users to focus in on particular areas of their own reflection. The digital mirror also includes unique hands-free user interface functionality in which simple vocal commands can select and adjust features and functions of the digital mirror. The digital mirror further includes a novel proximity and/or motion sensor for detecting when a user is physically present before and/or approaches and/or stands before the display screen of the mirror within some proximity range and automatically engages the digital mirror functionality of the present invention. The digital mirror also provides for dual-state operation embodiments in which the system displays digitized wall artwork or photographs when not in a mirroring mode and wherein the system automatically enters a mirroring mode when a user steps in front of the display screen for more than a threshold amount of time and/or when the user utters a particular verbal command. The digital mirror also provides for dual-state operation embodiments in which the system automatically enters a power-conservation mode, sending reduced power to the display screen when a user is not standing before the mirror for more than a threshold amount of time and wherein the system automatically enters a mirroring mode when a user steps in front of the display screen and/or when the user utters a particular verbal command. Embodiments of the present invention replace the common household mirrors with digital embodiments that provide numerous inventive features and functions. As described herein, embodiments of the present invention provide a wall-mounted flat panel display and one or more digital camera(s) configured to provide real-time images of a user who stands before the display. In a traditional mirror mode of an embodiment of the present invention, the real-time images are streamed video images captured by a

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	camera mounted upon the display, the real-time streamed video images being a left-right inverted representation of the video signal captured by the camera. This left-right inverted representation is generally produced by flipping the pixels of the image around the vertical centerline such that right side of the user, from the user's perspective, appears upon the right side of the display, and the left side of the user, from the user's perspective, appears upon the left side of the display. The left-right inversion process is generally performed by a processing electronics at a high rate of speed so that the left-right inverted video image of the user is presented substantially in real-time to the user (i.e., there is not a noticeable time lag for the user). This left-right inversion process is performed to present the user with a traditional mirror image view of himself or herself, inverted in a similar was as would be seen in a traditional optical mirror. In this way the user can view his or her own image quickly and conveniently by simply stepping before the display portion of the digital mirror. In addition, embodiments of the present invention may be configured to provide a plurality of digital mirror display modes that may be selectively engaged by the user through hands-free user interactions. In a basic mode of operation, referred to herein a traditional mirror emulation mode, the digital mirror is operative to replicate the performance of a standard household mirror, providing the user with a left-right reversed frontal image of himself or herself when standing before the display. This is achieved by streaming a left-right inverted representation of the real-time video imagery from a camera aimed at the user to a screen portion of the display, the camera being mounted and aimed such that it points back at the user from a position on or near the display. In a preferred embodiment, the camera is positioned such that it is centered with respect to the screen area of the display. In basic embodiments the camera is mounted directly above the screen area of the display, generally near the center. This is non-ideal because it provides the user with a view of himself or herself from a somewhat unnatural perspective as compared to a traditional mirror. In more advanced embodiments the camera is mounted within the screen area of the display itself, approximately at eye-level of typical users, for example, positioned behind the display surface and aimed through a transparent portion of the display. Such embedded-camera embodiments provide a superior arrangement because they provide the user with a natural and accurate visual perspective of himself or herself as compared

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	to a traditional mirror. In many such embedded-camera embodiments the camera imaging frame rate is interlaced with the display imagery frame rate such that camera images are captured during off times between the image display. Thus by mounting the camera at such a location and in such a manner, the user will get the most closely approximated mirror image captured by the camera and projected upon the display. However, embodiments which have a camera mounted above the screen area may still be configured to provide an effective image, but the vantage point will simply being slightly higher than the eye-level vantage point with which users are familiar. This raised vantage point is sometimes advantageous, giving users an increased view of the top of their head, an area that is often the focus of hair brushing. It is often preferred to incorporate the camera within or behind the display screen because it yields a more realistic replication of a true mirror image (i.e., an image that is from a vantage point perfectly straight ahead). Such embodiments of the present invention often strive to achieve placement of the camera such that the image captured by the camera is taken from a vantage point that is centered horizontally with respect to the display screen and at an elevation vertically that generally corresponds with a user's typical eye level. In this way the user is looking straight at the camera when standing centered before the digital mirror display screen. A number of different methods and/or technologies may be employed to achieve placement of a camera such that the image captured is from this centrally located area upon the display screen. In some embodiments a small region of active screen area is removed to allow the camera to capture an image through the screen surface. This region of removed screen will generally appear as a blacked-out portion of the mirror image as if a small black dot was cut into a real mirror to allow light to pass through it. With proper optics, this dead region of the mirror display surface can be very small—for example a circular region of less than 1 millimeter in diameter. Various configurations of lenses, mirrors, and/or fiber optics can be used to enable flexibility in camera hardware positioning with respect to the small non-active portion of the screen. In other embodiments, the camera is positioned behind the display screen and captures images through an active area of the screen during off-cycles when the digital mirror imagery is not displayed. LCD display screens are particularly well suited for such

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	embodiments because they are transparent when not activated. Because display screens are generally controlled through a rapid sequence of active and non-active cycling, the camera may be positioned such it collects image data through an LCD display screen during the off-cycles when the LCD is not displaying an image. In some such embodiments the camera is pulsed at the same rate as the LCD display but out of phase such that the camera is operative to record images through the LCD when the LCD is transparent. A number of technologies for capturing digital images through an active display screen are disclosed in European Patent Application EP 1041506A2, the disclosure of which is hereby incorporated by reference. Such technologies may be employed with the embodiments described below to enable unique and novel digital mirror features, functions, and hardware embodiments. Although LCD display technologies are noted herein as being particularly well suited for digital mirror systems in which the camera collects images through the screen itself, other display technologies that are transparent and/or semi-transparent during part of each display cycle may be used in a similar way.” *See* paras. [0025]-[0029]. “FIG. 13 illustrates a display 1300 according to at least one embodiment of the invention. As shown, the display 1300 includes a processor 1305, a memory 1310, a sensor 1315, a camera 1320, a microphone 1325, and a communication device 1330. The display 1300 displays the digital images. The processor 1305 is in communication with the display screen 1300, the microphone 1325, the camera 1320, the sensor(s) 1315, and the memory 1310. The processor 1305 receives data from the microphone 1325, the camera 1320, and the sensor 1315, and controls the various components of the display 1300. The processor may be a single microprocessor unit or may comprise a plurality of processing components that share the processing burden. The memory 1310 may store program code to be executed by the processor 1305, as well as archived images. The sensor 1310 senses various user inputs, such as the user walking in front of the display screen or stepping before the display screen. The sensor may comprise a dedicated motion sensor or proximity sensor. In some embodiments the sensor functions are achieved at least in part using camera 1320. The user's spoken voice is detected by the microphone 1325. The communication device 1330 is utilized to receive and transmit images across a network. The processor may be operative to enable a plurality of different operating states of the

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	unit, including a digital mirroring state, a power conservation state, and/or a digital picture frame state, as described previously." *See* para. [0109].  Fig. 13 This limitation would have been obvious to a person of ordinary skill in the art based on (1) Rosenberg 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]. obtaining a digital image from a camera;	Rosenberg expressly and/or inherently discloses and/or renders obvious obtaining a digital image from a camera. *See*, *e.g.*, disclosures below. "Embodiments of the present invention replace the common household wall mirror with a digital mirror system that provides numerous inventive features and functions. The system employs electronic imaging hardware and software components to provide a diverse range of user-selectable mirroring capabilities to a person who stands before the wall mounted display. For example, the integrated digital mirror of the present invention enables users to quickly and easily view not only a mirror image of themselves (i.e., a left-right inverted representation) as is displayed by a traditional mirror, but also a non-inverted image of themselves (i.e. a view similar to that which a third person would see if standing across from the user at the location of the mirror). Also, the integrated digital mirror of the present invention enables users to quickly and easily view not only their frontal image when looking in the digital mirror, but also profile images and rear images. The digital mirror also enables the user to view composite images that include a concurrent display of current and previous reflective images, thereby allowing users to view changes over time in their appearance. The digital mirror further enables users to quickly and easily adjust zoom-in and zoom-out the reflective image, enabling users to focus in on particular areas of their own reflection. The digital mirror also includes unique hands-free user interface functionality in which simple vocal commands can select and adjust features and functions of the digital mirror. The digital mirror further includes a novel proximity and/or motion sensor for detecting when a user is physically present before and/or approaches and/or stands before the display screen of the mirror within some proximity range and automatically engages the digital mirror functionality of the present invention. The digital mirror also provides for dual-state operation embodiments in which the system displays digitized wall artwork or photographs when not in a mirroring mode and wherein the system automatically enters a mirroring mode when a user steps in front of the display screen for more than a threshold amount of time and/or when the user utters a particular verbal command. The digital mirror also provides

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	for dual-state operation embodiments in which the system automatically enters a power-conservation mode, sending reduced power to the display screen when a user is not standing before the mirror for more than a threshold amount of time and wherein the system automatically enters a mirroring mode when a user steps in front of the display screen and/or when the user utters a particular verbal command. Embodiments of the present invention replace the common household mirrors with digital embodiments that provide numerous inventive features and functions. As described herein, embodiments of the present invention provide a wall-mounted flat panel display and one or more digital camera(s) configured to provide real-time images of a user who stands before the display. In a traditional mirror mode of an embodiment of the present invention, the real-time images are streamed video images captured by a camera mounted upon the display, the real-time streamed video images being a left-right inverted representation of the video signal captured by the camera. This left-right inverted representation is generally produced by flipping the pixels of the image around the vertical centerline such that right side of the user, from the user's perspective, appears upon the right side of the display, and the left side of the user, from the user's perspective, appears upon the left side of the display. The left-right inversion process is generally performed by a processing electronics at a high rate of speed so that the left-right inverted video image of the user is presented substantially in real-time to the user (i.e., there is not a noticeable time lag for the user). This left-right inversion process is performed to present the user with a traditional mirror image view of himself or herself, inverted in a similar was as would be seen in a traditional optical mirror. In this way the user can view his or her own image quickly and conveniently by simply stepping before the display portion of the digital mirror. In addition, embodiments of the present invention may be configured to provide a plurality of digital mirror display modes that may be selectively engaged by the user through hands-free user interactions. In a basic mode of operation, referred to herein a traditional mirror emulation mode, the digital mirror is operative to replicate the performance of a standard household mirror, providing the user with a left-right reversed frontal image of himself or herself when standing before the display. This is achieved by streaming a left-right inverted

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	representation of the real-time video imagery from a camera aimed at the user to a screen portion of the display, the camera being mounted and aimed such that it points back at the user from a position on or near the display. In a preferred embodiment, the camera is positioned such that it is centered with respect to the screen area of the display. In basic embodiments the camera is mounted directly above the screen area of the display, generally near the center. This is non-ideal because it provides the user with a view of himself or herself from a somewhat unnatural perspective as compared to a traditional mirror. In more advanced embodiments the camera is mounted within the screen area of the display itself, approximately at eye-level of typical users, for example, positioned behind the display surface and aimed through a transparent portion of the display. Such embedded-camera embodiments provide a superior arrangement because they provide the user with a natural and accurate visual perspective of himself or herself as compared to a traditional mirror. In many such embedded-camera embodiments the camera imaging frame rate is interlaced with the display imagery frame rate such that camera images are captured during off times between the image display. Thus by mounting the camera at such a location and in such a manner, the user will get the most closely approximated mirror image captured by the camera and projected upon the display. However, embodiments which have a camera mounted above the screen area may still be configured to provide an effective image, but the vantage point will simply being slightly higher than the eye-level vantage point with which users are familiar. This raised vantage point is sometimes advantageous, giving users an increased view of the top of their head, an area that is often the focus of hair brushing. It is often preferred to incorporate the camera within or behind the display screen because it yields a more realistic replication of a true mirror image (i.e., an image that is from a vantage point perfectly straight ahead). Such embodiments of the present invention often strive to achieve placement of the camera such that the image captured by the camera is taken from a vantage point that is centered horizontally with respect to the display screen and at an elevation vertically that generally corresponds with a user's typical eye level. In this way the user is looking straight at the camera when standing centered before the digital mirror display screen. A number of different methods and/or technologies may be employed to achieve placement of a camera such that the image captured is from this

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	centrally located area upon the display screen. In some embodiments a small region of active screen area is removed to allow the camera to capture an image through the screen surface. This region of removed screen will generally appear as a blacked-out portion of the mirror image as if a small black dot was cut into a real mirror to allow light to pass through it. With proper optics, this dead region of the mirror display surface can be very small—for example a circular region of less than 1 millimeter in diameter. Various configurations of lenses, mirrors, and/or fiber optics can be used to enable flexibility in camera hardware positioning with respect to the small non-active portion of the screen. In other embodiments, the camera is positioned behind the display screen and captures images through an active area of the screen during off-cycles when the digital mirror imagery is not displayed. LCD display screens are particularly well suited for such embodiments because they are transparent when not activated. Because display screens are generally controlled through a rapid sequence of active and non-active cycling, the camera may be positioned such it collects image data through an LCD display screen during the off-cycles when the LCD is not displaying an image. In some such embodiments the camera is pulsed at the same rate as the LCD display but out of phase such that the camera is operative to record images through the LCD when the LCD is transparent. A number of technologies for capturing digital images through an active display screen are disclosed in European Patent Application EP 1041506A2, the disclosure of which is hereby incorporated by reference. Such technologies may be employed with the embodiments described below to enable unique and novel digital mirror features, functions, and hardware embodiments. Although LCD display technologies are noted herein as being particularly well suited for digital mirror systems in which the camera collects images through the screen itself, other display technologies that are transparent and/or semi-transparent during part of each display cycle may be used in a similar way." *See* paras. [0025]-[0029]. "When in one of these real-time mirroring modes, the hardware and software rapidly update the image upon the display screen with a representation of the real-time digital video imagery collected from the camera. Because the camera is aimed back at the user from within, upon, or nearly upon the location of the display screen, this imagery will

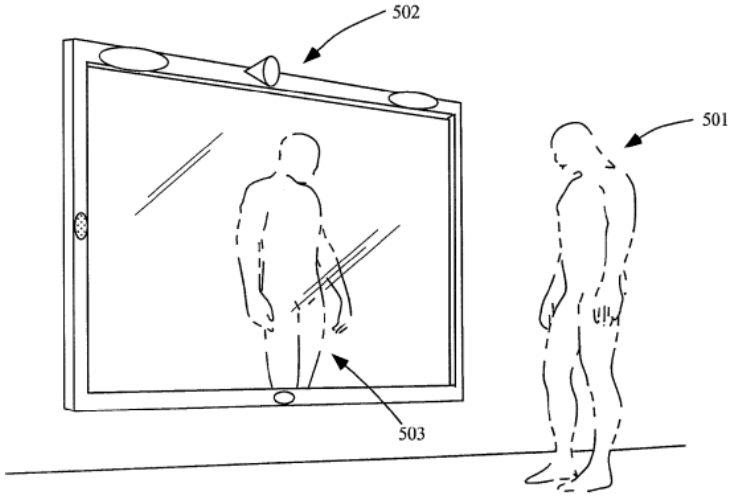
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	show a frontal depiction of any user or users who are standing substantially in front of the display screen and looking upon the screen while facing forward. In general, the rapid update rate is of a speed and lag such that it seems real-time and continuous to a human user. Typically an update rate of 60 HZ or more will be pleasing to a human user. In some embodiments update rates substantially higher than this may be used. In addition, the lag time is generally kept small (i.e., the time between image capture and image display), on the order of milliseconds or tens of milliseconds. Thus, when in a real-time mirroring mode, the image frames collected from the camera are captured at a rapid rate and displayed with minimal lag, providing a user with a real-time mirroring experience that responds in real time very much like a traditional mirror. As a user, for example, moves his arms about while brushing his or her hair, the image displayed upon the screen will appear continuously updated in real time. When employing the mirror image-freeze feature, the user is given the ability to selectively freeze the image displayed upon the screen such that it ceases being updated for a period of time with new video imagery from the camera. Instead a previous image that was captured at the time (or nearly at the time) that the image-freeze feature was engaged is displayed for that period of time. When in a traditional mirror emulation mode, the frozen image is a left-right inverted image of the user. When in a third person mirror mode, the frozen image is a non-inverted image of the user. Thus a user may be looking in the mirror, engage the mirror image-freeze feature, and have the then current (or substantially current) image that was displayed upon engaging the feature, freeze upon the screen for an extended period. This will allow the user, for example, to examine the frozen image in detail. This is particularly useful for a user who wishes to change his or her distance and/or location with respect to the mirror to get a better view of his or her image, but NOT have the image change as the user moves. For example, a user may wish to step closer to the mirror and view a portion of his or her face from only a few inches away. With a traditional optical mirror, such an act would cause the reflected image to change such that the user who is just a few inches away ends up staring into his or her own eyes. In reality he may wish to freeze the image, step close, and then view some other portion of the face. The mirror image-freeze feature of the present invention enables this enhanced mirroring operation. It works by saving a current frame (i.e., a

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	frame that was captured at or substantially at the time the user engaged the image freeze feature) in memory and using the stored image to update the graphical display such that the user views the frozen image over an extended period. When the user wishes to end the image-freeze function he or she may selectively end the feature and return to the real-time mirroring mode that was in operation prior to the freeze feature. In this way a real-time mirror mode will resume in which the image is continuously updated." *See* paras. [0038]-[0039]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Rosenberg 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;	Rosenberg 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. "Embodiments of the present invention replace the common household wall mirror with a digital mirror system that provides numerous inventive features and functions. The system employs electronic imaging hardware and software components to provide a diverse range of user-selectable mirroring capabilities to a person who stands before the wall mounted display. For example, the integrated digital mirror of the present invention enables users to quickly and easily view not only a mirror image of themselves (i.e., a left-right inverted representation) as is displayed by a traditional mirror, but also a non-inverted image of themselves (i.e. a view similar to that which a third person would see if standing across from the user at the location of the mirror). Also, the integrated digital mirror of the present invention enables users to quickly and easily view not only their frontal image when looking in the digital mirror, but also profile images and rear images. The digital mirror also enables the user to view composite images that include a concurrent display of current and previous reflective images, thereby allowing users to view changes over time in their appearance. The digital mirror further enables users to

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	quickly and easily adjust zoom-in and zoom-out the reflective image, enabling users to focus in on particular areas of their own reflection. The digital mirror also includes unique hands-free user interface functionality in which simple vocal commands can select and adjust features and functions of the digital mirror. The digital mirror further includes a novel proximity and/or motion sensor for detecting when a user is physically present before and/or approaches and/or stands before the display screen of the mirror within some proximity range and automatically engages the digital mirror functionality of the present invention. The digital mirror also provides for dual-state operation embodiments in which the system displays digitized wall artwork or photographs when not in a mirroring mode and wherein the system automatically enters a mirroring mode when a user steps in front of the display screen for more than a threshold amount of time and/or when the user utters a particular verbal command. The digital mirror also provides for dual-state operation embodiments in which the system automatically enters a power-conservation mode, sending reduced power to the display screen when a user is not standing before the mirror for more than a threshold amount of time and wherein the system automatically enters a mirroring mode when a user steps in front of the display screen and/or when the user utters a particular verbal command. Embodiments of the present invention replace the common household mirrors with digital embodiments that provide numerous inventive features and functions. As described herein, embodiments of the present invention provide a wall-mounted flat panel display and one or more digital camera(s) configured to provide real-time images of a user who stands before the display. In a traditional mirror mode of an embodiment of the present invention, the real-time images are streamed video images captured by a camera mounted upon the display, the real-time streamed video images being a left-right inverted representation of the video signal captured by the camera. This left-right inverted representation is generally produced by flipping the pixels of the image around the vertical centerline such that right side of the user, from the user's perspective, appears upon the right side of the display, and the left side of the user, from the user's perspective, appears upon the left side of the display. The left-right inversion process is generally performed by a processing electronics at a high rate of speed so that the left-right inverted video image of the user is presented substantially in real-time to the user (i.e., there is

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	not a noticeable time lag for the user). This left-right inversion process is performed to present the user with a traditional mirror image view of himself or herself, inverted in a similar was as would be seen in a traditional optical mirror. In this way the user can view his or her own image quickly and conveniently by simply stepping before the display portion of the digital mirror. In addition, embodiments of the present invention may be configured to provide a plurality of digital mirror display modes that may be selectively engaged by the user through hands-free user interactions. In a basic mode of operation, referred to herein a traditional mirror emulation mode, the digital mirror is operative to replicate the performance of a standard household mirror, providing the user with a left-right reversed frontal image of himself or herself when standing before the display. This is achieved by streaming a left-right inverted representation of the real-time video imagery from a camera aimed at the user to a screen portion of the display, the camera being mounted and aimed such that it points back at the user from a position on or near the display. In a preferred embodiment, the camera is positioned such that it is centered with respect to the screen area of the display. In basic embodiments the camera is mounted directly above the screen area of the display, generally near the center. This is non-ideal because it provides the user with a view of himself or herself from a somewhat unnatural perspective as compared to a traditional mirror. In more advanced embodiments the camera is mounted within the screen area of the display itself, approximately at eye-level of typical users, for example, positioned behind the display surface and aimed through a transparent portion of the display. Such embedded-camera embodiments provide a superior arrangement because they provide the user with a natural and accurate visual perspective of himself or herself as compared to a traditional mirror. In many such embedded-camera embodiments the camera imaging frame rate is interlaced with the display imagery frame rate such that camera images are captured during off times between the image display. Thus by mounting the camera at such a location and in such a manner, the user will get the most closely approximated mirror image captured by the camera and projected upon the display. However, embodiments which have a camera mounted above the screen area may still be configured to provide an effective image, but the vantage point will simply being slightly higher than the eye-level vantage point with which users are familiar. This raised

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	vantage point is sometimes advantageous, giving users an increased view of the top of their head, an area that is often the focus of hair brushing." *See* paras. [0025]-[0027]. "In a basic mode of operation the digital mirror is operative to replicate the performance of a standard household mirror, providing the user with a left-right reversed frontal image of himself or herself when standing before the display 200. This is achieved by feeding a left-right inverted representation of the real-time video image from a camera aimed at the user to a screen portion of the display, the camera being mounted and aimed such that it points back at the user from a position on or near the display 200. In a preferred embodiment, the camera is positioned such that it is horizontally centered with respect to the screen area of the display 200. In basic embodiments the camera is mounted directly above the screen area of the display 200, generally near the horizontal center. In more advanced embodiments the camera is mounted within the screen area of the display 200 itself, approximately at eye-level of typical users, positioned behind the display surface and aimed through a transparent portion of the display 200. In many such embodiments the camera imaging frame rate is interlaced with the display imagery frame rate such that camera images are captured during off times between the image display 200. By mounting the camera at such a location and in such a manner, the user will get the most closely approximated mirror image captured by the camera and projected upon the display 200. By mounting the camera above the display 200, the user can capture an image from slightly above, thereby providing some view of the top of his or head. This is sometimes desirable. A camera may also be mounted at multiple elevations with respect to the display screen and can be selected between to provide for a variety of viewing angles—for example, an eye-level viewing angle that provides a highly realistic mirror replication image and a higher viewing angle that provides some view of the top of the head." *See* para. [0061]. "FIG. 5 illustrates a computer rendering of a human user 501 standing in front of a wall-mounted embodiment of the advanced digital mirror system 502 according to at least one embodiment of the present invention. The user's image is captured as a real-time video image by a camera upon or within the digital mirror 502 as described previously. A representation of that real-time video image is then displayed upon the wall mounted

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	screen of the digital mirror 502 with a displayed size and scaling such that it appears like a traditional life-size mirror image 503. In a traditional mirror emulation mode, the real-time video image is left-right inverted prior to display upon the screen. Thus the user 501 standing before the digital display is given the visual impression that he or she is standing before a traditional wall mirror, viewing a traditional mirror image of himself or herself." *See* para. [0077].  Fig. 5 This limitation would have been obvious to a person of ordinary skill in the art based on (1) Rosenberg 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;	Rosenberg 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 an embodiment of the invention, a digital mirror system is provided that has a digital mirror display to display at least one image. A camera captures the at least one image. The camera is mounted onto the digital mirror display. A hands-free sensor detects a user input. A processor controls the camera to capture the at least one image in response to the user input. The digital mirror system is adapted to provide real-time captured images that approximate what a user would see when viewing an ordinary mirror, with the addition of various other image processing features. According to an embodiment of the invention, a method is provided that includes capturing at least one image of a user located in front of a camera mounted onto a digital mirror display. A hands-free user input is detected and the capturing is performed in response to the detecting. The at least one image is displayed on the digital mirror display. According to at least one function the at least one image is displayed substantially in real-time. According to an embodiment of the invention, a digital mirror is provided that includes a display to display at least one image. A camera captures the at least one image. At least one hands-free sensor detects a user input. Electronics control the display and the camera in response to the user input. A housing stores the display, camera, electronics, and at the least one hands-free sensor." *See* paras. [0006]-[0008]. "Embodiments of the present invention replace the common household wall mirror with a digital mirror system that provides numerous inventive features and functions. The system employs electronic imaging hardware and software components to provide a diverse range of user-selectable mirroring capabilities to a person who stands before the wall mounted display. For example, the integrated digital mirror of the present invention enables users to quickly and easily view not only a mirror image of themselves (i.e., a left-right inverted representation) as is displayed by a traditional mirror, but also a non-

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	inverted image of themselves (i.e. a view similar to that which a third person would see if standing across from the user at the location of the mirror). Also, the integrated digital mirror of the present invention enables users to quickly and easily view not only their frontal image when looking in the digital mirror, but also profile images and rear images. The digital mirror also enables the user to view composite images that include a concurrent display of current and previous reflective images, thereby allowing users to view changes over time in their appearance. The digital mirror further enables users to quickly and easily adjust zoom-in and zoom-out the reflective image, enabling users to focus in on particular areas of their own reflection. The digital mirror also includes unique hands-free user interface functionality in which simple vocal commands can select and adjust features and functions of the digital mirror. The digital mirror further includes a novel proximity and/or motion sensor for detecting when a user is physically present before and/or approaches and/or stands before the display screen of the mirror within some proximity range and automatically engages the digital mirror functionality of the present invention. The digital mirror also provides for dual-state operation embodiments in which the system displays digitized wall artwork or photographs when not in a mirroring mode and wherein the system automatically enters a mirroring mode when a user steps in front of the display screen for more than a threshold amount of time and/or when the user utters a particular verbal command. The digital mirror also provides for dual-state operation embodiments in which the system automatically enters a power-conservation mode, sending reduced power to the display screen when a user is not standing before the mirror for more than a threshold amount of time and wherein the system automatically enters a mirroring mode when a user steps in front of the display screen and/or when the user utters a particular verbal command. Embodiments of the present invention replace the common household mirrors with digital embodiments that provide numerous inventive features and functions. As described herein, embodiments of the present invention provide a wall-mounted flat panel display and one or more digital camera(s) configured to provide real-time images of a user who stands before the display. In a traditional mirror mode of an embodiment of the present invention, the real-time images are streamed video images captured by a camera mounted upon the display, the real-time streamed video images being a left-right

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	inverted representation of the video signal captured by the camera. This left-right inverted representation is generally produced by flipping the pixels of the image around the vertical centerline such that right side of the user, from the user's perspective, appears upon the right side of the display, and the left side of the user, from the user's perspective, appears upon the left side of the display. The left-right inversion process is generally performed by a processing electronics at a high rate of speed so that the left-right inverted video image of the user is presented substantially in real-time to the user (i.e., there is not a noticeable time lag for the user). This left-right inversion process is performed to present the user with a traditional mirror image view of himself or herself, inverted in a similar was as would be seen in a traditional optical mirror. In this way the user can view his or her own image quickly and conveniently by simply stepping before the display portion of the digital mirror. In addition, embodiments of the present invention may be configured to provide a plurality of digital mirror display modes that may be selectively engaged by the user through hands-free user interactions. In a basic mode of operation, referred to herein a traditional mirror emulation mode, the digital mirror is operative to replicate the performance of a standard household mirror, providing the user with a left-right reversed frontal image of himself or herself when standing before the display. This is achieved by streaming a left-right inverted representation of the real-time video imagery from a camera aimed at the user to a screen portion of the display, the camera being mounted and aimed such that it points back at the user from a position on or near the display. In a preferred embodiment, the camera is positioned such that it is centered with respect to the screen area of the display. In basic embodiments the camera is mounted directly above the screen area of the display, generally near the center. This is non-ideal because it provides the user with a view of himself or herself from a somewhat unnatural perspective as compared to a traditional mirror. In more advanced embodiments the camera is mounted within the screen area of the display itself, approximately at eye-level of typical users, for example, positioned behind the display surface and aimed through a transparent portion of the display. Such embedded-camera embodiments provide a superior arrangement because they provide the user with a natural and accurate visual perspective of himself or herself as compared to a traditional mirror. In many such embedded-camera embodiments the camera

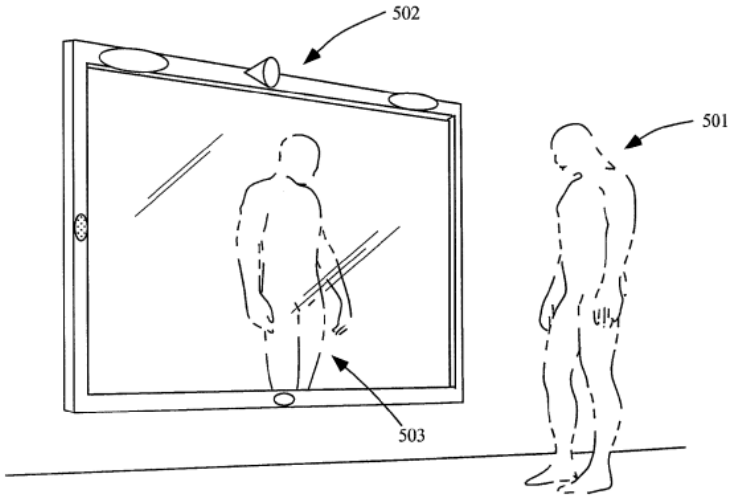
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	imaging frame rate is interlaced with the display imagery frame rate such that camera images are captured during off times between the image display. Thus by mounting the camera at such a location and in such a manner, the user will get the most closely approximated mirror image captured by the camera and projected upon the display. However, embodiments which have a camera mounted above the screen area may still be configured to provide an effective image, but the vantage point will simply being slightly higher than the eye-level vantage point with which users are familiar. This raised vantage point is sometimes advantageous, giving users an increased view of the top of their head, an area that is often the focus of hair brushing. It is often preferred to incorporate the camera within or behind the display screen because it yields a more realistic replication of a true mirror image (i.e., an image that is from a vantage point perfectly straight ahead). Such embodiments of the present invention often strive to achieve placement of the camera such that the image captured by the camera is taken from a vantage point that is centered horizontally with respect to the display screen and at an elevation vertically that generally corresponds with a user's typical eye level. In this way the user is looking straight at the camera when standing centered before the digital mirror display screen. A number of different methods and/or technologies may be employed to achieve placement of a camera such that the image captured is from this centrally located area upon the display screen. In some embodiments a small region of active screen area is removed to allow the camera to capture an image through the screen surface. This region of removed screen will generally appear as a blacked-out portion of the mirror image as if a small black dot was cut into a real mirror to allow light to pass through it. With proper optics, this dead region of the mirror display surface can be very small—for example a circular region of less than 1 millimeter in diameter. Various configurations of lenses, mirrors, and/or fiber optics can be used to enable flexibility in camera hardware positioning with respect to the small non-active portion of the screen. In other embodiments, the camera is positioned behind the display screen and captures images through an active area of the screen during off-cycles when the digital mirror imagery is not displayed. LCD display screens are particularly well suited for such embodiments because they are transparent when not activated. Because display screens

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	are generally controlled through a rapid sequence of active and non-active cycling, the camera may be positioned such it collects image data through an LCD display screen during the off-cycles when the LCD is not displaying an image. In some such embodiments the camera is pulsed at the same rate as the LCD display but out of phase such that the camera is operative to record images through the LCD when the LCD is transparent. A number of technologies for capturing digital images through an active display screen are disclosed in European Patent Application EP 1041506A2, the disclosure of which is hereby incorporated by reference. Such technologies may be employed with the embodiments described below to enable unique and novel digital mirror features, functions, and hardware embodiments. Although LCD display technologies are noted herein as being particularly well suited for digital mirror systems in which the camera collects images through the screen itself, other display technologies that are transparent and/or semi-transparent during part of each display cycle may be used in a similar way." *See* paras. [0025]-[0029]. "Embodiments of the present invention, as described herein, include a processor for adjusting and/or modifying the images that are displayed upon the screen to achieve unique mirroring features and functions not provided by a standard household wall mirror. The embodiments of present invention also includes a memory accessible by the processor for storing images to further enable unique mirroring features and functions not provided by a standard household wall mirror. The processor is operative to function in coordination with the speech processing module, selecting certain features and functions in response to particular identified verbal utterances. In some embodiments the speech processing module described above includes software components that run upon the processor along with other mirroring routines running upon the processor. The processor is also operative to function in coordination with the left-right image inversion processor described previously that inverts the real-time video image from the camera into a real-time mirror image representation. In some common embodiments the same processor unit is used to support multiple of these functions, the processor unit being a single microprocessor or being a combination of a plurality of hardware and software components, including for example both programmable and hardwired processing components. As described herein the processor generally refers to the grouping of

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	hardware and software components that perform the processing features described herein." *See* para. [0035]. "The electronics internal to the advanced digital mirror are not shown in FIG. 3 but include processing electronics, power electronics, signal conditioning electronics, and other common electronic components that may be required to support the features and functions, as discussed below with respect to FIG. 13. Embodiments of the present invention, as described herein, generally included a processor for adjusting and/or modifying the images that are displayed upon the screen to achieve unique mirroring features and functions not provided by a standard household wall mirror. Embodiments typically also include a memory accessible by the processor for storing images to further enable unique mirroring features and functions not provided by a standard household wall mirror. The processor is operative to function in coordination with the speech processing module, selecting certain modes, features, and functions in response to particular identified verbal utterances. In some embodiments the speech processing module described above includes software components that run upon the processor along with other mirroring routines running upon the processor. In addition, the processor within the advanced digital mirror may have communication access to one or more communication networks via a network connection 306." *See* para. [0074]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Rosenberg 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;	Rosenberg 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 some embodiments, the digital mirror also enables the user to zoom-in and/or zoom-out the real-time image that is displayed upon the screen. The feature, referred to herein

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	as "image-zoom mirroring," allows a user to view himself or herself from a perspective that seems nearer or farther than a typical mirror provides. Zooming in is particularly useful if a user is putting on makeup or performing some other operation that requires close attention to small details. Zooming out is particularly useful if a user wants to see a full length image of himself or herself on a mirror screen that is not naturally full-length. The zooming function may be performed by digital zoom and/or optical zoom. Digital zoom is a zoom performed by enlarging the display graphically while using an unchanged captured image. Optical zoom is a zoom performed by changing the optical focus of the camera. The present invention may employ either or both methods to modify the magnification characteristics of the digital mirror. Either way, the zooming functions are triggered by verbal commands that are correlated with zooming in or zooming out. For example, in some embodiments the verbal commands "zoom-in" and "zoom-out" are defined and associated with the zoom in and zoom out operations. The speech processor recognizes these commands and in response the routines zoom-in or zoom-out the image by some prescribed amount. For example, in some embodiments each time the user utters the command "zoom in" the mirror image is enlarged upon the display by 10%. Similarly each time the user utters the command "zoom out" the mirror image is zoomed out upon the display by 10%. Thus by repeated "zoom in" and "zoom out" verbal commands the user can achieve a desired magnification. An additional verbal command is generally included to terminate the zoom function and return the display to natural mirroring magnification. For example, verbal command "end zoom" may be used in some embodiments to achieve this function. The image zoom function may be performed by the user when in either traditional mirror emulation mode or third person mirror mode. The user interface for verbally controlling zoom also enables the user to control the zoom-level of the display in an incremental manner, with each verbal utterance corresponding to an increasing or decreasing increment of zoom. An alternate user interface method operates differently, allowing the user to have continuous control over zoom level using verbal commands. In the continuous user interface method, upon uttering the phase "zoom in" the software begins a slow and steady increase in zoom. This will continue until either (a) maximum zoom is achieved, (b) the user utters "stop" in which case it will stop zooming in, (c) the user utters "zoom out" in which case the

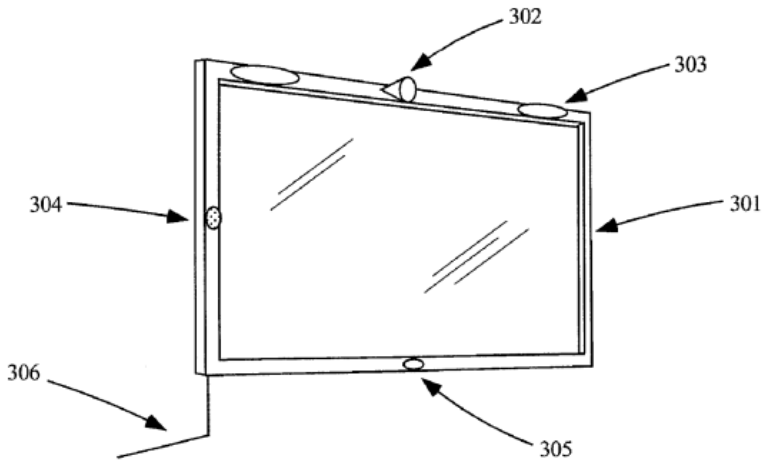
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	zoom will reverse direction, or (d) the user utters "end zoom" in which case the zoom feature will terminate and normal viewing will resume. Similarly, the user may utter "zoom out". In response, the software routines begin a slow and steady decrease in zoom. This will continue until either (a) minimum zoom is achieved, (b) the user utters "stop" in which case it will stop zooming out, (c) the user utters "zoom in" in which case the zoom will reverse direction, or (d) the user utters "end zoom" in which case the zoom feature will terminate and normal viewing will resume. When zooming in, it is sometimes unclear to the user where within the mirror display the zoom function is zooming in upon. For example, the user may wish to zoom in upon his ear but upon performing the zoom command may find that the image zoomed in upon his nose. This is because the zoom function generally increases the magnification towards a particular location on the screen. In some embodiments of the present invention the user may request that the location be displayed graphically to assist in his or her zooming operations. Such a graphical indicator is referred to herein as a zoom-guide. A zoom guide may be a graphical element displayed upon the screen such that it appears overlaid upon the mirror image of the user. The zoom-guide, in some embodiments, is a graphical rectangular outline that bounds the area upon the screen that the zoom function will magnify towards. In some embodiments of the present invention the user may request a zoom-guide by uttering a particular verbal command. For example, the user utters the verbal command "zoom guide" and in response a zoom guide graphical overlay is presented upon his or her projected mirror image. The zoom guide will indicate to the user what region of the screen will be zoomed in upon during a subsequent zoom operation. In some embodiments the user may issue verbal commands that move the zoom guide, including "move left," "move right," "move up," and "move down". In this way the user can control the location of the zoom-guide and thereby control where upon the mirror image is zoomed. Alternately, or in combination, the user may simply move his or her location in front of the mirror to adjust where upon his body the zoom-guide falls." *See* paras. [0050]-[0052]. "FIG. 5 illustrates a computer rendering of a human user 501 standing in front of a wall-mounted embodiment of the advanced digital mirror system 502 according to at least

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	one embodiment of the present invention. The user's image is captured as a real-time video image by a camera upon or within the digital mirror 502 as described previously. A representation of that real-time video image is then displayed upon the wall mounted screen of the digital mirror 502 with a displayed size and scaling such that it appears like a traditional life-size mirror image 503. In a traditional mirror emulation mode, the real-time video image is left-right inverted prior to display upon the screen. Thus the user 501 standing before the digital display is given the visual impression that he or she is standing before a traditional wall mirror, viewing a traditional mirror image of himself or herself.” *See* para. [0077].  Fig. 5 This limitation would have been obvious to a person of ordinary skill in the art based on (1) Rosenberg alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3)

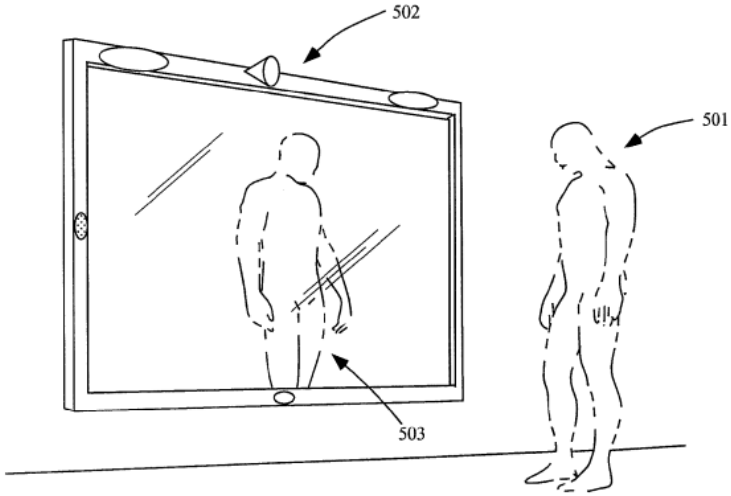
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	the teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[e]. displaying the image on the monitor after performing the flipping, transformation mapping, and resizing;	Rosenberg 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. "When in one of these real-time mirroring modes, the hardware and software rapidly update the image upon the display screen with a representation of the real-time digital video imagery collected from the camera. Because the camera is aimed back at the user from within, upon, or nearly upon the location of the display screen, this imagery will show a frontal depiction of any user or users who are standing substantially in front of the display screen and looking upon the screen while facing forward. In general, the rapid update rate is of a speed and lag such that it seems real-time and continuous to a human user. Typically an update rate of 60 HZ or more will be pleasing to a human user. In some embodiments update rates substantially higher than this may be used. In addition, the lag time is generally kept small (i.e., the time between image capture and image display), on the order of milliseconds or tens of milliseconds. Thus, when in a real-time mirroring mode, the image frames collected from the camera are captured at a rapid rate and displayed with minimal lag, providing a user with a real-time mirroring experience that responds in real time very much like a traditional mirror. As a user, for example, moves his arms about while brushing his or her hair, the image displayed upon the screen will appear continuously updated in real time." *See* para. [0038]. "In some embodiments, the digital mirror also enables the user to view a composite image upon the mirror display that includes a display of multiple images collected by the camera at different points in time. The feature, referred to herein as multi-view mirroring, allows a user to view himself or herself from multiple perspectives upon the same screen, thereby getting a more holistic impression of his or her appearance. A convenient, effective, and easy (for a user) embodiment of multi-view mirroring is enabled to allow a user to take a frozen image that was produced as a result of an image-

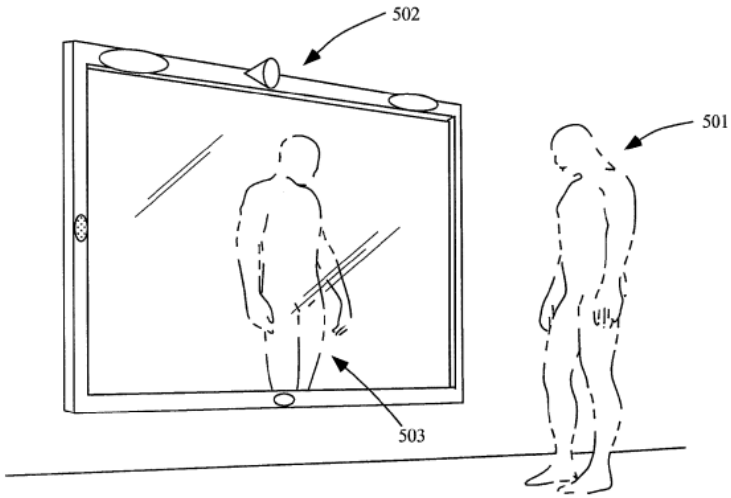
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	freeze operation and/or a short video clip that was produced as a result of a image-buffering operation and move it to either the left or right side of the mirror for continuous display. In this way a user can continue to view himself in the central portion of the display through the real-time mirroring function while having saved images of himself and/or video clips of himself on the sides of the display for comparison. This is generally enabled through another set of simple voice commands such that the user can perform the function without disrupting whatever manual activity was being performed such as brushing hair or teeth. In some embodiments two verbal commands are defined as "move left" and "move right." The system is configured in software to detect and identify these verbal utterances and in response move a frozen image or buffered video clip to the left side of the display or right side of the display respectively, freeing up the center of the display for a display standard mirroring mode. In this way, for example, a user can freeze his left profile by turning to the right and uttering "freeze." The user then can move the frozen image to the left side of the display by uttering "move left". The image then appears on the left side of the display and the central display resume the standard mirroring function. The user can then freeze his right profile by turning to the left and uttering "freeze". The user can then move the frozen image to the right side of the display by uttering "move right." The image then appears on the right side of the display and the central display again resumes the standard mirroring function. Now the user is looking in a mirror, as presented on the central portion of the digital mirror screen display, while having his left and right profiles presented on either side of the mirror. The same set of commands can be used to freeze frontal and/or rear images and present them on the left, right, or both sides of the display." *See* para. [0048]. "FIG. 3 illustrates a wall mounted flat panel display 301 according to at least one embodiment of the invention. As shown, a camera 302 is mounted above the screen area, integrated into the frame of the advanced digital mirror. The large flat panel display 301 may be mounted upon a wall of a user's house. The display 301 includes a screen area (darkly shaded) and a frame area (more lightly shaded). The frame area is generally a plastic casing that supports the display and supporting electronics. Also shown is the digital video camera 302 mounted upon the frame area of the display 301. The digital video camera 302 is centered horizontally across the display 301 and aimed slightly

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	downward such that it will be pointed at any typical user that stands centered in front of the display 301 a certain number of feet back from the display 301. In general, the camera 302 is aimed such that a user can stand at a comfortable mirror-viewing distance from the display 301 and be centered within the image capture area. In some embodiments wide-angle lenses are used upon the camera 302 to provide extended image capture areas. In some embodiments auto-focus lenses are used to account for differing distances of users standing in front of the display 301. Also shown are one or more light sources 303 mounted at or near the display 301 and aimed back at the user such that the fontal portion of his or her body is illuminated when standing before the display 301. These lights may be integrated into the frame casing of the display 301 itself. These lights sources 303 may be mounted directly to the wall beside the display 301. And in some embodiments the light sources 303 are mounted behind the screen surface of the display 301 and are operative to shine through the screen at the user. In some embodiments the lighting is a combination of the above, illuminating the user through a combination of light sources 303." *See* paras. [0062]-[0063].

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	 Fig. 3 “The electronics internal to the advanced digital mirror are not shown in FIG. 3 but include processing electronics, power electronics, signal conditioning electronics, and other common electronic components that may be required to support the features and functions, as discussed below with respect to FIG. 13. Embodiments of the present invention, as described herein, generally included a processor for adjusting and/or modifying the images that are displayed upon the screen to achieve unique mirroring features and functions not provided by a standard household wall mirror. Embodiments typically also include a memory accessible by the processor for storing images to further enable unique mirroring features and functions not provided by a standard household wall mirror. The processor is operative to function in coordination with the speech processing module, selecting certain modes, features, and functions in response to

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	particular identified verbal utterances. In some embodiments the speech processing module described above includes software components that run upon the processor along with other mirroring routines running upon the processor. In addition, the processor within the advanced digital mirror may have communication access to one or more communication networks via a network connection 306.” *See* para. [0074]. “FIG. 5 illustrates a computer rendering of a human user 501 standing in front of a wall-mounted embodiment of the advanced digital mirror system 502 according to at least one embodiment of the present invention. The user's image is captured as a real-time video image by a camera upon or within the digital mirror 502 as described previously. A representation of that real-time video image is then displayed upon the wall mounted screen of the digital mirror 502 with a displayed size and scaling such that it appears like a traditional life-size mirror image 503. In a traditional mirror emulation mode, the real-time video image is left-right inverted prior to display upon the screen. Thus the user 501 standing before the digital display is given the visual impression that he or she is standing before a traditional wall mirror, viewing a traditional mirror image of himself or herself.” *See* para. [0077].

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	 Fig. 5 This limitation would have been obvious to a person of ordinary skill in the art based on (1) Rosenberg 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;	Rosenberg 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. "FIG. 5 illustrates a computer rendering of a human user 501 standing in front of a wall-mounted embodiment of the advanced digital mirror system 502 according to at least one embodiment of the present invention. The user's image is captured as a real-time

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	video image by a camera upon or within the digital mirror 502 as described previously. A representation of that real-time video image is then displayed upon the wall mounted screen of the digital mirror 502 with a displayed size and scaling such that it appears like a traditional life-size mirror image 503. In a traditional mirror emulation mode, the real-time video image is left-right inverted prior to display upon the screen. Thus the user 501 standing before the digital display is given the visual impression that he or she is standing before a traditional wall mirror, viewing a traditional mirror image of himself or herself.” *See* para. [0077].  Fig. 5 This limitation would have been obvious to a person of ordinary skill in the art based on (1) Rosenberg 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.
1[g]. determining distance to a user appearing in the live video feed; and	Rosenberg 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. "Another aspect of the multi-function product embodiments described above are the innovative methods by which the system intelligently switches between operational states. As described above, a multi-state embodiment of the present invention may include a digital picture frame state and a digital mirroring state that are operative a different moments in time. Software routines are included for automatically switching between states based upon one or more sensor readings. As described previously the system may include a proximity and/or motion sensor operative to detect if a person is standing and/or moving in an area or region in front of the display screen. The proximity and/or motion sensor, for example, may be configured to detect whether a person (or other moving option) comes within an area that extends six to eight feet in front of the screen area. Based upon the motion and/or proximity data, the routines of embodiments of the present invention may be configured to automatically switch between operational states. In a preferred embodiment of the present invention, the software routines automatically put the system into digital picture frame state when it is determined that nobody is standing and/or moving in front of the screen for more than some threshold amount of time. Thus when a counter within the electronics of the present invention determines that the threshold time has elapsed during which no presence and/or motion was detected before the display screen (as determined by data from the proximity and/or motion sensors), the system is put into a digital picture frame state. Conversely when the system is in digital picture frame state and it is determined (based upon data from the proximity and/or motion sensor data) that a person is standing before the display screen for more than some threshold amount of time (e.g., 6 seconds), the routines put the system into a digital mirroring state. In some embodiments the system enables the user to purposefully change states based upon

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	verbal commands, in addition to and/or instead of, the automatic state changing method described above." *See* para. [0056]. "FIG. 3 illustrates a wall mounted flat panel display 301 according to at least one embodiment of the invention. As shown, a camera 302 is mounted above the screen area, integrated into the frame of the advanced digital mirror. The large flat panel display 301 may be mounted upon a wall of a user's house. The display 301 includes a screen area (darkly shaded) and a frame area (more lightly shaded). The frame area is generally a plastic casing that supports the display and supporting electronics. Also shown is the digital video camera 302 mounted upon the frame area of the display 301. The digital video camera 302 is centered horizontally across the display 301 and aimed slightly downward such that it will be pointed at any typical user that stands centered in front of the display 301 a certain number of feet back from the display 301. In general, the camera 302 is aimed such that a user can stand at a comfortable mirror-viewing distance from the display 301 and be centered within the image capture area. In some embodiments wide-angle lenses are used upon the camera 302 to provide extended image capture areas. In some embodiments auto-focus lenses are used to account for differing distances of users standing in front of the display 301." *See* para. [0062]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Rosenberg 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.	Rosenberg expressly and/or inherently discloses and/or renders obvious this limitation. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Rosenberg 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.

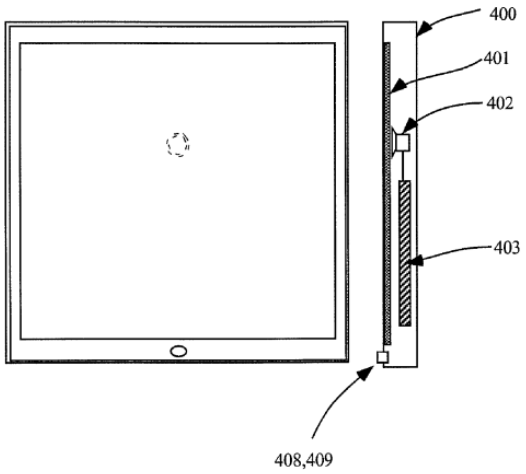
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Claim 2	
2. The method of claim 1, wherein the transformation mapping renders an image appearing to have been taken from a camera positioned at eye-level height and pointing horizontally.	Rosenberg expressly and/or inherently discloses and/or renders 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 this way the user can view his or her own image quickly and conveniently by simply stepping before the display portion of the digital mirror. In addition, embodiments of the present invention may be configured to provide a plurality of digital mirror display modes that may be selectively engaged by the user through hands-free user interactions. In a basic mode of operation, referred to herein a traditional mirror emulation mode, the digital mirror is operative to replicate the performance of a standard household mirror, providing the user with a left-right reversed frontal image of himself or herself when standing before the display. This is achieved by streaming a left-right inverted representation of the real-time video imagery from a camera aimed at the user to a screen portion of the display, the camera being mounted and aimed such that it points back at the user from a position on or near the display. In a preferred embodiment, the camera is positioned such that it is centered with respect to the screen area of the display. In basic embodiments the camera is mounted directly above the screen area of the display, generally near the center. This is non-ideal because it provides the user with a view of himself or herself from a somewhat unnatural perspective as compared to a traditional mirror. In more advanced embodiments the camera is mounted within the screen area of the display itself, approximately at eye-level of typical users, for example, positioned behind the display surface and aimed through a transparent portion of the display. Such embedded-camera embodiments provide a superior arrangement because they provide the user with a natural and accurate visual perspective of himself or herself as compared to a traditional mirror. In many such embedded-camera embodiments the camera imaging frame rate is interlaced with the display imagery frame rate such that camera images are captured during off times between the image display. Thus by mounting the camera at such a location and in such a manner, the user will get the most closely

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	approximated mirror image captured by the camera and projected upon the display. However, embodiments which have a camera mounted above the screen area may still be configured to provide an effective image, but the vantage point will simply being slightly higher than the eye-level vantage point with which users are familiar. This raised vantage point is sometimes advantageous, giving users an increased view of the top of their head, an area that is often the focus of hair brushing. It is often preferred to incorporate the camera within or behind the display screen because it yields a more realistic replication of a true mirror image (i.e., an image that is from a vantage point perfectly straight ahead). Such embodiments of the present invention often strive to achieve placement of the camera such that the image captured by the camera is taken from a vantage point that is centered horizontally with respect to the display screen and at an elevation vertically that generally corresponds with a user's typical eye level. In this way the user is looking straight at the camera when standing centered before the digital mirror display screen. A number of different methods and/or technologies may be employed to achieve placement of a camera such that the image captured is from this centrally located area upon the display screen. In some embodiments a small region of active screen area is removed to allow the camera to capture an image through the screen surface. This region of removed screen will generally appear as a blacked-out portion of the mirror image as if a small black dot was cut into a real mirror to allow light to pass through it. With proper optics, this dead region of the mirror display surface can be very small—for example a circular region of less than 1 millimeter in diameter. Various configurations of lenses, mirrors, and/or fiber optics can be used to enable flexibility in camera hardware positioning with respect to the small non-active portion of the screen." *See* paras. [0027]-[0028]. "In another set of inventive features, the integrated digital mirror enables users to quickly and easily view not only their frontal image, but also profile images and rear images. In fact, the user is enabled to view his or her image from any desired angle. This is performed using one of two different inventive methods. A first method is called mirror image-freeze and the second method is called mirror image-buffering. Such mirroring

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	features may be employed during either of the traditional mirror emulation mode of the digital mirror or the third-person mirror mode of the digital mirror. *See* para. [0037]. "As described above, the image freeze feature may be employed by a user of the digital mirror to enable this user to view himself or herself from orientations not provided by standard wall-mirrors. For example, the user may wish to view himself from behind, view himself from left profile, or view himself from right profile. When using a typical mirror, a user may turn sidewise thereby presenting his or her profile image to the mirror, but can no longer see the image because he or she is turned sideways. The same is true of the standard mirroring mode of the present invention. Thus to enable a user to view alternate angles upon himself or herself, the image freeze feature is used. The user interface of the present invention makes this a very simple operation of the user. To view himself from behind, the user simply turns around such that he or she is now facing away from the digital mirror display screen. The user then engages the image freeze feature by, for example, uttering the word "freeze," the user then turns back around to view the mirror in a normal manner. Upon the display is a view of his or her backside. In this way a user can easily view how he or she looks from behind, examining the back of his or her head or body. To end the mode, the user may issue a command such as uttering "end freeze" and then resume viewing himself in a standard mirroring manner. To view a left profile view of himself or herself, the user can turn and face to his right such that the front plane of his body is approximately orthogonal to the mirror display screen he is standing before. He or she may engage the image freeze feature by uttering the word "freeze" or some other defined command utterance. The user then turns back toward the mirror and views it in a normal manner. Upon the display will be the user's left profile view. To end the mode, the user may issue a command such as uttering "end freeze" and then resume viewing himself in a standard mirroring manner. To view a right profile view of himself or herself, the user can turn and face to his left such that the front plane of his body is approximately orthogonal to the mirror display screen he is standing before. He or she then engages the image freeze feature by uttering the word "freeze" or some other defined command utterance. The user then turns back toward the mirror and views it in a normal manner. Upon the display will be the user's

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	right profile view. To end the mode, the user may issue a command such as uttering "end freeze" and then resume viewing himself in a standard mirroring manner. In addition to viewing himself or herself from behind, left profile, and right profile, other orientations may be viewed in this manner. For example, if the user wishes to view the top of his or her head—he or she can tilt over such that the top of his or her head is angled towards the display screen, engage the freeze feature, and then tilt back and look at the image from a normal viewing orientation." *See* paras. [0042]-[0043]. "In a basic mode of operation the digital mirror is operative to replicate the performance of a standard household mirror, providing the user with a left-right reversed frontal image of himself or herself when standing before the display 200. This is achieved by feeding a left-right inverted representation of the real-time video image from a camera aimed at the user to a screen portion of the display, the camera being mounted and aimed such that it points back at the user from a position on or near the display 200. In a preferred embodiment, the camera is positioned such that it is horizontally centered with respect to the screen area of the display 200. In basic embodiments the camera is mounted directly above the screen area of the display 200, generally near the horizontal center. In more advanced embodiments the camera is mounted within the screen area of the display 200 itself, approximately at eye-level of typical users, positioned behind the display surface and aimed through a transparent portion of the display 200. In many such embodiments the camera imaging frame rate is interlaced with the display imagery frame rate such that camera images are captured during off times between the image display 200. By mounting the camera at such a location and in such a manner, the user will get the most closely approximated mirror image captured by the camera and projected upon the display 200. By mounting the camera above the display 200, the user can capture an image from slightly above, thereby providing some view of the top of his or head. This is sometimes desirable. A camera may also be mounted at multiple elevations with respect to the display screen and can be selected between to provide for a variety of viewing angles—for example, an eye-level viewing angle that provides a highly realistic mirror replication image and a higher viewing angle that provides some view of the top of the head." *See* para. [0061].

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	“FIG. 4 illustrates a digital mirror 405 according to at least one embodiment of the invention. Unlike the embodiment shown in FIG. 3 where the camera is mounted above the display screen, the embodiment shown in FIG. 4 has a camera 402 mounted within the screen area. Such embodiments may be preferred because they yield more realistic replications of traditional mirrors because the displayed image that is from a vantage that is straight ahead. Such embodiments of the present invention often strive to achieve placement of the camera 402 such that the image captured by the camera 402 is taken from a vantage point that is centered horizontally with respect to the display screen and at an elevation vertically that generally corresponds with a user's typical eye level. In this way the user is looking straight at the camera 402 when standing centered before the digital mirror display screen. A number of different methods and/or technologies may be employed to achieve placement of a camera 402 such that the image captured is from this centrally located area upon the display screen. In some embodiments a small region of active screen area is removed to allow the camera 402 to capture an image through the screen surface. This region of removed screen will generally appear as a blacked-out portion of the mirror image as if a small black dot was cut into a real mirror to allow light to pass through it. With proper optics, this dead region of the mirror display surface can be very small—such as for example, a circular region of less than 1 millimeter in diameter. Various configurations of lenses, mirrors, and/or fiber optics can be used to enable flexibility in camera hardware positioning with respect to the small non-active portion of the screen.” *See* para. [0075].

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	 Fig. 4 This limitation would have been obvious to a person of ordinary skill in the art based on (1) Rosenberg 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 7	

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7[pre]. The method of claim 1, further comprising the steps:	To the extent the preamble is limiting, Rosenberg 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) Rosenberg 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;	Rosenberg expressly and/or inherently discloses and/or renders obvious obtaining a reference image. *See*, *e.g.*, disclosures below. "Embodiments of the present invention, as described herein, include a processor for adjusting and/or modifying the images that are displayed upon the screen to achieve unique mirroring features and functions not provided by a standard household wall mirror. The embodiments of present invention also includes a memory accessible by the processor for storing images to further enable unique mirroring features and functions not provided by a standard household wall mirror. The processor is operative to function in coordination with the speech processing module, selecting certain features and functions in response to particular identified verbal utterances. In some embodiments the speech processing module described above includes software components that run upon the processor along with other mirroring routines running upon the processor. The processor is also operative to function in coordination with the left-right image inversion processor described previously that inverts the real-time video image from the camera into a real-time mirror image representation. In some common embodiments the same processor unit is used to support multiple of these functions, the processor unit being a single microprocessor or being a combination of a plurality of hardware and software components, including for example both programmable and hardwired processing components. As described herein the processor generally refers to the grouping of

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	hardware and software components that perform the processing features described herein." *See* para. [0035]. "When employing the mirror image-freeze feature, the user is given the ability to selectively freeze the image displayed upon the screen such that it ceases being updated for a period of time with new video imagery from the camera. Instead a previous image that was captured at the time (or nearly at the time) that the image-freeze feature was engaged is displayed for that period of time. When in a traditional mirror emulation mode, the frozen image is a left-right inverted image of the user. When in a third person mirror mode, the frozen image is a non-inverted image of the user. Thus a user may be looking in the mirror, engage the mirror image-freeze feature, and have the then current (or substantially current) image that was displayed upon engaging the feature, freeze upon the screen for an extended period. This will allow the user, for example, to examine the frozen image in detail. This is particularly useful for a user who wishes to change his or her distance and/or location with respect to the mirror to get a better view of his or her image, but NOT have the image change as the user moves. For example, a user may wish to step closer to the mirror and view a portion of his or her face from only a few inches away. With a traditional optical mirror, such an act would cause the reflected image to change such that the user who is just a few inches away ends up staring into his or her own eyes. In reality he may wish to freeze the image, step close, and then view some other portion of the face. The mirror image-freeze feature of the present invention enables this enhanced mirroring operation. It works by saving a current frame (i.e., a frame that was captured at or substantially at the time the user engaged the image freeze feature) in memory and using the stored image to update the graphical display such that the user views the frozen image over an extended period. When the user wishes to end the image-freeze function he or she may selectively end the feature and return to the real-time mirroring mode that was in operation prior to the freeze feature. In this way a real-time mirror mode will resume in which the image is continuously updated." *See* para. [0039]. "When employing the mirror image-buffering feature of the present invention, the user is given the ability to selectively store a certain amount of real-time video imagery from

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	the camera in memory and view is playing back upon the mirror. The imagery may be stored in inverted or non-inverted form. Some embodiments of the present invention are configured to continually store in memory (i.e., buffer) a certain number of recently displayed image frames. For example, if the system is capturing and displaying 100 frames per second, the system may be configured to always store the previous 1000 frames captured and displayed to the user. As new frames come in, old frames are over-written. In this way the image frame buffer maintains in memory the last 10 seconds of live imagery captured. These 1000 frames, which in this example correspond to 10 seconds of live imagery, are referred to as the "mirror image buffer." Various embodiments of the present invention may be configured to store image buffers of different size and thereby can store differing lengths of live imagery. In this way, a portion of the buffering feature is operative in the background during real-time mirror viewing modes, background routines of the present invention continually storing some number of previous image frames. To engage the display benefits of the mirror image-buffering feature of embodiments of the present invention, the user may utter a command such as "view buffer." In response to this command, and/or an alternate verbal command that is defined in software to trigger this feature, routines alter the display such that the real-time imagery ceases to be displayed upon the screen for a period of time. Instead of the real-time imagery, the previously buffered camera frames are displayed, showing for example the previous 10 seconds of imagery captured by the camera and displayed upon the mirror. Thus, the user can view a previous segment of imagery that was just captured, where the previous segment is all data or a portion of the data stored in the buffer. In general, when a user is engaged in a traditional mirror mode immediately prior to the buffering feature being engaged, the buffered real-time imagery is displayed as left-right inverted representation. Similarly, when a user is engaged in a third person mirror mode immediately prior to the buffering feature being engaged, the buffered real-time imagery is display as a non-inverted representation. As described previously, the mirror image buffering feature may be employed by a user to enable himself or herself to view himself or herself from orientations not provided by

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	standard wall-mirrors. For example, a user may slowly turn himself around in front of a traditional mirror but will not be able to see himself during times he is not facing the mirror. Using the digital mirror with the mirror image buffering feature, however, a user can slowly turn around in front of the mirror, exposing a range of angles of his or her body to the mirror surface, and then view the stream of captured imagery right afterwards while looking directly at the screen. The user interface makes this a very simple operation of the user. To view himself while turning around in front of the mirror, the user simply turns around, for example, in a slow 360 degree spin, directly in front of the digital mirror display screen. The user then engages the mirror image buffering display feature, by for example uttering the word "replay" while looking at the screen. In response to this identified command, or other command configured to trigger the feature, the imagery displayed upon the screen is routed from the buffer and not from the live camera feed. As described previously the buffer may, for example, store the previous 10 seconds worth of video footage captured by the camera. Thus in response to the "replay" command, the previous 10 seconds of mirror display imagery is displayed to the user, showing what it looked like when he turned around in front of the mirror. The system is generally configured to continue replaying the 10 second buffer video clip, again and again, until the user explicitly ends the feature. Thus the user can watch that particular 10 second clip again and again until he or she ends the replay feature. To end the replay image buffering mode, the user may issue a command such as uttering "end replay" and then resume viewing himself in a standard mirroring manner. In some embodiments the user may just utter "end." In some embodiments, the buffer may store some other duration than 10 seconds of previous video frames." *See* paras. [0044]-[0046]. "In some embodiments, the digital mirror also enables the user to zoom-in and/or zoom-out the real-time image that is displayed upon the screen. The feature, referred to herein as "image-zoom mirroring," allows a user to view himself or herself from a perspective that seems nearer or farther than a typical mirror provides. Zooming in is particularly useful if a user is putting on makeup or performing some other operation that requires close attention to small details. Zooming out is particularly useful if a user wants to see a full length image of himself or herself on a mirror screen that is not naturally full-length. The zooming function may be performed by digital zoom and/or optical zoom.

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	Digital zoom is a zoom performed by enlarging the display graphically while using an unchanged captured image. Optical zoom is a zoom performed by changing the optical focus of the camera. The present invention may employ either or both methods to modify the magnification characteristics of the digital mirror. Either way, the zooming functions are triggered by verbal commands that are correlated with zooming in or zooming out. For example, in some embodiments the verbal commands "zoom-in" and "zoom-out" are defined and associated with the zoom in and zoom out operations. The speech processor recognizes these commands and in response the routines zoom-in or zoom-out the image by some prescribed amount. For example, in some embodiments each time the user utters the command "zoom in" the mirror image is enlarged upon the display by 10%. Similarly each time the user utters the command "zoom out" the mirror image is zoomed out upon the display by 10%. Thus by repeated "zoom in" and "zoom out" verbal commands the user can achieve a desired magnification. An additional verbal command is generally included to terminate the zoom function and return the display to natural mirroring magnification. For example, verbal command "end zoom" may be used in some embodiments to achieve this function. The image zoom function may be performed by the user when in either traditional mirror emulation mode or third person mirror mode. The user interface for verbally controlling zoom also enables the user to control the zoom-level of the display in an incremental manner, with each verbal utterance corresponding to an increasing or decreasing increment of zoom. An alternate user interface method operates differently, allowing the user to have continuous control over zoom level using verbal commands. In the continuous user interface method, upon uttering the phase "zoom in" the software begins a slow and steady increase in zoom. This will continue until either (a) maximum zoom is achieved, (b) the user utters "stop" in which case it will stop zooming in, (c) the user utters "zoom out" in which case the zoom will reverse direction, or (d) the user utters "end zoom" in which case the zoom feature will terminate and normal viewing will resume. Similarly, the user may utter "zoom out". In response, the software routines begin a slow and steady decrease in zoom. This will continue until either (a) minimum zoom is achieved, (b) the user utters "stop" in which case it will stop zooming out, (c) the user utters "zoom in" in which case the

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	zoom will reverse direction, or (d) the user utters "end zoom" in which case the zoom feature will terminate and normal viewing will resume. When zooming in, it is sometimes unclear to the user where within the mirror display the zoom function is zooming in upon. For example, the user may wish to zoom in upon his ear but upon performing the zoom command may find that the image zoomed in upon his nose. This is because the zoom function generally increases the magnification towards a particular location on the screen. In some embodiments of the present invention the user may request that the location be displayed graphically to assist in his or her zooming operations. Such a graphical indicator is referred to herein as a zoom-guide. A zoom guide may be a graphical element displayed upon the screen such that it appears overlaid upon the mirror image of the user. The zoom-guide, in some embodiments, is a graphical rectangular outline that bounds the area upon the screen that the zoom function will magnify towards. In some embodiments of the present invention the user may request a zoom-guide by uttering a particular verbal command. For example, the user utters the verbal command "zoom guide" and in response a zoom guide graphical overlay is presented upon his or her projected mirror image. The zoom guide will indicate to the user what region of the screen will be zoomed in upon during a subsequent zoom operation. In some embodiments the user may issue verbal commands that move the zoom guide, including "move left," "move right," "move up," and "move down". In this way the user can control the location of the zoom-guide and thereby control where upon the mirror image is zoomed. Alternately, or in combination, the user may simply move his or her location in front of the mirror to adjust where upon his body the zoom-guide falls." *See* paras. [0050]-[0052]. "Another feature enabled by the digital mirror system is known as "image-archiving" in which images and/or video clips may be saved and stored for later retrieval. This is particularly useful for users who want to store how they look with particular hairstyles, clothing choices, and/or makeup work and review those images later. For example, a user may wish to store an image of himself or herself with his or her hair done a particular way such that the user can look at that image in the future while also looking at his or her mirror image, to assist in doing his or her hair that same way in the future. The user

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	may also wish to archive images of himself in various outfits and look at those images while getting dressed to get ideas about what to wear. A useful element to this feature in a digital wall mirror system is the hands-free user interface through which a user can quickly and easily save a particular view of himself or herself while standing before the system. This is generally performed after a user has frozen an image upon the display that he or she wants to save the frozen image in the image archive. The image save function is triggered by a verbal command that is correlated with the saving action. The image save function may also archive the image with respect to a particular verbal utterance issued by the user. For example, in some embodiments the verbal command "save" is configured to trigger the saving action. In addition, the verbal utterance following the verbal command "save" is relationally associated with the achieved image for future access. Thus for example, a user may stand in front of the mirror, utter "freeze" and freeze an image as described previously. The user may then save the frozen image within the archive by uttering "save." In some embodiments this image is saved based upon an automatically generated index. The automated generated index may be sequential number, a time and date, and/or an automatically generated file name. In other embodiments the user supplies an index reference by providing an additional utterance. Some embodiments of the present invention enable the mirroring features and functions in addition to other non-mirroring functions that are operative at times when a user is not standing before the display and looking in the mirror. Thus the present invention may provide a plurality of operation states, a digital mirroring operation state in which the digital mirror display modes and features are performed and an alternate operation state in which the digital mirror display modes and features are generally not performed Such embodiments are generally implemented on non-bathroom walls of a house wherein it may not make sense to have the display simply turn itself off when a user is not present (as is usually the case in bathrooms). For example, a digital mirror of the present invention installed upon a living room wall may not be desirably configured to turn itself off when a user is not standing directly before it. Instead the digital mirror may be configured to enter a different operational state. In a common such embodiment, the digital mirror may be configured in a digital picture frame state such that it displays digital pictures including digital photographs, artwork, and/or other imagery. In such an

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	embodiment the system is acting like a programmable picture frame when in the digital picture frame state. Unlike a traditional picture frame, a digital picture frame may be programmed to cycle through still images, including personal photos, stock artwork, and/or other stored content. Moving images may also be displayed. Embodiments of present invention provide for a novel combination of a digital picture frame that may also be operative to function as a digital mirror. This multi-function product embodiment is configured in hardware and software to have a plurality of states, the plurality of states including (a) a first state supporting digital picture frame functionality in which stored images are accessed from memory and automatically displayed upon the screen in a manner reminiscent of a real picture frame, and (b) a second state supporting digital mirroring modes and functions and features as described herein, the digital mirroring modes and functions and features being operative to display images upon the screen that are based upon image data collected in real-time from a camera aimed at the person or persons standing before the screen at that real time and thereby replicating the function of a real mirror." *See* paras. [0053]-[0055]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Rosenberg 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;	Rosenberg expressly and/or inherently discloses and/or renders obvious performing registration of the digital image with the reference image. *See*, *e.g.*, disclosures below. "When employing the mirror image-freeze feature, the user is given the ability to selectively freeze the image displayed upon the screen such that it ceases being updated for a period of time with new video imagery from the camera. Instead a previous image that was captured at the time (or nearly at the time) that the image-freeze feature was engaged is displayed for that period of time. When in a traditional mirror emulation mode, the frozen image is a left-right inverted image of the user. When in a third person

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	mirror mode, the frozen image is a non-inverted image of the user. Thus a user may be looking in the mirror, engage the mirror image-freeze feature, and have the then current (or substantially current) image that was displayed upon engaging the feature, freeze upon the screen for an extended period. This will allow the user, for example, to examine the frozen image in detail. This is particularly useful for a user who wishes to change his or her distance and/or location with respect to the mirror to get a better view of his or her image, but NOT have the image change as the user moves. For example, a user may wish to step closer to the mirror and view a portion of his or her face from only a few inches away. With a traditional optical mirror, such an act would cause the reflected image to change such that the user who is just a few inches away ends up staring into his or her own eyes. In reality he may wish to freeze the image, step close, and then view some other portion of the face. The mirror image-freeze feature of the present invention enables this enhanced mirroring operation. It works by saving a current frame (i.e., a frame that was captured at or substantially at the time the user engaged the image freeze feature) in memory and using the stored image to update the graphical display such that the user views the frozen image over an extended period. When the user wishes to end the image-freeze function he or she may selectively end the feature and return to the real-time mirroring mode that was in operation prior to the freeze feature. In this way a real-time mirror mode will resume in which the image is continuously updated." *See* para. [0039]. "In some embodiments, the digital mirror also enables the user to zoom-in and/or zoom-out the real-time image that is displayed upon the screen. The feature, referred to herein as "image-zoom mirroring," allows a user to view himself or herself from a perspective that seems nearer or farther than a typical mirror provides. Zooming in is particularly useful if a user is putting on makeup or performing some other operation that requires close attention to small details. Zooming out is particularly useful if a user wants to see a full length image of himself or herself on a mirror screen that is not naturally full-length. The zooming function may be performed by digital zoom and/or optical zoom. Digital zoom is a zoom performed by enlarging the display graphically while using an unchanged captured image. Optical zoom is a zoom performed by changing the optical focus of the camera. The present invention may employ either or both methods to modify

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	the magnification characteristics of the digital mirror. Either way, the zooming functions are triggered by verbal commands that are correlated with zooming in or zooming out. For example, in some embodiments the verbal commands "zoom-in" and "zoom-out" are defined and associated with the zoom in and zoom out operations. The speech processor recognizes these commands and in response the routines zoom-in or zoom-out the image by some prescribed amount. For example, in some embodiments each time the user utters the command "zoom in" the mirror image is enlarged upon the display by 10%. Similarly each time the user utters the command "zoom out" the mirror image is zoomed out upon the display by 10%. Thus by repeated "zoom in" and "zoom out" verbal commands the user can achieve a desired magnification. An additional verbal command is generally included to terminate the zoom function and return the display to natural mirroring magnification. For example, verbal command "end zoom" may be used in some embodiments to achieve this function. The image zoom function may be performed by the user when in either traditional mirror emulation mode or third person mirror mode. The user interface for verbally controlling zoom also enables the user to control the zoom-level of the display in an incremental manner, with each verbal utterance corresponding to an increasing or decreasing increment of zoom. An alternate user interface method operates differently, allowing the user to have continuous control over zoom level using verbal commands. In the continuous user interface method, upon uttering the phase "zoom in" the software begins a slow and steady increase in zoom. This will continue until either (a) maximum zoom is achieved, (b) the user utters "stop" in which case it will stop zooming in, (c) the user utters "zoom out" in which case the zoom will reverse direction, or (d) the user utters "end zoom" in which case the zoom feature will terminate and normal viewing will resume. Similarly, the user may utter "zoom out". In response, the software routines begin a slow and steady decrease in zoom. This will continue until either (a) minimum zoom is achieved, (b) the user utters "stop" in which case it will stop zooming out, (c) the user utters "zoom in" in which case the zoom will reverse direction, or (d) the user utters "end zoom" in which case the zoom feature will terminate and normal viewing will resume.

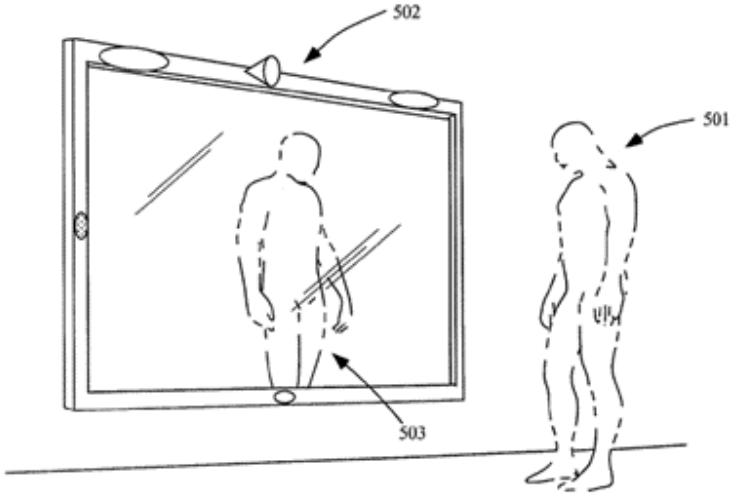
Asserted Claim of the '109 Patent	Exemplary Citations to Rosenberg
	When zooming in, it is sometimes unclear to the user where within the mirror display the zoom function is zooming in upon. For example, the user may wish to zoom in upon his ear but upon performing the zoom command may find that the image zoomed in upon his nose. This is because the zoom function generally increases the magnification towards a particular location on the screen. In some embodiments of the present invention the user may request that the location be displayed graphically to assist in his or her zooming operations. Such a graphical indicator is referred to herein as a zoom-guide. A zoom guide may be a graphical element displayed upon the screen such that it appears overlaid upon the mirror image of the user. The zoom-guide, in some embodiments, is a graphical rectangular outline that bounds the area upon the screen that the zoom function will magnify towards. In some embodiments of the present invention the user may request a zoom-guide by uttering a particular verbal command. For example, the user utters the verbal command "zoom guide" and in response a zoom guide graphical overlay is presented upon his or her projected mirror image. The zoom guide will indicate to the user what region of the screen will be zoomed in upon during a subsequent zoom operation. In some embodiments the user may issue verbal commands that move the zoom guide, including "move left," "move right," "move up," and "move down". In this way the user can control the location of the zoom-guide and thereby control where upon the mirror image is zoomed. Alternately, or in combination, the user may simply move his or her location in front of the mirror to adjust where upon his body the zoom-guide falls." See paras. [0050]-[0052]. "The electronics internal to the advanced digital mirror are not shown in FIG. 3 but include processing electronics, power electronics, signal conditioning electronics, and other common electronic components that may be required to support the features and functions, as discussed below with respect to FIG. 13. Embodiments of the present invention, as described herein, generally included a processor for adjusting and/or modifying the images that are displayed upon the screen to achieve unique mirroring features and functions not provided by a standard household wall mirror. Embodiments typically also include a memory accessible by the processor for storing images to further enable unique mirroring features and functions not provided by a standard household wall mirror. The processor is operative to function in coordination with the speech

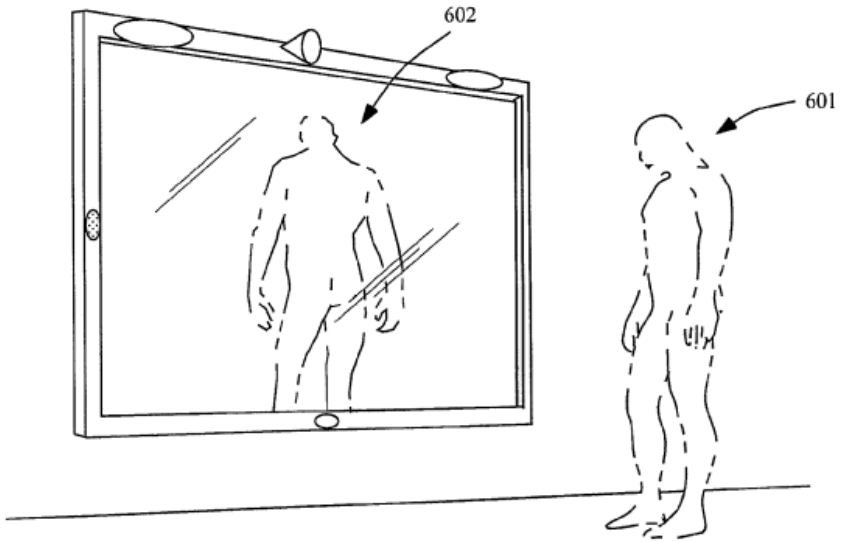
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	processing module, selecting certain modes, features, and functions in response to particular identified verbal utterances. In some embodiments the speech processing module described above includes software components that run upon the processor along with other mirroring routines running upon the processor. In addition, the processor within the advanced digital mirror may have communication access to one or more communication networks via a network connection 306." *See* para. [0074]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Rosenberg 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.	Rosenberg 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. "When employing the mirror image-freeze feature, the user is given the ability to selectively freeze the image displayed upon the screen such that it ceases being updated for a period of time with new video imagery from the camera. Instead a previous image that was captured at the time (or nearly at the time) that the image-freeze feature was engaged is displayed for that period of time. When in a traditional mirror emulation mode, the frozen image is a left-right inverted image of the user. When in a third person mirror mode, the frozen image is a non-inverted image of the user. Thus a user may be looking in the mirror, engage the mirror image-freeze feature, and have the then current (or substantially current) image that was displayed upon engaging the feature, freeze upon the screen for an extended period. This will allow the user, for example, to examine the frozen image in detail. This is particularly useful for a user who wishes to change his or her distance and/or location with respect to the mirror to get a better view of his or her image, but NOT have the image change as the user moves. For example, a user may wish to step closer to the mirror and view a portion of his or her face from only a few inches away. With a traditional optical mirror, such an act would cause the reflected

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	image to change such that the user who is just a few inches away ends up staring into his or her own eyes. In reality he may wish to freeze the image, step close, and then view some other portion of the face. The mirror image-freeze feature of the present invention enables this enhanced mirroring operation. It works by saving a current frame (i.e., a frame that was captured at or substantially at the time the user engaged the image freeze feature) in memory and using the stored image to update the graphical display such that the user views the frozen image over an extended period. When the user wishes to end the image-freeze function he or she may selectively end the feature and return to the real-time mirroring mode that was in operation prior to the freeze feature. In this way a real-time mirror mode will resume in which the image is continuously updated." *See* para. [0039]. "In some embodiments, the digital mirror also enables the user to zoom-in and/or zoom-out the real-time image that is displayed upon the screen. The feature, referred to herein as "image-zoom mirroring," allows a user to view himself or herself from a perspective that seems nearer or farther than a typical mirror provides. Zooming in is particularly useful if a user is putting on makeup or performing some other operation that requires close attention to small details. Zooming out is particularly useful if a user wants to see a full length image of himself or herself on a mirror screen that is not naturally full-length. The zooming function may be performed by digital zoom and/or optical zoom. Digital zoom is a zoom performed by enlarging the display graphically while using an unchanged captured image. Optical zoom is a zoom performed by changing the optical focus of the camera. The present invention may employ either or both methods to modify the magnification characteristics of the digital mirror. Either way, the zooming functions are triggered by verbal commands that are correlated with zooming in or zooming out. For example, in some embodiments the verbal commands "zoom-in" and "zoom-out" are defined and associated with the zoom in and zoom out operations. The speech processor recognizes these commands and in response the routines zoom-in or zoom-out the image by some prescribed amount. For example, in some embodiments each time the user utters the command "zoom in" the mirror image is enlarged upon the display by 10%. Similarly each time the user utters the command "zoom out" the mirror image is zoomed out upon the display by 10%. Thus by repeated "zoom in" and "zoom out" verbal

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	commands the user can achieve a desired magnification. An additional verbal command is generally included to terminate the zoom function and return the display to natural mirroring magnification. For example, verbal command "end zoom" may be used in some embodiments to achieve this function. The image zoom function may be performed by the user when in either traditional mirror emulation mode or third person mirror mode. The user interface for verbally controlling zoom also enables the user to control the zoom-level of the display in an incremental manner, with each verbal utterance corresponding to an increasing or decreasing increment of zoom. An alternate user interface method operates differently, allowing the user to have continuous control over zoom level using verbal commands. In the continuous user interface method, upon uttering the phase "zoom in" the software begins a slow and steady increase in zoom. This will continue until either (a) maximum zoom is achieved, (b) the user utters "stop" in which case it will stop zooming in, (c) the user utters "zoom out" in which case the zoom will reverse direction, or (d) the user utters "end zoom" in which case the zoom feature will terminate and normal viewing will resume. Similarly, the user may utter "zoom out". In response, the software routines begin a slow and steady decrease in zoom. This will continue until either (a) minimum zoom is achieved, (b) the user utters "stop" in which case it will stop zooming out, (c) the user utters "zoom in" in which case the zoom will reverse direction, or (d) the user utters "end zoom" in which case the zoom feature will terminate and normal viewing will resume. When zooming in, it is sometimes unclear to the user where within the mirror display the zoom function is zooming in upon. For example, the user may wish to zoom in upon his ear but upon performing the zoom command may find that the image zoomed in upon his nose. This is because the zoom function generally increases the magnification towards a particular location on the screen. In some embodiments of the present invention the user may request that the location be displayed graphically to assist in his or her zooming operations. Such a graphical indicator is referred to herein as a zoom-guide. A zoom guide may be a graphical element displayed upon the screen such that it appears overlaid upon the mirror image of the user. The zoom-guide, in some embodiments, is a graphical rectangular outline that bounds the area upon the screen that

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	the zoom function will magnify towards. In some embodiments of the present invention the user may request a zoom-guide by uttering a particular verbal command. For example, the user utters the verbal command "zoom guide" and in response a zoom guide graphical overlay is presented upon his or her projected mirror image. The zoom guide will indicate to the user what region of the screen will be zoomed in upon during a subsequent zoom operation. In some embodiments the user may issue verbal commands that move the zoom guide, including "move left," "move right," "move up," and "move down". In this way the user can control the location of the zoom-guide and thereby control where upon the mirror image is zoomed. Alternately, or in combination, the user may simply move his or her location in front of the mirror to adjust where upon his body the zoom-guide falls." See paras. [0050]-[0052]. "FIG. 5 illustrates a computer rendering of a human user 501 standing in front of a wall-mounted embodiment of the advanced digital mirror system 502 according to at least one embodiment of the present invention. The user's image is captured as a real-time video image by a camera upon or within the digital mirror 502 as described previously. A representation of that real-time video image is then displayed upon the wall mounted screen of the digital mirror 502 with a displayed size and scaling such that it appears like a traditional life-size mirror image 503. In a traditional mirror emulation mode, the real-time video image is left-right inverted prior to display upon the screen. Thus the user 501 standing before the digital display is given the visual impression that he or she is standing before a traditional wall mirror, viewing a traditional mirror image of himself or herself." *See* para. [0077].

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	 Fig. 5 “FIG. 6 illustrates a frozen digital image of a user's backside according to at least on embodiment of the invention. As shown, a user 601 has just performed the image freeze operation as described above (i.e., froze the image while having his back to the display screen). The user 601 then turns back around. Thus the user 601 is standing before the mirror and viewing a frozen image of himself 602 as viewed from behind. In this way a user 601 can easily view how he or she looks from behind, examining the back of his or her head or body. To end the mode, the user may issue a command such as uttering “end freeze” and then resume viewing himself in a standard mirroring manner.” *See* para. [0086].

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	 Fig. 6 “[0087] To view a left profile view of himself or herself, the user can turn and face to his right such that the front plane of his body is approximately orthogonal to the mirror display screen he is standing before. He or she then engages the image freeze feature by uttering the word “freeze” or some other defined command utterance. The user then turns back toward the mirror and views it in a normal manner. Upon the display is the user's left profile view. FIG. 7 illustrates a frozen digital image of a user's left profile view according to at least on embodiment of the invention. As shown, a user 701 has just performed the image freeze operation as described above (i.e., froze the image while having his left profile aimed at the display screen). The user 701 then turns back around.

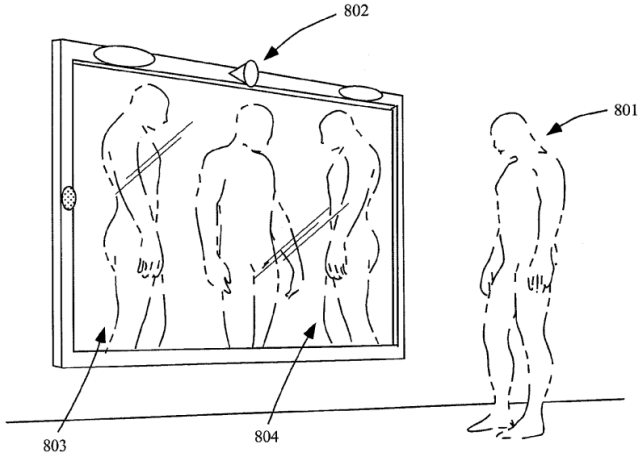
Asserted Claim of the '109 Patent	Exemplary Citations to Rosenberg
	Thus the user 701 stands before the mirror and views a frozen image of himself 702 as displayed in left profile. To end the mode, the user 701 may issue a command such as uttering "end freeze" and then resume viewing himself in a standard mirroring manner. To view a right profile view of himself or herself, the user 701 can turn and face to his left such that the front plane of his body is approximately orthogonal to the mirror display screen he is standing before. He or she then engages the image freeze feature by uttering the word "freeze" or some other defined command utterance. The user 701 then turns back toward the mirror and views it in a normal manner. Upon the display is the user's right profile view. To end the mode, the user 701 may issue a command such as uttering "end freeze" and then resume viewing himself in a standard mirroring manner. In addition to viewing himself or herself from behind, left profile, and right profile, other orientations may be viewed in this manner. For example, if the user wishes to view the top of his or her head he or she can tilt over such that the top of his or her head is angled towards the display screen, engage the freeze feature, and then tilt back and look at the image from a normal viewing orientation." *See* paras. [0087]-[0088]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Rosenberg 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 8	
8. The method of claim 1, further comprising applying a translation	Rosenberg 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.

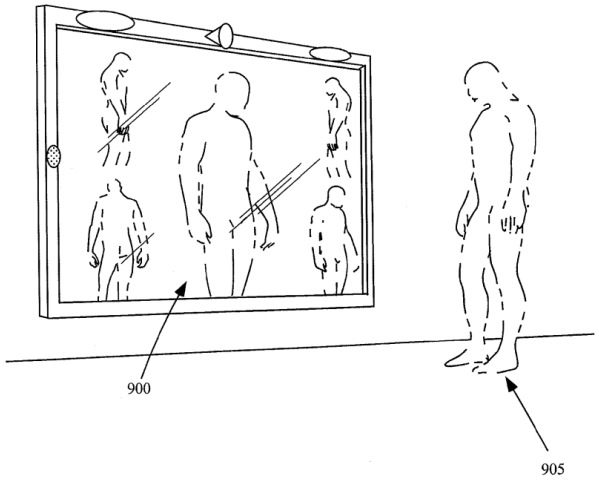
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transformation to move the image within display area of the monitor.	"In some embodiments, the digital mirror also enables the user to view a composite image upon the mirror display that includes a display of multiple images collected by the camera at different points in time. The feature, referred to herein as multi-view mirroring, allows a user to view himself or herself from multiple perspectives upon the same screen, thereby getting a more holistic impression of his or her appearance. A convenient, effective, and easy (for a user) embodiment of multi-view mirroring is enabled to allow a user to take a frozen image that was produced as a result of an image-freeze operation and/or a short video clip that was produced as a result of a image-buffering operation and move it to either the left or right side of the mirror for continuous display. In this way a user can continue to view himself in the central portion of the display through the real-time mirroring function while having saved images of himself and/or video clips of himself on the sides of the display for comparison. This is generally enabled through another set of simple voice commands such that the user can perform the function without disrupting whatever manual activity was being performed such as brushing hair or teeth. In some embodiments two verbal commands are defined as "move left" and "move right." The system is configured in software to detect and identify these verbal utterances and in response move a frozen image or buffered video clip to the left side of the display or right side of the display respectively, freeing up the center of the display for a display standard mirroring mode. In this way, for example, a user can freeze his left profile by turning to the right and uttering "freeze." The user then can move the frozen image to the left side of the display by uttering "move left". The image then appears on the left side of the display and the central display resume the standard mirroring function. The user can then freeze his right profile by turning to the left and uttering "freeze". The user can then move the frozen image to the right side of the display by uttering "move right." The image then appears on the right side of the display and the central display again resumes the standard mirroring function. Now the user is looking in a mirror, as presented on the central portion of the digital mirror screen display, while having his left and right profiles presented on either side of the mirror. The same set of commands can be used to freeze frontal and/or rear images and present them on the left, right, or both sides of the display.

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	In some embodiments, multiple images can be moved to the left or right side of the display. In general any previously display images on the left or right side are reduced in size such that each image sent to that side can be displayed with generally equal size. Thus the software of the present invention may be configured to automatically reduce the size of images (or video clips) moved to the left and/or right side of the mirror display to accommodate increasing numbers of saved images (or video clips). In this way a user can freeze (or buffer) a number of images (or video clips) of himself or herself and display them along side his or her real-time mirror image on the display screen.” *See* paras. [0048]-[0049]. “In some embodiments, the digital mirror also enables the user to view a composite image upon the mirror display that include a display of multiple images collected by the camera at different points in time. This feature, referred to herein as multi-view mirroring, allows a user to view himself or herself from multiple perspectives upon the same screen, thereby getting a more holistic impression of his or her appearance. A convenient, effective, and easy to user embodiment of multi-view mirroring is enabled as follows—a user may take a frozen image that was produced as a result of a mirror image-freeze operation and/or a short video clip that was produced as a result of a mirror image-buffering operation and move it to either the left or right side of the mirror for continuous display. In this way a user can continue to view himself in the central portion of the display through the real-time mirroring function while having saved images of himself and/or video clips of himself on the sides of the display for comparison. This is generally enabled through another set of voice commands such that the user can perform the function without disrupting whatever manual activity was being performed such as brushing hair or teeth. In some embodiments two verbal commands are defined as “move left” and “move right.” The system is configured in software to detect and identify these verbal utterances and in response move a frozen image or buffered video clip to the left side of the display or right side of the display respectively, freeing up the center of the display for a display standard mirroring mode. In this way, for example, a user can freeze his left profile by turning to the right and uttering “freeze.” The user then can move the frozen image to the left side of the display by uttering “move left.” The image then appears on the left side of the display and the central display resume the standard

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	mirroring function. The user can then freeze his right profile by turning to the left and uttering "freeze." The user can then move the frozen image to the right side of the display by uttering "move right." The image then appears on the right side of the display and the central display again resumes the standard mirroring function. The results of such an operation are shown in FIG. 8 herein. FIG. 8 illustrates a user 801 standing before the display screen of the digital mirror system according to at least one embodiment of the invention. In the center of the display, a real-time mirror image 802 is generated and displayed. On the left side of the display is a frozen left profile image 803 of the user 801 as captured during a previous "image freeze" command and put on the left side of the display by a previous "move left" command. On the right side of the display is a frozen right profile image 804 of the user as captured during a previous "image freeze" command and put on the right side of the display by a previous "move right" command. Thus with a few simple hands free commands, the user 801 can cause the processor to compose and display a valuable composite image display. In some embodiments the user may choose to put the right profile on the left side of the display and vice versa. Thus as shown in FIG. 8, the user 801 is looking in a mirror, as presented on the central portion of the digital mirror screen display, while having his left and right profiles presented on either side of the mirror. The same set of commands can be used to freeze frontal and/or rear images and present them on the left, right, or both sides of the display." *See* paras. [0093]-[0095].

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	 Fig. 8 “In some embodiments, multiple images can be moved to either the left or right side of the display. The software of the present invention is configured to display the multiple images by reducing the size of each to accommodate the multi-image display. For example, if two images are sent to the left side of the display by the user, the software of the present invention will reduce each image to half size upon display. If the user sends three images to the left side of the display, the software according to some embodiments of the preset invention will reduce each image to one-third size upon display. In general, the software may be configured to display any number of images on either the left or right side of the display (within some maximum limit) by reducing the size of each displayed image such that each image sent to that side can be displayed with generally equal size.” FIG. 9 illustrates an exemplary display screen 900 embodiment of such a multi-image display operation. In this particular embodiment the user 905 has sent two frozen images to the left side of the display by using two sequential image freeze and image move

Asserted Claim of the '109 Patent	Exemplary Citations to Rosenberg
	commands. The user has also sent two frozen images to the right side of the display using two sequential image freeze and image move commands. The software according to this embodiment of the invention may display all four frozen images, each one reduced to approximately half-size, to accommodate the multiple images. In this way the user 905 can freeze and display a plurality of images of himself or herself, all displayed simultaneously with the real-time mirror image which is displayed at the center of the display screen. If the user moves four images to the left side of the display using the image freeze and "move left" commands four consecutive times, each of the four images would be displayed on the left side of the display, each at about quarter-size. Thus the software according to embodiments of the present invention may be configured to automatically reduce the size of images (or video clips) moved to the left and/or right side of the mirror display to accommodate increasing numbers of saved images (or video clips). In this way a user can freeze (or buffer) a number of images (or video clips) of himself or herself and display them along side his or her real-time mirror image on the display screen. Alternate or additional verbal utterances can be used to trigger the move-left and move-right commands described above so long as those commands are defined in software and associated with the respective commands." *See* paras. [0096]-[0098].

Asserted Claim of the ’109 Patent	Exemplary Citations to Rosenberg
	 Fig. 9 This limitation would have been obvious to a person of ordinary skill in the art based on (1) Rosenberg 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 Rosenberg
Claim 9	
9. The method of claim 1, further comprising changing illumination intensity of individual or groups of pixels of the	Rosenberg expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below.

Asserted Claim of the '109 Patent	Exemplary Citations to Rosenberg
monitor, so as to enhance shading or illumination in the image.	"An additional feature enabled by at least one embodiment of the present invention is a lighting emulation feature in which well known image processing techniques are used upon the real-time video imagery to alter the natural lighting conditions of the imagery to that of a simulated lighting condition. For example, image processing routines may be employed to alter the real-time video image such that the displayed lighting conditions simulate one of natural light, florescent light, or incandescent light. In this way a user may selectively view himself or herself in lighting conditions other than that which are present in the area of the digital mirror system. Particular verbal commands are relationally associated with each simulated lighting condition thus enabling a hands-free control of the lighting emulation features. For example verbal commands such as "natural light", "florescent light" and "incandescent light" may be relationally associated with simulations of natural lighting conditions, florescent lighting conditions, and incandescent lighting conditions, respectively." *See* para. [0116]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Rosenberg 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 Rosenberg
Claim 11	
11[pre]. The method of claim 1, further comprising:	To the extent the preamble is limiting, Rosenberg 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) Rosenberg alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3)

Asserted Claim of the '109 Patent	Exemplary Citations to Rosenberg
	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,	Rosenberg 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*: "Another aspect of the multi-function product embodiments described above are the innovative methods by which the system intelligently switches between operational states. As described above, a multi-state embodiment of the present invention may include a digital picture frame state and a digital mirroring state that are operative a different moments in time. Software routines are included for automatically switching between states based upon one or more sensor readings. As described previously the system may include a proximity and/or motion sensor operative to detect if a person is standing and/or moving in an area or region in front of the display screen. The proximity and/or motion sensor, for example, may be configured to detect whether a person (or other moving option) comes within an area that extends six to eight feet in front of the screen area. Based upon the motion and/or proximity data, the routines of embodiments of the present invention may be configured to automatically switch between operational states. In a preferred embodiment of the present invention, the software routines automatically put the system into digital picture frame state when it is determined that nobody is standing and/or moving in front of the screen for more than some threshold amount of time. Thus when a counter within the electronics of the present invention determines that the threshold time has elapsed during which no presence and/or motion was detected before the display screen (as determined by data from the proximity and/or motion sensors), the system is put into a digital picture frame state. Conversely when the system is in digital picture frame state and it is determined (based upon data from the proximity and/or motion sensor data) that a person is standing before the display screen for more than some threshold amount of time (e.g., 6 seconds), the routines put the system into a digital mirroring state. In some

Asserted Claim of the '109 Patent	Exemplary Citations to Rosenberg
	embodiments the system enables the user to purposefully change states based upon verbal commands, in addition to and/or instead of, the automatic state changing method described above." *See* para. [0056]. "FIG. 3 illustrates a wall mounted flat panel display 301 according to at least one embodiment of the invention. As shown, a camera 302 is mounted above the screen area, integrated into the frame of the advanced digital mirror. The large flat panel display 301 may be mounted upon a wall of a user's house. The display 301 includes a screen area (darkly shaded) and a frame area (more lightly shaded). The frame area is generally a plastic casing that supports the display and supporting electronics. Also shown is the digital video camera 302 mounted upon the frame area of the display 301. The digital video camera 302 is centered horizontally across the display 301 and aimed slightly downward such that it will be pointed at any typical user that stands centered in front of the display 301 a certain number of feet back from the display 301. In general, the camera 302 is aimed such that a user can stand at a comfortable mirror-viewing distance from the display 301 and be centered within the image capture area. In some embodiments wide-angle lenses are used upon the camera 302 to provide extended image capture areas. In some embodiments auto-focus lenses are used to account for differing distances of users standing in front of the display 301." *See* para. [0062]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Rosenberg 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.	Rosenberg expressly and/or inherently discloses and/or renders obvious this limitation. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Rosenberg 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 Rosenberg
	Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Exhibit A-14: Invalidity of U.S. Patent No. 8,982,109 in view of *Virtual Mirror by Fusing Multiple RGB-D Cameras*, Shen et al. ("Shen")

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.

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 U.S. Patent No. 8,982,109 (the "'109 Patent") under at least 35 U.S.C. §102(a).

Shen anticipates the Asserted Claims of the '109 Patent. To the extent it is found Shen 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 Shen does not anticipate the Asserted Claims, Shen 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.

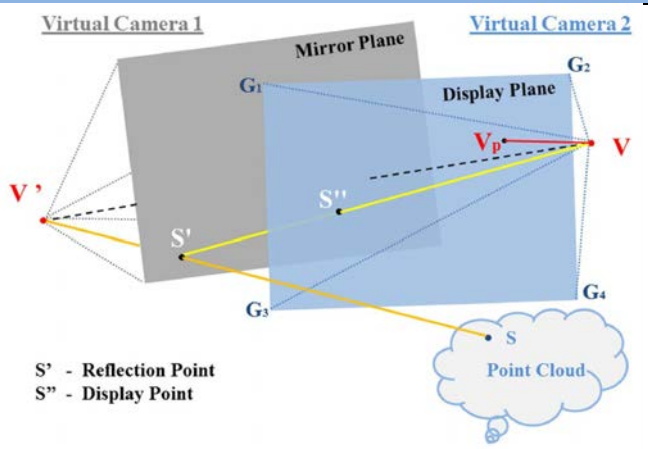
Defendants have endeavored to provide as much detail as possible in these contentions and, in doing so, have exceeded the level of detail required. The inclusion of specific details in some areas is not a concession that such details are required or that the omission of similar details in other areas 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 Shen
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, Shen expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. "After obtaining the 3D point cloud and the viewpoint, the next step is to render the mirror image from an arbitrarily positioned virtual plane mirror onto the display surface." *See* p. 4. "We adopt a Server-Client distributed system to deal with larger rendering space and high computation complexity. Each client is responsible for one RGB-D camera. It also contains all the calibration information and the user's viewpoint from previous instance. Each client first computes the 3D point cloud in the world coordinate system and an initial estimate of the viewpoint. Based on the viewpoint from the previous instance, the client will render the mirror image, possibly incomplete, based on its own point cloud data. As such, the 3D point cloud processing, the viewpoint estimate and the mirror image rendering are all done at the client level. The mirror image and the viewpoint estimate are then sent to the server. The server then combines all the mirror images with the clustering algorithm to fill in any area that may be occluded from one camera but visible at the others. The viewpoint estimate is also refined by taking a statistical average of all estimates and broadcast back to all the clients for the rendering of the next frame." *See* p. 4. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Shen 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;	Shen expressly and/or inherently discloses and/or renders obvious obtaining a digital image from a camera. *See*, *e.g.*, disclosures below.

Asserted Claim of the '109 Patent	Exemplary Citations to Shen
	"The 3D point cloud and the color texture information are obtained through a network of multiple fully-calibrated RGB-D cameras. As the image captured by the depth camera has the depth value available for each pixel. Based on the intrinsic parameters of the camera and the measured depth, we can obtain the corresponding 3D point by applying an inverse camera projection operation. Furthermore, for each RGB and depth camera pair, pixel-wise alignment can be achieved between the RGB and depth image according to their extrinsic parameters including the rotation and the translation. Thus, for each pixel on the color image, we can compute the tuple {X,Y,Z,R,G,B} where R, G, B are the three color channels." *See* p. 3. "After obtaining the 3D point cloud and the viewpoint, the next step is to render the mirror image from an arbitrarily positioned virtual plane mirror onto the display surface. For each 3D scene point, the rendering step is equivalent to first identifying the reflection point on the mirror and then the display point on the display surface. The identification of the reflection and display points can be viewed as two consecutive procedures of virtual camera projection. As illustrated in Figure 2, the reflection point can be viewed as the projection of the scene point onto a virtual camera, denoted as "Virtual Camera 1" in the figure, with the image plane at the mirror and the optical center at the mirror image V' of the viewpoint V. The display point is the projection of the reflection point onto another virtual camera, denoted as "Virtual Camera 2" in the figure, with the image plane at the display plane and the optical center at V." *See* p. 4. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Shen 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;	Shen 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.

Asserted Claim of the '109 Patent	Exemplary Citations to Shen
	"After obtaining the 3D point cloud and the viewpoint, the next step is to render the mirror image from an arbitrarily positioned virtual plane mirror onto the display surface. For each 3D scene point, the rendering step is equivalent to first identifying the reflection point on the mirror and then the display point on the display surface. The identification of the reflection and display points can be viewed as two consecutive procedures of virtual camera projection. As illustrated in Figure 2, the reflection point can be viewed as the projection of the scene point onto a virtual camera, denoted as "Virtual Camera 1" in the figure, with the image plane at the mirror and the optical center at the mirror image V' of the viewpoint V. The display point is the projection of the reflection point onto another virtual camera, denoted as "Virtual Camera 2" in the figure, with the image plane at the display plane and the optical center at V." *See* p. 4. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Shen 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;	Shen 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. "After obtaining the 3D point cloud and the viewpoint, the next step is to render the mirror image from an arbitrarily positioned virtual plane mirror onto the display surface. For each 3D scene point, the rendering step is equivalent to first identifying the reflection point on the mirror and then the display point on the display surface. The identification of the reflection and display points can be viewed as two consecutive procedures of virtual camera projection. As illustrated in Figure 2, the reflection point can be viewed as the projection of the scene point onto a virtual camera, denoted as "Virtual Camera 1" in the figure, with the image plane at the mirror and the optical center at the mirror image V' of the viewpoint V. The display point is the projection of the reflection point

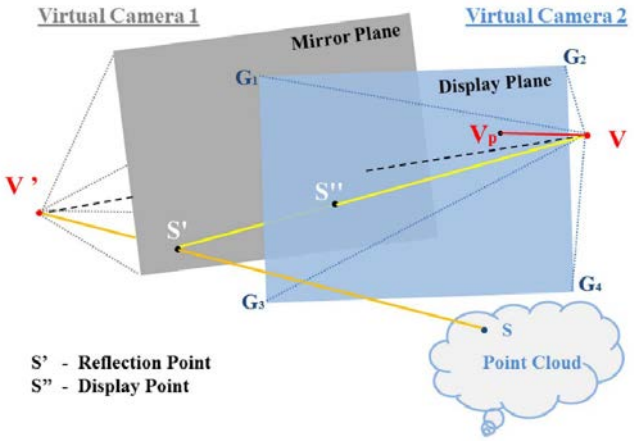
Asserted Claim of the '109 Patent	Exemplary Citations to Shen
	onto another virtual camera, denoted as "Virtual Camera 2" in the figure, with the image plane at the display plane and the optical center at V. "Thus, the rendering problem boils down to estimating the camera projection matrix for each of the two virtual cameras. The approaches to estimate the camera matrix for both cameras are identical and we use the display surface camera as an example. The focal length f is simply the distance between V and the display surface. The image center (c_x, c_y) on the display plane is the perpendicular projection V_p of V on the display plane relative to the top-left corner G_1. As for the extrinsics, the rotation matrix R can be inferred by the orientation of the display plane. For example, the plane normal is computed as $\vec{n} = \overrightarrow{G_1G_2} \times \overrightarrow{G_1G_2}$. R is determined according to the angle subtended by $\vec{n}$ and the Z axis in the world coordinate system. The translation T can be computed directly based on the distance between V and the origin of the world coordinate system. "Once all the above parameters are computed, the corresponding image on the display can be rendered based on the display points, denoted by S″. For each pixel on the display surface, there might be zero to multiple corresponding display points. If there is only one display point, that pixel will assume the color value associated with the corresponding 3D scene point S. If there are more than one display points, they can either be from the same 3D scene point but originated from different cameras, or they can be different scene points that fall on the same 3D ray V S″. For the first case, their depth values would be close to each other. For the second class, their depth values would be far apart and the one with the closest to the mirror would occlude the rest. This suggests a simple procedure of first clustering all the scene points that share similar depth values and then selecting the group that is closest to the mirror. To compute the final color among all points in the winning cluster, we use the scheme of winner takes all to select the one that best aligns with the viewpoint [9]." *See* p. 4.

Asserted Claim of the '109 Patent	Exemplary Citations to Shen
	 *See* p. 4, Fig. 2. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Shen 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;	Shen 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 this paper, we propose a camera-display system that simulates a mirror using a network of commodity RGB-D [depth] cameras in capturing 3D point clouds and color texture information. Our system uses the depth information to track the viewer, traces

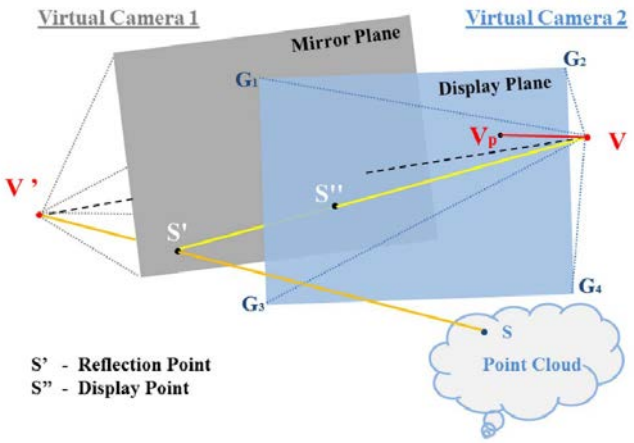
Asserted Claim of the '109 Patent	Exemplary Citations to Shen
	the light ray from each 3D point to the point of reflection on the virtual mirror, and determines the proper position and color values when the reflected ray hits the display surface. This model allows viewer-dependent rendering and supports arbitrary positioning or even movement of the virtual mirror." *See* p. 1. "Our system is capable of providing a far larger viewing surface and supporting a wider range of viewing position due to its capability in estimating the 3D coordinate for each pixel in the captured frame rather than merely getting the color intensity value on a 2D image as a normal camera does." *See* p. 2. "In our system, we have a dynamic scene so the geometry needs to be estimated on-the-fly from the depth camera." *See* p. 2. "The 3D point cloud and the color texture information are obtained through a network of multiple fully-calibrated RGB-D cameras. As the image captured by the depth camera has the depth value available for each pixel. Based on the intrinsic parameters of the camera and the measured depth, we can obtain the corresponding 3D point by applying an inverse camera projection operation. Furthermore, for each RGB and depth camera pair, pixel-wise alignment can be achieved between the RGB and depth image according to their extrinsic parameters including the rotation and the translation. Thus, for each pixel on the color image, we can compute the tuple {X, Y, Z, R, G, B} where R, G, B are the three color channels." *See* p. 3. "After obtaining the 3D point cloud and the viewpoint, the next step is to render the mirror image from an arbitrarily positioned virtual plane mirror onto the display surface. For each 3D scene point, the rendering step is equivalent to first identifying the reflection point on the mirror and then the display point on the display surface. The identification of the reflection and display points can be viewed as two consecutive procedures of virtual camera projection. As illustrated in Figure 2, the reflection point can be viewed as the projection of the scene point onto a virtual camera, denoted as "Virtual Camera 1" in the figure, with the image plane at the mirror and the optical center at the mirror image V' of the viewpoint V. The display point is the projection of the reflection point

Asserted Claim of the '109 Patent	Exemplary Citations to Shen
	onto another virtual camera, denoted as "Virtual Camera 2" in the figure, with the image plane at the display plane and the optical center at V. "Thus, the rendering problem boils down to estimating the camera projection matrix for each of the two virtual cameras. The approaches to estimate the camera matrix for both cameras are identical and we use the display surface camera as an example. The focal length f is simply the distance between V and the display surface. The image center (c_x, c_y) on the display plane is the perpendicular projection V_p of V on the display plane relative to the top-left corner G_1. As for the extrinsics, the rotation matrix R can be inferred by the orientation of the display plane. For example, the plane normal is computed as $\vec{n} = \overrightarrow{G_1G_2} \times \overrightarrow{G_1G_2}$. R is determined according to the angle subtended by $\vec{n}$ and the Z axis in the world coordinate system. The translation T can be computed directly based on the distance between V and the origin of the world coordinate system. "Once all the above parameters are computed, the corresponding image on the display can be rendered based on the display points, denoted by S″. For each pixel on the display surface, there might be zero to multiple corresponding display points. If there is only one display point, that pixel will assume the color value associated with the corresponding 3D scene point S. If there are more than one display points, they can either be from the same 3D scene point but originated from different cameras, or they can be different scene points that fall on the same 3D ray V S″. For the first case, their depth values would be close to each other. For the second class, their depth values would be far apart and the one with the closest to the mirror would occlude the rest. This suggests a simple procedure of first clustering all the scene points that share similar depth values and then selecting the group that is closest to the mirror. To compute the final color among all points in the winning cluster, we use the scheme of winner takes all to select the one that best aligns with the viewpoint [9]." *See* p. 4.

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Asserted Claim of the '109 Patent	Exemplary Citations to Shen
	 *See* p. 4, Fig. 2. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Shen 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;	Shen 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. "After obtaining the 3D point cloud and the viewpoint, the next step is to render the mirror image from an arbitrarily positioned virtual plane mirror onto the display surface. For each 3D scene point, the rendering step is equivalent to first identifying the reflection

Asserted Claim of the '109 Patent	Exemplary Citations to Shen
	point on the mirror and then the display point on the display surface. The identification of the reflection and display points can be viewed as two consecutive procedures of virtual camera projection. As illustrated in Figure 2, the reflection point can be viewed as the projection of the scene point onto a virtual camera, denoted as "Virtual Camera 1" in the figure, with the image plane at the mirror and the optical center at the mirror image V' of the viewpoint V. The display point is the projection of the reflection point onto another virtual camera, denoted as "Virtual Camera 2" in the figure, with the image plane at the display plane and the optical center at V. "Thus, the rendering problem boils down to estimating the camera projection matrix for each of the two virtual cameras. The approaches to estimate the camera matrix for both cameras are identical and we use the display surface camera as an example. The focal length f is simply the distance between V and the display surface. The image center (c_x, c_y) on the display plane is the perpendicular projection V_p of V on the display plane relative to the top-left corner G_1. As for the extrinsics, the rotation matrix R can be inferred by the orientation of the display plane. For example, the plane normal is computed as $\vec{n} = \overrightarrow{G_1G_2} \times \overrightarrow{G_1G_2}$. R is determined according to the angle subtended by $\vec{n}$ and the Z axis in the world coordinate system. The translation T can be computed directly based on the distance between V and the origin of the world coordinate system. "Once all the above parameters are computed, the corresponding image on the display can be rendered based on the display points, denoted by S″. For each pixel on the display surface, there might be zero to multiple corresponding display points. If there is only one display point, that pixel will assume the color value associated with the corresponding 3D scene point S. If there are more than one display points, they can either be from the same 3D scene point but originated from different cameras, or they can be different scene points that fall on the same 3D ray V S″. For the first case, their depth values would be close to each other. For the second class, their depth values would be far apart and the one with the closest to the mirror would occlude the rest. This suggests a simple procedure of first clustering all the scene points that share similar depth values and then selecting the group that is closest to the mirror. To compute the final color among all

Asserted Claim of the '109 Patent	Exemplary Citations to Shen
	points in the winning cluster, we use the scheme of winner takes all to select the one that best aligns with the viewpoint [9]." *See* p. 4.  *See* p. 4, Fig. 2. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Shen 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;	Shen 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.

Asserted Claim of the '109 Patent	Exemplary Citations to Shen
	"In our system, we have a dynamic scene so the geometry needs to be estimated on-the-fly from the depth camera." *See* p. 2. "We adopt a Server-Client distributed system to deal with larger rendering space and high computation complexity. Each client is responsible for one RGB-D camera. It also contains all the calibration information and the user's viewpoint from previous instance. Each client first computes the 3D point cloud in the world coordinate system and an initial estimate of the viewpoint. Based on the viewpoint from the previous instance, the client will render the mirror image, possibly incomplete, based on its own point cloud data. As such, the 3D point cloud processing, the viewpoint estimate and the mirror image rendering are all done at the client level. The mirror image and the viewpoint estimate are then sent to the server. The server then combines all the mirror images with the clustering algorithm to fill in any area that may be occluded from one camera but visible at the others. The viewpoint estimate is also refined by taking a statistical average of all estimates and broadcast back to all the clients for the rendering of the next frame." *See* p. 4. ". . . D_{max} is the dynamic range of the depth measurement." *See* p. 6. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Shen 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	Shen 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 this paper, we propose a camera-display system that simulates a mirror using a network of commodity RGB-D cameras in capturing 3D point clouds and color texture information. Our system uses the depth information to track the viewer, traces the light ray from each 3D point to the point of reflection on the virtual mirror, and determines

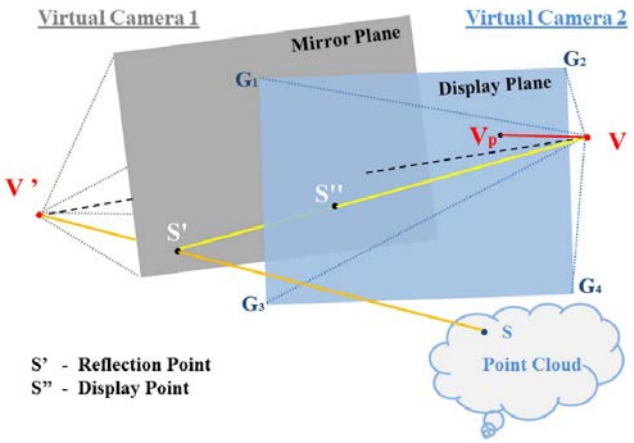
Asserted Claim of the '109 Patent	Exemplary Citations to Shen
	the proper position and color values when the reflected ray hits the display surface. This model allows viewer-dependent rendering and supports arbitrary positioning or even movement of the virtual mirror." *See* p. 1. "The 3D point cloud and the color texture information are obtained through a network of multiple fully-calibrated RGBD cameras. As the image captured by the depth camera has the depth value available for each pixel. Based on the intrinsic parameters of the camera and the measured depth we can obtain the corresponding 3D point by applying an inverse camera projection operation. Furthermore, for each RGB and depth camera pair, pixel-wise alignment can be achieved between the RGB and depth image according to their extrinsic parameters including the rotation and the translation. Thus, for each pixel on the color image, we can compute the tuple {X, Y, Z, R, G, B} where R, G, B are the three color channels." *See* p. 3. "While there are many high-performance sophisticated tracking algorithms in the literature, we take advantage of a single-user nature of the system and develop a very simple depth-based tracking algorithm. We assume that the user is much closer to the depth camera than the rest of the 3D scene points. As such, the histogram of depth values has a sharp peak of small values corresponding to the viewer that can be easily separated from the rest using a single threshold. These small depth values are then back-projected to the corresponding 2-D camera spatial coordinates. The actual depth values are not used anymore and we only keep the 2-D binary shape of the viewer. Morphological opening and closing are applied to fill in small holes and to smooth the outline of the silhouette. Starting from the topmost point of the silhouette, our algorithm follows the outline in both directions and calculates the curvature at each boundary point. The characteristic omega shape of a head induces a curvature curve that has a sharp dip from positive to negative at the two inflexion points. Detection of these two inflexion points define the extent of the head curve which are then used to fit a circle. The estimated center of the circle on the camera plane is temporally smoothed with a Kalman filter. The actual 3D coordinates of the viewpoint is then estimated to be the 3D point that

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	minimizes the sum of distances to each of the line formed between each camera's optical center and the center of the corresponding head circle." *See* p. 3. "Noise present in the depth image can significantly impair the quality of the rendered mirror image. Erroneous depth can move background scene to foreground or vice versa. Missing depth values and occlusion can lead to "holes" in the rendered image. To handle these problems, we propose a novel depth data denoising algorithm based on foreground-background separation. By separating pixels into foreground and background, the generated image can be completed in a guided manner. Missing depth pixels are interpolated or inpainted by neighboring depth pixels from the same group to prevent smearing of object boundaries. In addition, the foreground-background separation admits a low-complexity and better-quality rendering of the mirror image – foreground pixels can be first extracted and projected onto the display image while the remaining regions are filled by pre-captured backgrounds, thereby avoiding the rendering of the entire frame and filling background holes caused by the change of viewpoint." *See* p. 4. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Shen 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.	Shen 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. "As the quality of the depth data directly impacts the rendering, we propose a depth data denoising algorithm that models the noise process different between foreground and background, and applies different strategies in removing erroneous data and inpainting missing values." *See* p. 2.

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	This limitation would have been obvious to a person of ordinary skill in the art based on (1) Shen 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 Shen
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.	Shen 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. "To provide viewpoint dependent viewing, the system needs to track the viewer's eyes' position. As our display only renders a monocular view, we track the head position rather than the actual locations of the two eyes. We approximate the head as a sphere and treat the center as our target viewpoint. While there are many high-performance sophisticated tracking algorithms in the literature, we take advantage of a single-user nature of the system and develop a very simple depth-based tracking algorithm. We assume that the user is much closer to the depth camera than the rest of the 3D scene points. As such, the histogram of depth values has a sharp peak of small values corresponding to the viewer that can be easily separated from the rest using a single threshold. These small depth values are then back-projected to the corresponding 2-D camera spatial coordinates. The actual depth values are not used anymore and we only keep the 2-D binary shape of the viewer. Morphological opening and closing are applied to fill in small holes and to smooth the outline of the silhouette. Starting from the topmost point of the silhouette, our algorithm follows the outline in both directions and calculates the curvature at each boundary point. The characteristic omega shape of a head induces a curvature curve that has a sharp dip from positive to negative at the two inflexion points. Detection of these

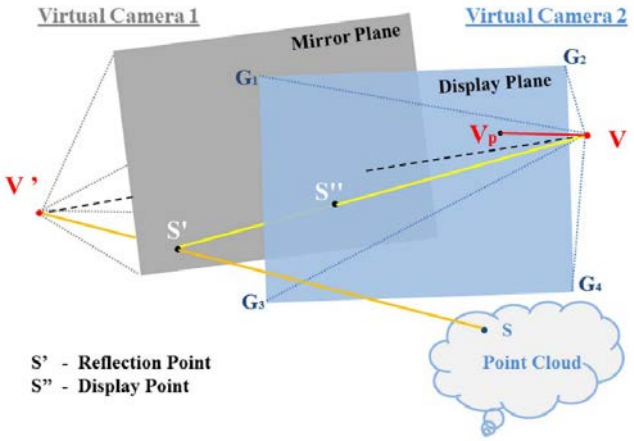
Asserted Claim of the '109 Patent	Exemplary Citations to Shen
	two inflexion points define the extent of the head curve which are then used to fit a circle. The estimated center of the circle on the camera plane is temporally smoothed with a Kalman filter. The actual 3D coordinates of the viewpoint is then estimated to be the 3D point that minimizes the sum of distances to each of the line formed between each camera's optical center and the center of the corresponding head circle. "After obtaining the 3D point cloud and the viewpoint, the next step is to render the mirror image from an arbitrarily positioned virtual plane mirror onto the display surface. For each 3D scene point, the rendering step is equivalent to first identifying the reflection point on the mirror and then the display point on the display surface. The identification of the reflection and display points can be viewed as two consecutive procedures of virtual camera projection. As illustrated in Figure 2, the reflection point can be viewed as the projection of the scene point onto a virtual camera, denoted as "Virtual Camera 1" in the figure, with the image plane at the mirror and the optical center at the mirror image V' of the viewpoint V. The display point is the projection of the reflection point onto another virtual camera, denoted as "Virtual Camera 2" in the figure, with the image plane at the display plane and the optical center at V. "Thus, the rendering problem boils down to estimating the camera projection matrix for each of the two virtual cameras. The approaches to estimate the camera matrix for both cameras are identical and we use the display surface camera as an example. The focal length f is simply the distance between V and the display surface. The image center (c_x, c_y) on the display plane is the perpendicular projection V_p of V on the display plane relative to the top-left corner G_1. As for the extrinsics, the rotation matrix R can be inferred by the orientation of the display plane. For example, the plane normal is computed as $\vec{n} = \overrightarrow{G_1G_2} \times \overrightarrow{G_1G_2}$. R is determined according to the angle subtended by $\vec{n}$ and the Z axis in the world coordinate system. The translation T can be computed directly based on the distance between V and the origin of the world coordinate system. "Once all the above parameters are computed, the corresponding image on the display can be rendered based on the display points, denoted by S″. For each pixel on the display surface, there might be zero to multiple corresponding display points. If there is only one

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	display point, that pixel will assume the color value associated with the corresponding 3D scene point S. If there are more than one display points, they can either be from the same 3D scene point but originated from different cameras, or they can be different scene points that fall on the same 3D ray V S″. For the first case, their depth values would be close to each other. For the second class, their depth values would be far apart and the one with the closest to the mirror would occlude the rest. This suggests a simple procedure of first clustering all the scene points that share similar depth values and then selecting the group that is closest to the mirror. To compute the final color among all points in the winning cluster, we use the scheme of winner takes all to select the one that best aligns with the viewpoint [9].” *See* p. 4.  *See* p. 4, Fig. 2. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Shen alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the

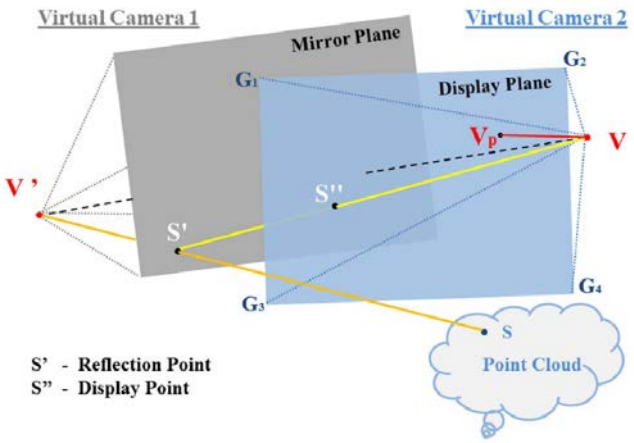
Asserted Claim of the '109 Patent	Exemplary Citations to Shen
	teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Asserted Claim of the '109 Patent	Exemplary Citations to Shen
Claim 7	
7[pre]. The method of claim 1, further comprising the steps:	To the extent the preamble is limiting, Shen 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) Shen 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;	Shen expressly and/or inherently discloses and/or renders obvious obtaining a reference image. *See*, *e.g.*, disclosures below. "After obtaining the 3D point cloud and the viewpoint, the next step is to render the mirror image from an arbitrarily positioned virtual plane mirror onto the display surface. For each 3D scene point, the rendering step is equivalent to first identifying the reflection point on the mirror and then the display point on the display surface. The identification of the reflection and display points can be viewed as two consecutive procedures of virtual camera projection. As illustrated in Figure 2, the reflection point can be viewed as the projection of the scene point onto a virtual camera, denoted as "Virtual Camera 1" in the figure, with the image plane at the mirror and the optical center at the mirror image V' of the viewpoint V. The display point is the projection of the reflection point

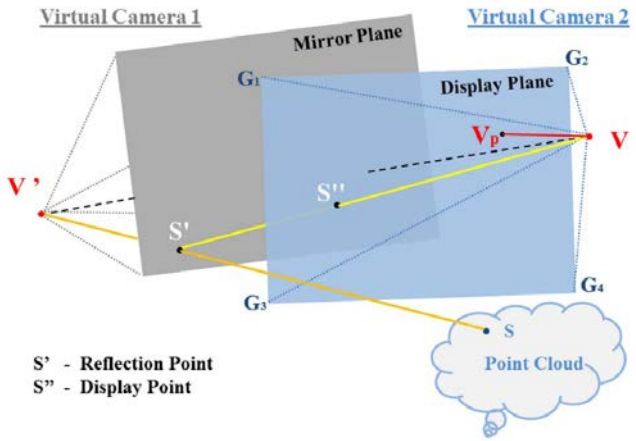
Asserted Claim of the '109 Patent	Exemplary Citations to Shen
	onto another virtual camera, denoted as "Virtual Camera 2" in the figure, with the image plane at the display plane and the optical center at V. "Thus, the rendering problem boils down to estimating the camera projection matrix for each of the two virtual cameras. The approaches to estimate the camera matrix for both cameras are identical and we use the display surface camera as an example. The focal length f is simply the distance between V and the display surface. The image center (c_x, c_y) on the display plane is the perpendicular projection V_p of V on the display plane relative to the top-left corner G_1. As for the extrinsics, the rotation matrix R can be inferred by the orientation of the display plane. For example, the plane normal is computed as $\vec{n} = \overrightarrow{G_1G_2} \times \overrightarrow{G_1G_2}$. R is determined according to the angle subtended by $\vec{n}$ and the Z axis in the world coordinate system. The translation T can be computed directly based on the distance between V and the origin of the world coordinate system. "Once all the above parameters are computed, the corresponding image on the display can be rendered based on the display points, denoted by S″. For each pixel on the display surface, there might be zero to multiple corresponding display points. If there is only one display point, that pixel will assume the color value associated with the corresponding 3D scene point S. If there are more than one display points, they can either be from the same 3D scene point but originated from different cameras, or they can be different scene points that fall on the same 3D ray V S″. For the first case, their depth values would be close to each other. For the second class, their depth values would be far apart and the one with the closest to the mirror would occlude the rest. This suggests a simple procedure of first clustering all the scene points that share similar depth values and then selecting the group that is closest to the mirror. To compute the final color among all points in the winning cluster, we use the scheme of winner takes all to select the one that best aligns with the viewpoint [9]." *See* p. 4.

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	 *See* p. 4, Fig. 2. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Shen 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;	Shen expressly and/or inherently discloses and/or renders obvious performing registration of the digital image with the reference image. *See*, *e.g.*, disclosures below. "After obtaining the 3D point cloud and the viewpoint, the next step is to render the mirror image from an arbitrarily positioned virtual plane mirror onto the display surface. For each 3D scene point, the rendering step is equivalent to first identifying the reflection point on the mirror and then the display point on the display surface. The identification

Asserted Claim of the '109 Patent	Exemplary Citations to Shen
	of the reflection and display points can be viewed as two consecutive procedures of virtual camera projection. As illustrated in Figure 2, the reflection point can be viewed as the projection of the scene point onto a virtual camera, denoted as "Virtual Camera 1" in the figure, with the image plane at the mirror and the optical center at the mirror image V' of the viewpoint V. The display point is the projection of the reflection point onto another virtual camera, denoted as "Virtual Camera 2" in the figure, with the image plane at the display plane and the optical center at V. "Thus, the rendering problem boils down to estimating the camera projection matrix for each of the two virtual cameras. The approaches to estimate the camera matrix for both cameras are identical and we use the display surface camera as an example. The focal length f is simply the distance between V and the display surface. The image center (c_x, c_y) on the display plane is the perpendicular projection V_p of V on the display plane relative to the top-left corner G_1. As for the extrinsics, the rotation matrix R can be inferred by the orientation of the display plane. For example, the plane normal is computed as $\vec{n} = \overrightarrow{G_1G_2} \times \overrightarrow{G_1G_2}$. R is determined according to the angle subtended by $\vec{n}$ and the Z axis in the world coordinate system. The translation T can be computed directly based on the distance between V and the origin of the world coordinate system. "Once all the above parameters are computed, the corresponding image on the display can be rendered based on the display points, denoted by S″. For each pixel on the display surface, there might be zero to multiple corresponding display points. If there is only one display point, that pixel will assume the color value associated with the corresponding 3D scene point S. If there are more than one display points, they can either be from the same 3D scene point but originated from different cameras, or they can be different scene points that fall on the same 3D ray V S″. For the first case, their depth values would be close to each other. For the second class, their depth values would be far apart and the one with the closest to the mirror would occlude the rest. This suggests a simple procedure of first clustering all the scene points that share similar depth values and then selecting the group that is closest to the mirror. To compute the final color among all

Asserted Claim of the '109 Patent	Exemplary Citations to Shen
	points in the winning cluster, we use the scheme of winner takes all to select the one that best aligns with the viewpoint [9]." *See* p. 4.  *See* p. 4, Fig. 2. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Shen 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.	Shen 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.

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	"After obtaining the 3D point cloud and the viewpoint, the next step is to render the mirror image from an arbitrarily positioned virtual plane mirror onto the display surface. For each 3D scene point, the rendering step is equivalent to first identifying the reflection point on the mirror and then the display point on the display surface. The identification of the reflection and display points can be viewed as two consecutive procedures of virtual camera projection. As illustrated in Figure 2, the reflection point can be viewed as the projection of the scene point onto a virtual camera, denoted as "Virtual Camera 1" in the figure, with the image plane at the mirror and the optical center at the mirror image V' of the viewpoint V. The display point is the projection of the reflection point onto another virtual camera, denoted as "Virtual Camera 2" in the figure, with the image plane at the display plane and the optical center at V. "Thus, the rendering problem boils down to estimating the camera projection matrix for each of the two virtual cameras. The approaches to estimate the camera matrix for both cameras are identical and we use the display surface camera as an example. The focal length f is simply the distance between V and the display surface. The image center (c_x, c_y) on the display plane is the perpendicular projection V_p of V on the display plane relative to the top-left corner G_1. As for the extrinsics, the rotation matrix R can be inferred by the orientation of the display plane. For example, the plane normal is computed as $\vec{n} = \overrightarrow{G_1G_2} \times \overrightarrow{G_1G_2}$. R is determined according to the angle subtended by $\vec{n}$ and the Z axis in the world coordinate system. The translation T can be computed directly based on the distance between V and the origin of the world coordinate system. "Once all the above parameters are computed, the corresponding image on the display can be rendered based on the display points, denoted by S″. For each pixel on the display surface, there might be zero to multiple corresponding display points. If there is only one display point, that pixel will assume the color value associated with the corresponding 3D scene point S. If there are more than one display points, they can either be from the same 3D scene point but originated from different cameras, or they can be different scene points that fall on the same 3D ray V S″. For the first case, their depth values would be close to each other. For the second class, their depth values would be far apart and the one with the closest to the mirror would occlude the rest. This suggests a simple

Asserted Claim of the '109 Patent	Exemplary Citations to Shen
	procedure of first clustering all the scene points that share similar depth values and then selecting the group that is closest to the mirror. To compute the final color among all points in the winning cluster, we use the scheme of winner takes all to select the one that best aligns with the viewpoint [9]." *See* p. 4.  *See* p. 4, Fig. 2. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Shen 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 Shen
Claim 8	
8. The method of claim 1, further comprising applying a translation transformation to move the image within display area of the monitor.	Shen 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. "To simulate a large mirror surface that can cope with wide displacement of a viewer, a camera-display system must be able to capture the 3-D world, track the moving viewpoint, render new view based on the viewpoint, and possibly add new visual content that are compatible with the scene geometry. In addition, it must be able to accomplish all these tasks in real-time otherwise it loses the instant visual feedback required to provide the realism of a mirror." *See* p. 1. "Our system uses the depth information to track the viewer, traces the light ray from each 3D point to the point of reflection on the virtual mirror, and determines the proper position and color values when the reflected ray hits the display surface. This model allows viewer-dependent rendering and supports arbitrary positioning or even movement of the virtual mirror." *See* p. 1. "To provide viewpoint dependent viewing, the system needs to track the viewer's eyes' position. As our display only renders a monocular view, we track the head position rather than the actual locations of the two eyes. We approximate the head as a sphere and treat the center as our target viewpoint. While there are many high-performance sophisticated tracking algorithms in the literature, we take advantage of a single-user nature of the system and develop a very simple depth-based tracking algorithm. We assume that the user is much closer to the depth camera than the rest of the 3D scene points. As such, the histogram of depth values has a sharp peak of small values corresponding to the viewer that can be easily separated from the rest using a single threshold. These small depth values are then back-projected to the corresponding 2-D camera spatial coordinates. The actual depth values are not used anymore and we only keep the 2-D binary shape of the viewer. Morphological opening and closing are applied to fill in small holes and to smooth the outline of the silhouette. Starting from the topmost point of the silhouette,

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	our algorithm follows the outline in both directions and calculates the curvature at each boundary point. The characteristic omega shape of a head induces a curvature curve that has a sharp dip from positive to negative at the two inflexion points. Detection of these two inflexion points define the extent of the head curve which are then used to fit a circle. The estimated center of the circle on the camera plane is temporally smoothed with a Kalman filter. The actual 3D coordinates of the viewpoint is then estimated to be the 3D point that minimizes the sum of distances to each of the line formed between each camera's optical center and the center of the corresponding head circle." *See* p. 3. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Shen 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 Shen
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.	Shen expressly and/or inherently discloses and/or renders obvious this limitation. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Shen 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 Shen
Claim 11	
11[pre]. The method of claim 1, further comprising:	To the extent the preamble is limiting, Shen expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. *See* Claim Limitations 1[pre]-[h]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Shen 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,	Shen 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 this paper, we propose a camera-display system that simulates a mirror using a network of commodity RGB-D cameras in capturing 3D point clouds and color texture information. Our system uses the depth information to track the viewer, traces the light ray from each 3D point to the point of reflection on the virtual mirror, and determines the proper position and color values when the reflected ray hits the display surface. This model allows viewer-dependent rendering and supports arbitrary positioning or even movement of the virtual mirror." *See* p. 1. "The 3D point cloud and the color texture information are obtained through a network of multiple fully-calibrated RGBD cameras. As the image captured by the depth camera has the depth value available for each pixel. Based on the intrinsic parameters of the camera and the measured depth we can obtain the corresponding 3D point by applying an inverse camera projection operation. Furthermore, for each RGB and depth camera pair, pixel-wise alignment can be achieved between the RGB and depth image according to their extrinsic parameters including the rotation and the translation. Thus, for each

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	pixel on the color image, we can compute the tuple {X, Y, Z, R, G, B} where R, G, B are the three color channels." *See* p. 3. "While there are many high-performance sophisticated tracking algorithms in the literature, we take advantage of a single-user nature of the system and develop a very simple depth-based tracking algorithm. We assume that the user is much closer to the depth camera than the rest of the 3D scene points. As such, the histogram of depth values has a sharp peak of small values corresponding to the viewer that can be easily separated from the rest using a single threshold. These small depth values are then back-projected to the corresponding 2-D camera spatial coordinates. The actual depth values are not used anymore and we only keep the 2-D binary shape of the viewer. Morphological opening and closing are applied to fill in small holes and to smooth the outline of the silhouette. Starting from the topmost point of the silhouette, our algorithm follows the outline in both directions and calculates the curvature at each boundary point. The characteristic omega shape of a head induces a curvature curve that has a sharp dip from positive to negative at the two inflexion points. Detection of these two inflexion points define the extent of the head curve which are then used to fit a circle. The estimated center of the circle on the camera plane is temporally smoothed with a Kalman filter. The actual 3D coordinates of the viewpoint is then estimated to be the 3D point that minimizes the sum of distances to each of the line formed between each camera's optical center and the center of the corresponding head circle." *See* p. 3. "Noise present in the depth image can significantly impair the quality of the rendered mirror image. Erroneous depth can move background scene to foreground or vice versa. Missing depth values and occlusion can lead to "holes" in the rendered image. To handle these problems, we propose a novel depth data denoising algorithm based on foreground-background separation. By separating pixels into foreground and background, the generated image can be completed in a guided manner. Missing depth pixels are interpolated or inpainted by neighboring depth pixels from the same group to prevent smearing of object boundaries. In addition, the foreground-background separation admits a low-complexity and better-quality rendering of the mirror image – foreground pixels can be first extracted and projected onto the display image while the remaining

Asserted Claim of the '109 Patent	Exemplary Citations to Shen
	regions are filled by pre-captured backgrounds, thereby avoiding the rendering of the entire frame and filling background holes caused by the change of viewpoint." *See* p. 4. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Shen 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.	Shen expressly and/or inherently discloses and/or renders obvious varying resolution of the image according to the distance. *See*, *e.g.*, disclosures below. "We have a preliminary prototype mirror system with two Kinect implemented using C++ and OpenCV library. Each Kinect captures 640 × 480 resolution video for scene points generation and the local client renders the virtual image with resolution 1024 × 768, which is the same size as the final image on the server. The server and client machines are as follows: • **Server**: Intel Xeon E5335 processor with 4-core CPUs at 2.0 GHz and 4.0Gb of RAM. • **Client**: Intel Core(TM) E8400 Duo CPU at 3.00 GHz and 8.0Gb of RAM No special software optimization or hardware acceleration is currently employed. Without the depth denoising algorithm, our system can render roughly three frames per second. Due to the significant complexity of the iterative loopy belief propagation, the system needs roughly 4 seconds to render one frame when the depth denoising algorithm is applied." *See* p. 7. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Shen 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 Shen
	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-15: Invalidity of U.S. Patent No. 8,982,109 in view of *A Free-Viewpoint Virtual Mirror with Marker-Less User Interaction*, Straka et al. ("Straka 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.

Straka I was originally published in May 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) and (b).

Straka I anticipates the Asserted Claims of the '109 Patent. To the extent it is found Straka 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 Straka I does not anticipate the Asserted Claims, Straka I 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. 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, 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.

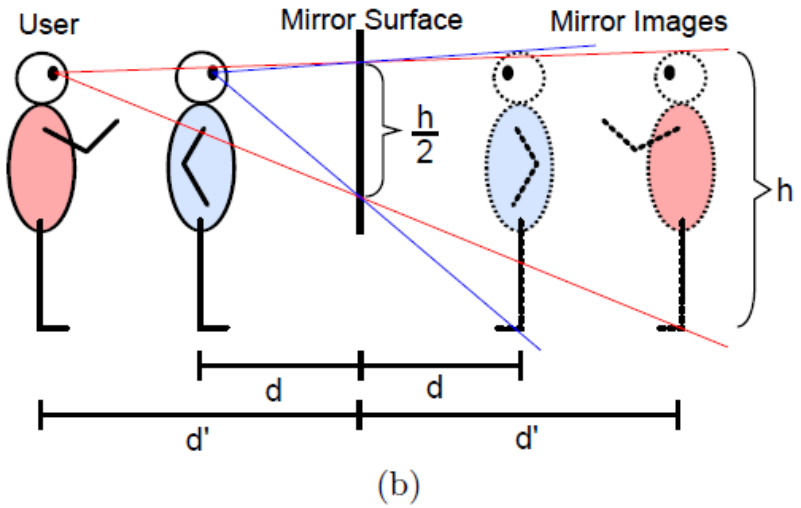
Asserted Claim of the '109 Patent	Exemplary Citations to Straka I
Claim 1	
1[pre]. A method for operating a system having a monitor, a camera, and a processor, so as to display a mirror-mimicking image on the monitor, by performing non-ordered steps comprising:	To the extent the preamble is limiting, Straka I expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. "Our virtual mirror system requires three components: multiple cameras to capture images of the user, a computer to process the data and a monitor to show the mirror image." *See* Straka I at p. 3. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Straka 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]. obtaining a digital image from a camera;	Straka I expressly and/or inherently discloses and/or renders obvious obtaining a digital image from a camera. *See*, *e.g.*, disclosures below. "Our contribution is a novel virtual mirror system which combines a multicamera capture system with real-time free-viewpoint video. We equip a room with several cameras (see Sect. 3) and use a virtual camera to render an artificial mirror image which we display on a large monitor." *See* Straka I at p. 2. "In contrast, free viewpoint video systems are able to render arbitrary views of an object by using images from multiple fixed cameras." *See* Straka at p. 2. "Our virtual mirror system requires three components: multiple cameras to capture images of the user, a computer to process the data and a monitor to show the mirror image." *See* Straka I at p. 3. "The cameras deliver 640 × 480 pixel images at 15 frames per second." *See* Straka I at p. 4.

Asserted Claim of the '109 Patent	Exemplary Citations to Straka I
	"In the first stage, we acquire a live stream of multiple synchronized camera images." *See* Straka I at p. 4. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Straka 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]. flipping the image about a vertical axis so as to reverse right and left sides of the image;	Straka I 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. "We present a Virtual Mirror system which is able to simulate a physically correct full-body mirror on a monitor." *See* Straka I at Abstract. "A virtual mirror is an Augmented Reality (AR) system which renders an image of the user from a virtual viewpoint and creates the illusion of a mirror image." *See* Straka I at p. 1. "Free viewpoint video systems on the other hand are able to render an arbitrary view of a person by combining images from multiple fixed cameras [3,9,18]. This allows for the accurate simulation of optical effects, including rendering of a reflection image." *See* Straka I at p. 1. "We equip a room with several cameras (see Sect. 3) and use a virtual camera to render an artificial mirror image which we display on a large monitor." *See* Straka I at p. 2. "The last component of the camera matrix $\tilde{P}$ is the intrinsic matrix $\tilde{K}$ which mirrors and projects the scene onto the monitor's surface:

Asserted Claim of the '109 Patent	Exemplary Citations to Straka I
	$$\tilde{\mathbf{K}} = \begin{bmatrix} -f & 0 & p_x \\ 0 & -f & p_y \\ 0 & 0 & 1 \end{bmatrix} \qquad \text{with} \quad f = 2 \cdot d \,. \qquad (5)$$ " *See* Straka I at p. 7. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Straka 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]. applying a transformation mapping to the image to modify the image such that it appears to mimic a reflection of a mirror;	Straka I 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 mirror plane π, which is the surface of the monitor in our system, can be expressed using a homogeneous notation which satisfies $\pi^T X = 0$ for every 3D point X that lies on the plane. The first three components of π correspond to the plane normal $$\mathbf{n} = [\pi^{(1)}, \pi^{(2)}, \pi^{(3)}]^T \qquad \|\mathbf{n}\| = 1 \qquad (1)$$ of the mirror while the fourth component $\pi^{(4)}$ describes the distance of the plane from the origin as determined in the configuration step. The orthogonal distance *d* between c and the mirror surface can be calculated as follows:

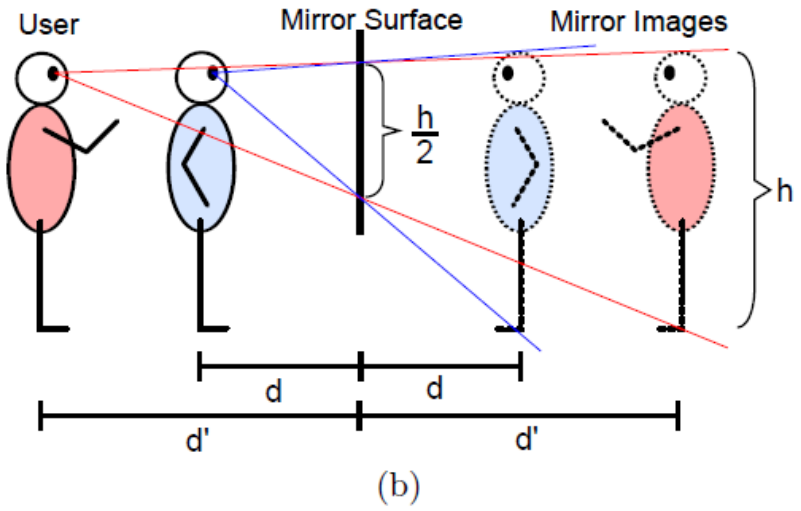
Asserted Claim of the '109 Patent	Exemplary Citations to Straka I
	$$d = \pi^T \begin{bmatrix} \mathbf{c} \\ 1 \end{bmatrix} . \quad (2)$$ "The 3 × 4 camera matrix $\widetilde{P} = \widetilde{K}[\widetilde{R}\|\tilde{t}]$ producing an optically correct mirror image from the user's view on the monitor can be calculated from the position of eyes c, the distance d and the normal n of the mirror plane (see Fig. 4a). The rotation $\widetilde{R}_{[3\times3]}$ of the virtual camera is defined so that the camera looks along the normal **n** of the mirror surface with an up-vector (up = $[0, 0, 1]^T$): $$\tilde{\mathbf{R}} = \begin{bmatrix} \mathbf{r}_x{}^T \\ (\mathbf{r}_x \times \mathbf{n})^T \\ \mathbf{n}^T \end{bmatrix} \quad \text{with} \quad \mathbf{r}_x = \mathbf{n} \times \mathbf{up} . \quad (3)$$ "Note that the gazing direction of the user does not affect the mirror image and therefore does not need to be considered. The position $\tilde{c}$ of the virtual camera is simply a mirrored version of the position of the eyes c which yields the translation vector $\tilde{t}$ for the virtual projection matrix $\widetilde{P}$: $$\tilde{\mathbf{t}} = -\tilde{\mathbf{R}} \cdot \tilde{\mathbf{c}} \quad \text{with} \quad \tilde{\mathbf{c}} = \mathbf{c} - 2 \cdot d \cdot \mathbf{n} . \quad (4)$$ "The last component of the camera matrix $\tilde{P}$ is the intrinsic matrix $\widetilde{K}$ which mirrors and projects the scene onto the monitor's surface:

Asserted Claim of the '109 Patent	Exemplary Citations to Straka I
	$$\tilde{\mathbf{K}} = \begin{bmatrix} -f & 0 & p_x \\ 0 & -f & p_y \\ 0 & 0 & 1 \end{bmatrix} \quad \text{with} \quad f = 2 \cdot d \,. \qquad (5)$$ "The focal length *f* of the camera is equal to the distance between the virtual camera and the user, which is twice the user-mirror distance *d*. This can be explained by the observation that the size of oneself's image on the mirror surface is constant and independent from *d* and the focal length of the eyes (see Fig. 1b). In the general case, the mirror image will be an off-center projection with the principal point offsets p_x and p_y shifted depending on the eye position **c**, the size of the monitor and its resolution in pixels as well as the position of the application window on the monitor." *See* Straka I at p. 7. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Straka 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]. resizing the image to reduce variations caused by changes in object's distance to the camera;	Straka I 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. "Illustration of the mirror effect: When the user has a distance *d* from the mirror, the mirror image appears at the same distance behind the mirror. The height of the mirror image on the mirror surface always is half the height *h* of the user and does not depend on the distance *d*." *See* Straka I at p. 3." "A virtual mirror needs to simulate the properties of a real mirror as accurate as possible. When standing in front of a mirror at a distance *d*, the mirror image of oneself appears

Asserted Claim of the '109 Patent	Exemplary Citations to Straka I
	exactly at the same distance but behind the mirror. However, even though this distance can change, the size of the user in the mirror image when projected on the mirror surface stays constant at half the height of the *h* user." *See* Straka I at p. 3.  (b) *See* Straka I at Fig. 1(b). This limitation would have been obvious to a person of ordinary skill in the art based on (1) Straka 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 '109 Patent	Exemplary Citations to Straka I
1[e]. displaying the image on the monitor after performing the flipping, transformation mapping, and resizing;	Straka I 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. "A 47 inch Full-HD television mounted in portrait mode has a height of 104cm and therefore can display the full-body mirror image of users up to 2 meters in height, which includes 99 percent of all people according to [15]." *See* Straka I at pp. 3-4. "In this section we evaluate our virtual mirror system in terms of visual quality, robustness and run-time. Figure 5a shows an example of an user interacting with the system. As soon as the user steps in front of the monitor, a virtual mirror image such as in Fig. 5b is shown on the screen. We obtain an appealing artificial mirror image at a resolution of 540×960 pixels, from any virtual camera position such as in Fig. 5c which shows a user looking at his own back." *See* Straka I at pp. 5-6.  (a) (b) (c) *See* Straka I. at Figs. 5(a)-(c). This limitation would have been obvious to a person of ordinary skill in the art based on (1) Straka 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

Asserted Claim of the '109 Patent	Exemplary Citations to Straka I
	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;	Straka I 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. "A real-time 3D reconstruction and rendering pipeline enables us to create a virtual mirror image at 15 frames per second on a single computer." *See* Straka I at Abstract. "Our contribution is a novel virtual mirror system which combines a multi-camera capture system with real-time free-viewpoint video." *See* Straka I at p. 2. "In Sect. 5 we show that we are able to achieve real-time processing of the camera images using only a single computer." *See* Straka I at p. 2. "A balanced use of graphics hardware and CPU processing allows us to achieve real-time execution for the whole system. We are able to render an output mirror image at 15 frames per second and display it to the user less than 100ms after camera image acquisition." *See* Straka I at p. 9. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Straka 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[g]. determining distance to a user appearing in the live video feed; and	Straka I 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. "Illustration of the mirror effect: When the user has a distance *d* from the mirror, the mirror image appears at the same distance behind the mirror. The height of the mirror

Asserted Claim of the '109 Patent	Exemplary Citations to Straka I
	image on the mirror surface always is half the height *h* of the user and does not depend on the distance *d*." *See* Straka I at p. 3." "A virtual mirror needs to simulate the properties of a real mirror as accurate as possible. When standing in front of a mirror at a distance *d*, the mirror image of oneself appears exactly at the same distance but behind the mirror. However, even though this distance can change, the size of the user in the mirror image when projected on the mirror surface stays constant at half the height of the *h* user." *See* Straka I at p. 3. "The orthogonal distance *d* between c and the mirror surface can be calculated as follows: $d = \pi^T \begin{bmatrix} c \\ 1 \end{bmatrix}$." *See* Straka I at 7.  *See* Straka I at Fig. 1(b).

Asserted Claim of the '109 Patent	Exemplary Citations to Straka I
	This limitation would have been obvious to a person of ordinary skill in the art based on (1) Straka 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[h]. varying rate at which the non-ordered steps are performed on the series of images according to the distance.	Straka I expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Straka 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 '109 Patent	Exemplary Citations to Straka I
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.	Straka I 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. "One common property of existing virtual mirror systems is that they consist of a single camera with a fixed position where the horizontally flipped video stream is shown to the user on a monitor. However, such systems generally do not allow one to simulate a correct mirror because video devices are only able to capture a projected image and not the reflection of the user from his viewpoint. Free viewpoint video systems on the other hand are able to render an arbitrary view of a person by combining images from multiple fixed cameras [3,9,18]. This allows for the accurate simulation of optical effects including rendering of a reflection image." *See* Straka I at p. 1.

Asserted Claim of the '109 Patent	Exemplary Citations to Straka I
	"In contrast, free viewpoint video systems are able to render arbitrary views of an object by using images from multiple fixed cameras." *See* Straka I at p. 2. "Visual-hull based rendering [1,9] requires only depth information obtained through processing of camera images with background segmentation (silhouette) in order to synthesize a new viewpoint." *See* Straka at p. 3  *See* Straka I at Fig. 5(a) (showing an eye-level height, horizontally point-of-view despite the cameras (circled in red) being above the user's head).

Asserted Claim of the '109 Patent	Exemplary Citations to Straka I
	This limitation would have been obvious to a person of ordinary skill in the art based on (1) Straka 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 '109 Patent	Exemplary Citations to Straka I
Claim 7	
7[pre]. The method of claim 1, further comprising the steps:	To the extent the preamble is limiting, Straka I expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. *See* Claims 1[pre]-1[h]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Straka 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.
7[a]. obtaining a reference image;	Straka I expressly and/or inherently discloses and/or renders obvious obtaining a reference image. *See*, *e.g.*, disclosures below. "In the first stage, we acquire a live stream of multiple synchronized camera images. Each image is then undistorted using radial distortion parameters determined during camera calibration. A subsequent silhouette extraction step segments the user from the background in all images." *See* Straka I at p. 4. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Straka I alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the

Asserted Claim of the '109 Patent	Exemplary Citations to Straka I
	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;	Straka I expressly and/or inherently discloses and/or renders obvious performing registration of the digital image with the reference image. *See*, *e.g.*, disclosures below. "In the first stage, we acquire a live stream of multiple synchronized camera images. Each image is then undistorted using radial distortion parameters determined during camera calibration. A subsequent silhouette extraction step segments the user from the background in all images. We employ a luminance insensitive background subtraction method in order to cope with shadows caused by the user. Silhouette data is used to generate a low-resolution voxel model and extract a skeleton which we use to implement marker-less user interaction. In the mirror simulation mode of our system, a virtual camera is controlled by the 3D position of the user's head which we determine in voxel space. An alternative mode of operation allows the user to rotate the camera around him- or herself by hand gestures. Finally, we use an image based visual hull (IBVH) technique to render the image of the user using the virtual camera. The remainder of this section describes important components of our system in more detail." *See* Straka I at pp. 4-5. "In our system, we use a 3D model to determine the position of the head and hands of the user. We use a fast space carving approach on the GPU [13] to obtain a discrete voxel grid V with a resolution of $k3$ voxels ($k = 64$). Once the voxel model has been obtained, we need to perform a hierarchical segmentation into head, body and limbs. In the recent years it has become popular to build a so-called Reeb graph [19] to represent the topology of arbitrary multidimensional structures. A Reeb graph is generated by extracting level sets from such structures and keeping track of critical points where a level set becomes disconnected. When applied to the human body, an optimal Reeb graph has a tree structure with branches for head, arms and legs. "In this work, we utilize a fast and robust method called *Voxel Scooping* [12] for extracting the Reeb graph of the human body. While the algorithm was originally

Asserted Claim of the '109 Patent	Exemplary Citations to Straka I
	intended for tracing centerlines of neurons in medical data, we show that it can be easily applied to volumetric body scans such as obtained from our shape-from-silhouette approach. Starting with the node at a seeding point, each node in the graph spherically expands in voxel space with a locally adaptive radius (hence the name scooping). Based on this expansion, a new node is created and the process is repeated until there are no more voxels left to scoop. When the expanded voxels of a single node no longer form a connected component, a branching node is created and each branch is processed individually. In the final Reeb graph there will be artifacts in the form of short branches (see Fig. 3c). A final pruning step removes branches that only consist of two or less nodes in order to obtain a clean graph with only six arcs corresponding to head, body and limbs (as in Fig. 3d). We propose to use the top of the head as the seeding point for voxel scooping, which will always produce a tree structure similar to the human skeleton as in Fig. 3b. The position of the head is determined when the user steps into the system and is further tracked in voxel space." *See* Straka I at pp. 5-6. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Straka 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.
7[c]. using data obtained from the registration to generate the transformation mapping.	Straka I 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 the first stage, we acquire a live stream of multiple synchronized camera images. Each image is then undistorted using radial distortion parameters determined during camera calibration. A subsequent silhouette extraction step segments the user from the background in all images. We employ a luminance insensitive background subtraction method in order to cope with shadows caused by the user. Silhouette data is used to generate a low-resolution voxel model and extract a skeleton which we use to implement marker-less user interaction. In the mirror simulation mode of our system, a virtual

Asserted Claim of the '109 Patent	Exemplary Citations to Straka I
	camera is controlled by the 3D position of the user's head which we determine in voxel space. An alternative mode of operation allows the user to rotate the camera around him- or herself by hand gestures. Finally, we use an image based visual hull (IBVH) technique to render the image of the user using the virtual camera. The remainder of this section describes important components of our system in more detail." *See* Straka I at pp. 4-5. "In our system, we use a 3D model to determine the position of the head and hands of the user. We use a fast space carving approach on the GPU [13] to obtain a discrete voxel grid V with a resolution of $k3$ voxels ($k = 64$). Once the voxel model has been obtained, we need to perform a hierarchical segmentation into head, body and limbs. In the recent years it has become popular to build a so-called Reeb graph [19] to represent the topology of arbitrary multidimensional structures. A Reeb graph is generated by extracting level sets from such structures and keeping track of critical points where a level set becomes disconnected. When applied to the human body, an optimal Reeb graph has a tree structure with branches for head, arms and legs. "In this work, we utilize a fast and robust method called *Voxel Scooping* [12] for extracting the Reeb graph of the human body. While the algorithm was originally intended for tracing centerlines of neurons in medical data, we show that it can be easily applied to volumetric body scans such as obtained from our shape-from-silhouette approach. Starting with the node at a seeding point, each node in the graph spherically expands in voxel space with a locally adaptive radius (hence the name scooping). Based on this expansion, a new node is created and the process is repeated until there are no more voxels left to scoop. When the expanded voxels of a single node no longer form a connected component, a branching node is created and each branch is processed individually. In the final Reeb graph there will be artifacts in the form of short branches (see Fig. 3c). A final pruning step removes branches that only consist of two or less nodes in order to obtain a clean graph with only six arcs corresponding to head, body and limbs (as in Fig. 3d). We propose to use the top of the head as the seeding point for voxel scooping, which will always produce a tree structure similar to the human skeleton

Asserted Claim of the '109 Patent	Exemplary Citations to Straka I
	as in Fig. 3b. The position of the head is determined when the user steps into the system and is further tracked in voxel space." *See* Straka I at pp. 5-6. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Straka 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.

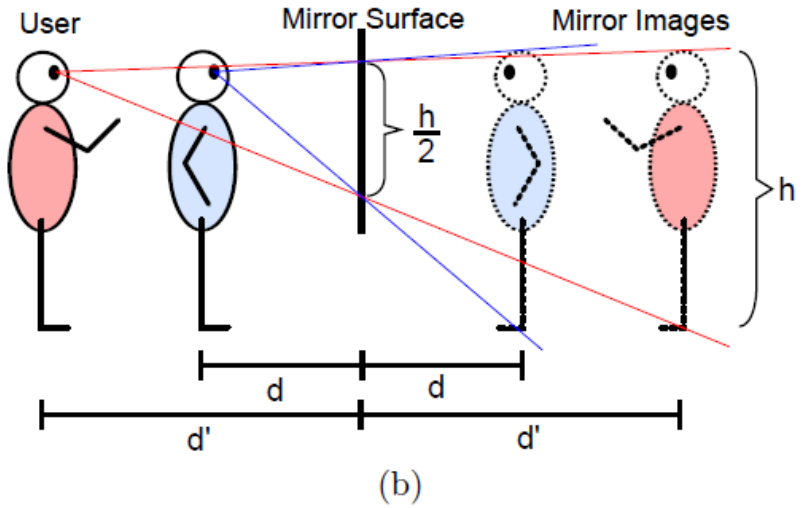
Asserted Claim of the '109 Patent	Exemplary Citations to Straka I
Claim 8	
8. The method of claim 1, further comprising applying a translation transformation to move the image within display area of the monitor.	Straka I expressly and/or inherently discloses and/or renders obvious further comprising applying a translation transformation to move the image within display area of the monitor. *See*, *e.g.*, disclosures below. "The last component of the camera matrix $\tilde{P}$ is the intrinsic matrix $\tilde{K}$ which mirrors and projects the scene onto the monitor's surface: $$\tilde{\mathbf{K}} = \begin{bmatrix} -f & 0 & p_x \\ 0 & -f & p_y \\ 0 & 0 & 1 \end{bmatrix} \qquad \text{with} \quad f = 2 \cdot d \,. \qquad (5)$$ "The focal length *f* of the camera is equal to the distance between the virtual camera and the user, which is twice the user-mirror distance *d*. This can be explained by the observation that the size of oneself's image on the mirror surface is constant and independent from *d* and the focal length of the eyes (see Fig. 1b). In the general case, the

Asserted Claim of the '109 Patent	Exemplary Citations to Straka I
	mirror image will be an off-center projection with the principal point offsets p_x and p_y shifted depending on the eye position **c**, the size of the monitor and its resolution in pixels as well as the position of the application window on the monitor." *See* Straka I at p. 7. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Straka 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 '109 Patent	Exemplary Citations to Straka I
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.	Straka I expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Straka 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 '109 Patent	Exemplary Citations to Straka I
Claim 11	
11[pre]. The method of claim 1, further comprising:	To the extent the preamble is limiting, Straka I expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below.

Asserted Claim of the '109 Patent	Exemplary Citations to Straka I
	See Claims 1[pre]-1[h]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Straka 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.
11[a]. determining distance to a user appearing in the image; and,	Straka I 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*: "Illustration of the mirror effect: When the user has a distance *d* from the mirror, the mirror image appears at the same distance behind the mirror. The height of the mirror image on the mirror surface always is half the height *h* of the user and does not depend on the distance *d*." *See* Straka I at p. 3." "A virtual mirror needs to simulate the properties of a real mirror as accurate as possible. When standing in front of a mirror at a distance *d*, the mirror image of oneself appears exactly at the same distance but behind the mirror. However, even though this distance can change, the size of the user in the mirror image when projected on the mirror surface stays constant at half the height of the *h* user." *See* Straka I at p. 3. "The orthogonal distance *d* between c and the mirror surface can be calculated as follows:

Asserted Claim of the '109 Patent	Exemplary Citations to Straka I
	$$d = \pi^T \begin{bmatrix} \mathbf{c} \\ 1 \end{bmatrix} . \quad (2)$$ " *See* Straka I at 7.  (b) *See* Straka I at Fig. 1(b). This limitation would have been obvious to a person of ordinary skill in the art based on (1) Straka 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 '109 Patent	Exemplary Citations to Straka I
11[b]. varying resolution of the image according to the distance.	Straka I expressly and/or inherently discloses and/or renders obvious varying resolution of the image according to the distance. *See*, *e.g.*, disclosures below. "The last component of the camera matrix $\tilde{P}$ is the intrinsic matrix $\tilde{K}$ which mirrors and projects the scene onto the monitor's surface: $$\tilde{\mathbf{K}} = \begin{bmatrix} -f & 0 & p_x \\ 0 & -f & p_y \\ 0 & 0 & 1 \end{bmatrix} \quad \text{with} \quad f = 2 \cdot d \,. \qquad (5)$$ "The focal length *f* of the camera is equal to the distance between the virtual camera and the user, which is twice the user-mirror distance *d*. This can be explained by the observation that the size of oneself's image on the mirror surface is constant and independent from *d* and the focal length of the eyes (see Fig. 1b). In the general case, the mirror image will be an off-center projection with the principal point offsets p_x and p_y shifted depending on the eye position **c**, the size of the monitor and its resolution in pixels as well as the position of the application window on the monitor." *See* Straka I at p. 7. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Straka 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.

Exhibit A-16: Invalidity of U.S. Patent No. 8,982,109 in view of U.S. Patent Pub. No. 2014/0313230 ("Suggs")

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.

Suggs was originally filed December 20, 2011 and published on October 23, 2014, 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).

Suggs anticipates the Asserted Claims of the '109 Patent. To the extent it is found Suggs 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 Suggs does not anticipate the Asserted Claims, Suggs 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 Suggs
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, Suggs expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. "Computing device 100 may include a display. Display 110 may be any of various display screens. For example, the display may be a display integrated into computing device 100, such as in the case of tablet computers and all-in-one computers. The display may also be a display remotely connected to computing device 100, such as a LCD monitor. Furthermore, the display may be a touch sensitive display. Display 110 may be used for various purposes, such as to display a user interface, text, images, and movies. "Computing device 100 may include memory 120, such as a machine-readable storage medium. The machine-readable storage medium may be any electronic, magnetic, optical, or other physical storage device that contains or stores data and/or executable instructions. Thus, the machine-readable storage medium may comprise, for example, various Random Access Memory (RAM), Read Only Memory (ROM), flash memory, and combinations thereof. For example, the machine-readable medium may include a Non-Volatile Random Access Memory (NVRAM), an Electrically Erasable Programmable Read-Only Memory (EEPROM), a storage drive, a NAND flash memory, and the like. Further, the machine-readable storage medium can be computer-readable and non-transitory." *See* paras. [0017]-[0018]. "Computing device 100 may include a sensor. Sensor 130 may be used to detect and/or determine a second position of a user relative to display 110. The second position may represent a current position or perspective of the user. Sensor 130 may include any of various sensors to determine a position or perspective of the user. "For example, sensor 130 may be a digital camera integrated into computing device 100, attached thereto, or integrated into or attached to a display associated with computing device 100, such as display 110. The camera may be or include an image sensor. For example, the image sensor may be a charge coupled device (CCD) image sensor or a

Asserted Claim of the '109 Patent	Exemplary Citations to Suggs
	complementary metal oxide semiconductor (CMOS) image sensor. The camera may include a processor, such as a digital signal processor, but may also be controlled by a separate processor in computing device 100, such as controller 140." *See* paras. [0022]-[0023]. "In FIG. 2, user 210 is looking at computer 220. Computer 220 may be an all-in-one computer, in which the display and other computer components (e.g., processor, memory) are combined. Computer 220 has a base 222, a display 224, and a camera 226." *See* para. [0042]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Suggs 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;	Suggs expressly and/or inherently discloses and/or renders obvious obtaining a digital image from a camera. *See*, *e.g.*, disclosures below. "A user position can be detected or determined using a sensor. A transformation can be applied to the image data based on the user position. The transformed image data can be displayed on a display." *See* Abstract. "Memory 120 may store various data. For example, memory 120 may store image data 122. Image data 122 may be data that is to be displayed on display 110. Image data 122 may include user interfaces, images, text, documents, photographs, videos, and the like." *See* para. [0019]. "For example, sensor 130 may be a digital camera integrated into computing device 100, attached thereto, or integrated into or attached to a display associated with computing device 100, such as display 110. The camera may be or include an image sensor. For example, the image sensor may be a charge coupled device (CCD) image sensor or a

Asserted Claim of the ’109 Patent	Exemplary Citations to Suggs
	complementary metal oxide semiconductor (CMOS) image sensor. The camera may include a processor, such as a digital signal processor, but may also be controlled by a separate processor in computing device 100, such as controller 140. In addition, the camera may be a stereo camera with multiple lenses and image sensors for capturing three-dimensional images. Sensor 130 may also be or include a tilt sensor. The tilt sensor may be embedded in or attached to display 110 and/or computing device 100 and may be configured to detect a degree of tilt of display 110. Other sensors for detecting the position of the display or the user may be used as well, such as a sound detector (e.g., a microphone), a heat sensor (e.g., a thermographic camera), a vibration sensor (e.g., a gravimeter), an orientation sensor (e.g., an accelerometer), an infrared light sensor, and the like. Furthermore, a combination of sensors may be used. “Sensor 130 may include logic, such as machine-readable instructions, for detecting and recognizing objects in an image represented by image data, and determining the position of the objects. Thus, for example, facial recognition techniques may be used to detect a user's face in an image sensed by a digital camera. Furthermore, the location of the user's eyes and pupils may be determined using the facial recognition technology and/or eye detection technology, thus enabling a more accurate determination of a user's perspective. For instance, the user's line of sight may be determined in this manner. Another technique of determining a location of the user's eyes and pupils is to shine infrared light and sense a reflection of the light from the user's eyes. Alternatively, the location of the user's eyes may be estimated based on the location of the user's head. For instance, if a heat sensor is used, the location of the head of the user may be inferred from the heat image and the location of the user's eyes may be estimated based on statistical data regarding the average location of a human being's eyes on his head.” *See* paras. [0023]-[0024]. “The line of sight 230 may be detected using camera 226 by sensing an image of user 210 and the surroundings and using facial recognition techniques to determine a location of the user's eyes and/or pupils . . . Alternatively, the tilt of the display screen relative to

Asserted Claim of the '109 Patent	Exemplary Citations to Suggs
	the line of sight may be determined using only the image data from camera 226 by using facial and object recognition techniques." *See* para. [0043]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Suggs 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;	Suggs 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. "Image data transformation module 142 may transform the image data using a matrix transformation, such as a perspective transformation. For example, position and angle vectors may be determined based on the second position detected by sensor 130. For instance, the distance and angle between the detected position and the center of sensor 130's field of view or of display 110's display area may be determined. The center of sensor 130's field of view or of display 110's display area may be considered the first position. Accordingly, the change in position or perspective from the first position to the second position may be determined. A perspective transform may then be applied to the image data that is to be displayed on display 110 to accommodate for the change in position or perspective. The perspective transform may essentially correct, counteract, or reverse some of the distortion that would otherwise result from viewing the image data from the second position. Display 110 may then display the transformed image data. "Image transformations may be described as sets of mathematical transformation functions represented by mathematical equations. Each pixel in the image data may be transformed based on the mathematical transformation functions to obtain a set of output pixels, which together may represent the transformed image data. For example, each pixel may be associated with a pixel location represented by coordinates (xin, yin). An appropriate transformation function based on the type of distortion to be corrected (e.g.,

Asserted Claim of the '109 Patent	Exemplary Citations to Suggs
	distortion due to a tilt of the display downwards, distortion due to a tilt of the display upwards, distortion due to a location of the user to the left of the vertical centerline, distortion due to a location of the user to the right of the centerline) may be selected. For example, if the display is tilted down, the appropriate transformation function may operate to foreshorten the image data, while if the display is tilted up/back, the appropriate transformation function may do the opposite. A perspective transformation may have one or more constants which determine the amount and smoothness of the perspective transformation effect. These constants may be determined based on the second position. For instance, the difference between the second position and the first position may be used to determine an appropriate value for the one or more constants in order to reduce the distortion. The output of the transformation may be a set of coordinates (x_{out}, y_{out}) for each pixel, which may represent the new location of each pixel. The image data may then be displayed in accordance with the new pixel locations. "In an example in which the second position includes a single component, such as a tilt of display 110, a single transformation may be applied. For example, a perspective transformation based on the tilt of the display may be calculated and applied to the image data. This transformed image data may then be displayed on display 110. "In an example in which the second position includes multiple components, such as a tilt of display 110 and a location of the user to the right or left of a vertical centerline, multiple transformations may be successively applied. For example, a perspective transformation based on the tilt of the display may be first calculated and applied to the image data. Then, a perspective transformation based on the location of the user to the right or left of the vertical centerline may be calculated and applied to the transformed image data. This twice-transformed image data may then be displayed on displayed 110." *See* paras. [0034]-[0037]. "At 430, the image data may be transformed if it is determined that the image data would appear distorted from the user's position. For example, a perspective transform may be used to transform the image data. In an example, controller 140 may transform the image data using image data transformation module 142. The image data may be transformed

Asserted Claim of the '109 Patent	Exemplary Citations to Suggs
	using a perspective transformation based on the user's position. At 440, the transformed image data may be displayed. For example, the transformed image data may be displayed on display 110. As a result, the transformed image data may appear less distorted to the user when viewed from the user's position." *See* para. [0053]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Suggs 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;	Suggs 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. "Image data transformation module 142 may transform the image data using a matrix transformation, such as a perspective transformation. For example, position and angle vectors may be determined based on the second position detected by sensor 130. For instance, the distance and angle between the detected position and the center of sensor 130's field of view or of display 110's display area may be determined. The center of sensor 130's field of view or of display 110's display area may be considered the first position. Accordingly, the change in position or perspective from the first position to the second position may be determined. A perspective transform may then be applied to the image data that is to be displayed on display 110 to accommodate for the change in position or perspective. The perspective transform may essentially correct, counteract, or reverse some of the distortion that would otherwise result from viewing the image data from the second position. Display 110 may then display the transformed image data. "Image transformations may be described as sets of mathematical transformation functions represented by mathematical equations. Each pixel in the image data may be transformed based on the mathematical transformation functions to obtain a set of output pixels, which together may represent the transformed image data. For example, each

Asserted Claim of the '109 Patent	Exemplary Citations to Suggs
	pixel may be associated with a pixel location represented by coordinates (xin, yin). An appropriate transformation function based on the type of distortion to be corrected (e.g., distortion due to a tilt of the display downwards, distortion due to a tilt of the display upwards, distortion due to a location of the user to the left of the vertical centerline, distortion due to a location of the user to the right of the centerline) may be selected. For example, if the display is tilted down, the appropriate transformation function may operate to foreshorten the image data, while if the display is tilted up/back, the appropriate transformation function may do the opposite. A perspective transformation may have one or more constants which determine the amount and smoothness of the perspective transformation effect. These constants may be determined based on the second position. For instance, the difference between the second position and the first position may be used to determine an appropriate value for the one or more constants in order to reduce the distortion. The output of the transformation may be a set of coordinates (x_{out}, y_{out}) for each pixel, which may represent the new location of each pixel. The image data may then be displayed in accordance with the new pixel locations. "In an example in which the second position includes a single component, such as a tilt of display 110, a single transformation may be applied. For example, a perspective transformation based on the tilt of the display may be calculated and applied to the image data. This transformed image data may then be displayed on display 110. "In an example in which the second position includes multiple components, such as a tilt of display 110 and a location of the user to the right or left of a vertical centerline, multiple transformations may be successively applied. For example, a perspective transformation based on the tilt of the display may be first calculated and applied to the image data. Then, a perspective transformation based on the location of the user to the right or left of the vertical centerline may be calculated and applied to the transformed image data. This twice-transformed image data may then be displayed on displayed 110." *See* paras. [0034]-[0037]. "At 430, the image data may be transformed if it is determined that the image data would appear distorted from the user's position. For example, a perspective transform may be

Asserted Claim of the '109 Patent	Exemplary Citations to Suggs
	used to transform the image data. In an example, controller 140 may transform the image data using image data transformation module 142. The image data may be transformed using a perspective transformation based on the user's position. At 440, the transformed image data may be displayed. For example, the transformed image data may be displayed on display 110. As a result, the transformed image data may appear less distorted to the user when viewed from the user's position." *See* para. [0053]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Suggs 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;	Suggs 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. "According to an example embodiment, however, the user's position may be detected and the image data may be transformed. The image data may be transformed so that the transformed image data appears to the user from his position largely as the image data was intended to appear (e.g., as the untransformed image data likely would appear from a default position directly in front of the display). Thus, the transformation may reduce the appearance of distortion when the transformed image data is viewed from the user's position." *See* para. [0015]. "The second position may include as a component a distance of the user from display 110. For example, the distance of the user from the display can be determined using a camera, such as a digital or thermographic camera. The distance can be estimated based on the size of the user in the grid, based on the size of the user relative to the user's surroundings, etc." *See* para. [0029].

Asserted Claim of the '109 Patent	Exemplary Citations to Suggs
	"Image data transformation module 142 may transform image data 122 based on the second position of the user determined by sensor 130. The transformed image data may appear from the second position as image data 122 would appear from the first position. Thus, for example, the transformed image data may appear with less distortion than would have been visible had the image data not been transformed." *See* para. [0032]. "Method 700 may start at 710 where an area of focus of the user may be determined. For example, the area of focus may be determined using sensor 130 of computing device 100. In one example, a digital camera may be used to detect which portion of display 110 the user's pupils are focused on. Controller 140 may determine the area of focus using facial recognition techniques. Alternatively, sensor 130 may include a pupil tracker, such as on a pair of eye glasses or contact lenses. At 720, the area of focus may be displayed in a zoomed-in manner. For example, display 110 may correlate the user's area of focus with certain image data which is displayed in the determined area of focus on display 110. The correlated image data may be enhanced by zooming. This may permit the user to more easily view the image data that the user was focused on." *See* para. [0057]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Suggs 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;	Suggs 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. "Memory 120 may store various data. For example, memory 120 may store image data 122. Image data 122 may be data that is to be displayed on display 110. Image data 122

Asserted Claim of the '109 Patent	Exemplary Citations to Suggs
	may include user interfaces, images, text, documents, photographs, videos, and the like." *See* para. [0019]. "Thus, when image data 122 is displayed on display 110, it may appear without noticeable distortion when viewed from the first position." *See* para. [0021]. "A perspective transform may then be applied to the image data that is to be displayed on display 110 to accommodate for the change in position or perspective. The perspective transform may essentially correct, counteract, or reverse some of the distortion that would otherwise result from viewing the image data from the second position. Display 110 may then display the transformed image data." *See* para. [0034]. "The output of the transformation may be a set of coordinates (x_{out}, y_{out}) for each pixel, which may represent the new location of each pixel. The image data may then be displayed in accordance with the new pixel locations. "In an example in which the second position includes a single component, such as a tilt of display 110, a single transformation may be applied. For example, a perspective transformation based on the tilt of the display may be calculated and applied to the image data. This transformed image data may then be displayed on display 110. "In an example in which the second position includes multiple components, such as a tilt of display 110 and a location of the user to the right or left of a vertical centerline, multiple transformations may be successively applied. For example, a perspective transformation based on the tilt of the display may be first calculated and applied to the image data. Then, a perspective transformation based on the location of the user to the right or left of the vertical centerline may be calculated and applied to the transformed image data. This twice-transformed image data may then be displayed on displayed [*sic*] 110." *See* paras. [0035]-[0037]. "At 720, the area of focus may be displayed in a zoomed-in manner. For example, display 110 may correlate the user's area of focus with certain image data which is displayed in

Asserted Claim of the '109 Patent	Exemplary Citations to Suggs
	the determined area of focus on display 110. The correlated image data may be enhanced by zooming. This may permit the user to more easily view the image data that the user was focused on." *See* para. [0057]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Suggs 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;	Suggs 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. "Image transformations may be described as sets of mathematical transformation functions represented by mathematical equations. Each pixel in the image data may be transformed based on the mathematical transformation functions to obtain a set of output pixels, which together may represent the transformed image data. For example, each pixel may be associated with a pixel location represented by coordinates (xin, yin). An appropriate transformation function based on the type of distortion to be corrected (e.g., distortion due to a tilt of the display downwards, distortion due to a tilt of the display upwards, distortion due to a location of the user to the left of the vertical centerline, distortion due to a location of the user to the right of the centerline) may be selected. For example, if the display is tilted down, the appropriate transformation function may operate to foreshorten the image data, while if the display is tilted up/back, the appropriate transformation function may do the opposite. A perspective transformation may have one or more constants which determine the amount and smoothness of the perspective transformation effect. These constants may be determined based on the second position. For instance, the difference between the second position and the first position may be used to determine an appropriate value for the one or more constants in order to reduce the distortion. The output of the transformation may be a set of

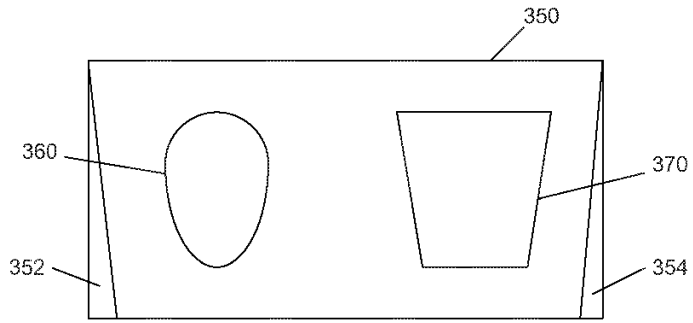
Asserted Claim of the '109 Patent	Exemplary Citations to Suggs
	coordinates (x_{out}, y_{out}) for each pixel, which may represent the new location of each pixel. The image data may then be displayed in accordance with the new pixel locations. "In an example in which the second position includes a single component, such as a tilt of display 110, a single transformation may be applied. For example, a perspective transformation based on the tilt of the display may be calculated and applied to the image data. This transformed image data may then be displayed on display 110." *See* paras. [0035]-[0036]. "At 430, the image data may be transformed if it is determined that the image data would appear distorted from the user's position. For example, a perspective transform may be used to transform the image data. In an example, controller 140 may transform the image data using image data transformation module 142. The image data may be transformed using a perspective transformation based on the user's position. At 440, the transformed image data may be displayed. For example, the transformed image data may be displayed on display 110. As a result, the transformed image data may appear less distorted to the user when viewed from the user's position." *See* para. [0053]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Suggs 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	Suggs 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. "According to an example embodiment, however, the user's position may be detected and the image data may be transformed. The image data may be transformed so that the transformed image data appears to the user from his position largely as the image data was intended to appear (e.g., as the untransformed image data likely would appear from a default position directly in front of the display). Thus, the transformation may reduce

Asserted Claim of the '109 Patent	Exemplary Citations to Suggs
	the appearance of distortion when the transformed image data is viewed from the user's position." *See* para. [0015]. "Sensor 130 may include logic, such as machine-readable instructions, for detecting and recognizing objects in an image represented by image data, and determining the position of the objects. Thus, for example, facial recognition techniques may be used to detect a user's face in an image sensed by a digital camera. Furthermore, the location of the user's eyes and pupils may be determined using the facial recognition technology and/or eye detection technology, thus enabling a more accurate determination of a user's perspective. For instance, the user's line of sight may be determined in this manner. Another technique of determining a location of the user's eyes and pupils is to shine infrared light and sense a reflection of the light from the user's eyes. Alternatively, the location of the user's eyes may be estimated based on the location of the user's head. For instance, if a heat sensor is used, the location of the head of the user may be inferred from the heat image and the location of the user's eyes may be estimated based on statistical data regarding the average location of a human being's eyes on his head." *See* para. [0024]. "The second position may include as a component a distance of the user from display 110. For example, the distance of the user from the display can be determined using a camera, such as a digital or thermographic camera. The distance can be estimated based on the size of the user in the grid, based on the size of the user relative to the user's surroundings, etc." *See* para. [0029]. "Image data transformation module 142 may transform image data 122 based on the second position of the user determined by sensor 130. The transformed image data may appear from the second position as image data 122 would appear from the first position. Thus, for example, the transformed image data may appear with less distortion than would have been visible had the image data not been transformed." *See* para. [0032]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Suggs alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the

Asserted Claim of the '109 Patent	Exemplary Citations to Suggs
	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.	Suggs 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. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Suggs 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 Suggs
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.	Suggs 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. "Display 224 is tilted back relative to a line of sight 230 of user 210. The line of sight 230 may be detected using camera 226 by sensing an image of user 210 and the surroundings and using facial recognition techniques to determine a location of the user's eyes and/or pupils. A line of sight from the user's eyes or pupils to a center of the display 224 or to a center of a field of view of camera 226 may be determined. The tilt of the display screen relative to the line of sight may be determined using an input from the tilt sensor in conjunction with the determined line of sight of the user. Alternatively, the tilt of the display screen relative to the line of sight may be determined using only the image data from camera 226 by using facial and object recognition techniques.

Asserted Claim of the '109 Patent	Exemplary Citations to Suggs
	"Camera 226 may also detect a location of user 210 relative to display 224, such as relative to a centerline 240 and/or a centerline 250 of display 224. Additionally, camera 226 may detect a distance 260 of user 210 from display 224. "In this example, the location of the user relative to centerlines 240, 250 and the distance 260 of the user from display 224 are within a threshold amount of a first position associated with image data to be displayed on display 224. However, the tilt of the display relative to line of sight 230 of user 210 is determined to exceed a threshold value. Accordingly, a perspective transform may be used to reduce distortion that may otherwise result due to viewing the image data from the user's detected position." *See* paras. [0043]-[0045]. "FIG. 3(c) depicts transformed image data 350, which is image data 310 after a perspective transform has been applied. To illustrate what happens to the image data as a result of the transformation, transformed image data 350 is shown in FIG. 3(c) as it may appear when viewed on display 224 from a first position (e.g., the default position). In such a scenario, image data 350 may indeed appear distorted, as shown. For example, circle 360 appears as a foreshortened ellipse, where the lower portion of circle 360 appears narrower than the upper portion of circle 360. Similarly, square 370 appears as a trapezoid, where the lower portion of square 370 appears narrower than the upper portion of square 370. "However, when transformed image data 350 is viewed by user 210 on display 224 from the second position, in which the display is tilted back as shown in FIG. 2, the image data may appear more like image data 310 as depicted in FIG. 3(a). In other words, the transformation may reduce the appearance of distortion. Accordingly, due to the backward tilting of display 224, circle 360 may appear as undistorted circle 320 in FIG. 3(a) and square 370 may appear as undistorted circle 330 in FIG. 3(a). User 210 may thus have a more satisfying experience since the displayed image data may appear closer to the way it is intended to appear." *See* paras. [0048]-[0049].

Asserted Claim of the ’109 Patent	Exemplary Citations to Suggs
	 FIG. 3(c) *See* Fig. 3(c). This limitation would have been obvious to a person of ordinary skill in the art based on (1) Suggs 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 Suggs
Claim 7	
7[pre]. The method of claim 1, further comprising the steps:	To the extent the preamble is limiting, Suggs 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 Suggs
	This limitation would have been obvious to a person of ordinary skill in the art based on (1) Suggs 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;	Suggs expressly and/or inherently discloses and/or renders obvious obtaining a reference image. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Suggs 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;	Suggs expressly and/or inherently discloses and/or renders obvious performing registration of the digital image with the reference image. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Suggs 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.	Suggs expressly and/or inherently discloses and/or renders obvious using data obtained from the registration to generate the transformation mapping. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Suggs 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 Suggs
Claim 8	
8. The method of claim 1, further comprising applying a translation transformation to move the image within display area of the monitor.	Suggs expressly and/or inherently discloses and/or renders obvious applying a translation transformation to move the image within display area of the monitor. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Suggs 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 Suggs
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.	Suggs 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. "Method 500 may start at 510 where the position of the user may be detected. For example, the user's position may be detected using sensor 130 of computing device 100. At 520, a display characteristic may be adjusted based on the user's position. For example, the brightness of display 110 may be adjusted by controller 140. For instance, if the user is positioned to one side of display 110, the brightness may be increased so as to increase the visibility of displayed image data from the user's position. Other display characteristics that may be adjusted include contrast, color quality, and the like." *See* para. [0055]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Suggs 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 Suggs
	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 Suggs
Claim 11	
11[pre]. The method of claim 1, further comprising:	To the extent the preamble is limiting, Suggs 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) Suggs 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,	Suggs 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*: "The second position may include as a component a distance of the user from display 110. For example, the distance of the user from the display can be determined using a camera, such as a digital or thermographic camera. The distance can be estimated based on the size of the user in the grid, based on the size of the user relative to the user's surroundings, etc. Other sensors, such as a noise sensor, may be used as well." *See* para. [0029].

Asserted Claim of the '109 Patent	Exemplary Citations to Suggs
	"Image data transformation module 142 may transform the image data using a matrix transformation, such as a perspective transformation. For example, position and angle vectors may be determined based on the second position detected by sensor 130. For instance, the distance and angle between the detected position and the center of sensor 130's field of view or of display 110's display area may be determined." *See* para. [0034]. "Additionally, camera 226 may detect a distance 260 of user 210 from display 224." *See* para. [0044]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Suggs 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.	Suggs expressly and/or inherently discloses and/or renders obvious varying resolution of the image according to the distance. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Suggs 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-17: Invalidity of U.S. Patent No. 8,982,109 in view of U.S. Patent No. 9,355,585 ("Tripathi")

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.

Tripathi was originally filed April 3, 2012 and issued on May 31, 2016, 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).

Tripathi anticipates the Asserted Claims of the '109 Patent. To the extent it is found Tripathi 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 Tripathi does not anticipate the Asserted Claims, Tripathi 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.

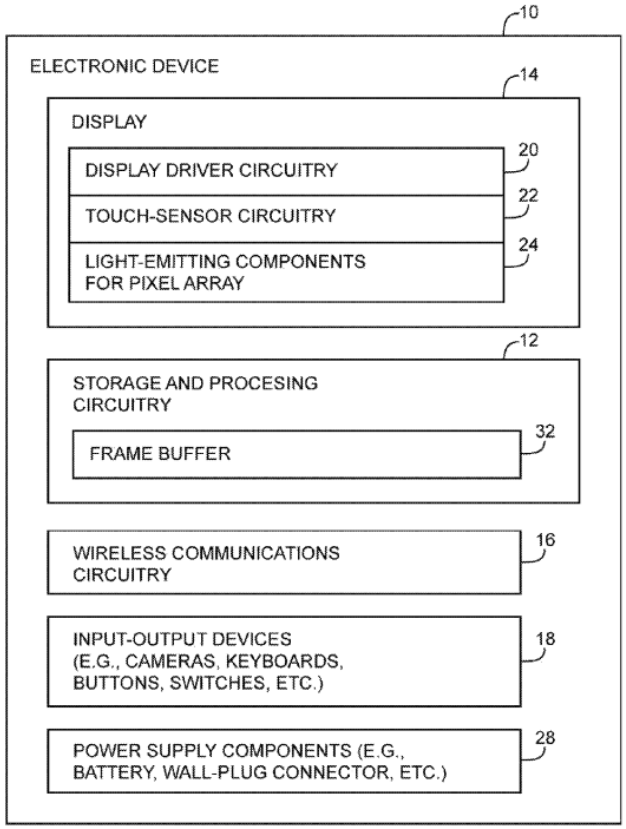
Defendants have endeavored to provide as much detail as possible in these contentions and, in doing so, have exceeded the level of detail required. The inclusion of specific details in some areas is not a concession that such details are required or that the omission of similar details in other areas 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 Tripathi
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, Tripathi expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. "This relates generally to displays, and more particularly, to electronic devices with displays. Electronic devices such as computers, televisions, portable computers, and cellular telephones are often provided with displays. A display often includes a frame buffer for buffering information to be displayed on the display and display driver circuitry that periodically refreshes display pixels in the display. The frequency at which the display pixels are periodically refreshed is commonly called the frame rate of the display. Conventional displays use a fixed standard frame rate such as the 24 frames-per-second frame rate that is often used for displaying television and movie content. In some scenarios a user may be able to select a fixed frame rate for a display from a set of fixed standard frame rates that are available for that display. However, in some scenarios, display content or other operating environment characteristics of a device may change during operation of an electronic device resulting in a configuration for which a different frame rate for the display may be desirable. Changes of this type may occur on time scales that are too short for a user of a device to effectively choose a frame rate for each configuration. It would therefore be desirable to be able to provide improved displays for electronic devices." *See* 1:6-31. "Electronic devices may be provided that contain displays. The display may include display pixels and display driver circuitry for operating the display pixels. The electronic device may include control circuitry. The control circuitry may monitor the device operating environment and other aspects of the operation of the electronic device. The control circuitry may configure operational attributes of the display in response to

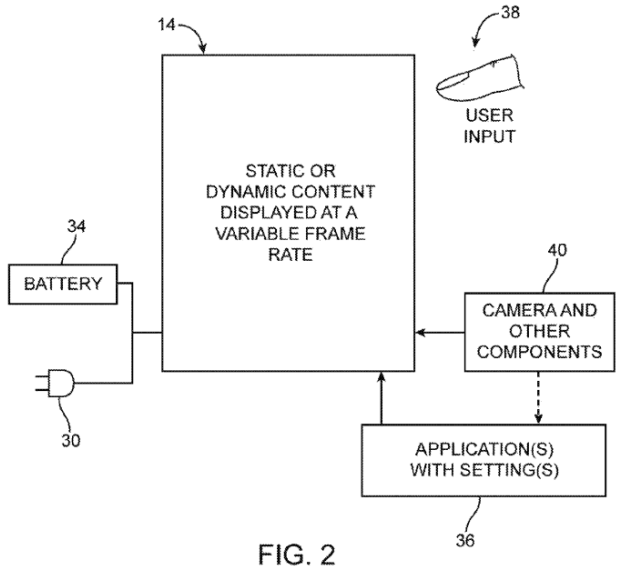
Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
	monitored operating environment information or other information obtained while monitoring the operation of the electronic device. The display driver circuitry may operate the display pixels by periodically refreshing light-emitting elements in the display. The frequency at which the display control circuitry refreshes the light-emitting elements of the display may be referred to as the display frame rate or the frame rate. Configuring operational attributes of the display may include increasing or decreasing the display frame rate of the display. Monitoring the device operating environment and other aspects of the operation of the electronic device may include monitoring the status of a frame buffer that stores display data to be displayed on the display, monitoring the type of display content to be displayed with the display, monitoring user-input signals, monitoring the device power supply status, and/or monitoring other aspects of the operation of the electronic device. In some situations, the control circuitry may reduce the display frame rate in response to detection of, for example, static display content to be displayed. Static display content may include static text, a static web browser webpage or other stationary display content. Reducing the display frame rate may reduce power consumption for the device and may allow powering down of memory needed for storing display data to be displayed. In some situations, the control circuitry may increase the display frame rate in response to detection of, for example, dynamic display content to be displayed. Dynamic display content may include scrolling content, video content, common-vector motion content, or other non-stationary display content. Increasing the display frame rate may result in a higher perceived display resolution for a user of the electric device. Further features of the invention, its nature and various advantages will be more apparent from the accompanying drawings and the following detailed description of the preferred embodiments." *See* 1:35-2:12.

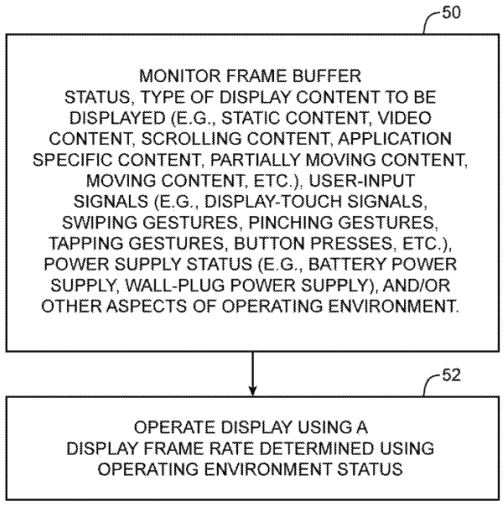
Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
	"Electronic devices such as cellular telephones, media players, computers, set-top boxes, wireless access points, and other electronic equipment may be provided displays. Displays may include liquid-crystal display (LCD) screens, light-emitting diodes (LEDs), organic light-emitting diodes (OLEDs), and other components such as touch-sensitive components that present visual information and status data and/or gather user input data. Operational attributes of the display such as the display frame rate (i.e., the frequency at which display signals are provided to display pixels) may be controlled and configured by control circuitry in the electronic device. Operational status information may be gathered using control circuitry in the electronic device that monitors the operation of the device. The control circuitry may adjust the display frame rate (also sometimes referred to herein as the frame rate, the display refresh rate, or the refresh rate) in response to the operational status information. An illustrative electronic device of the type that may be provided with a display is shown in FIG. 1. Electronic device 10 may be a computer such as a computer that is integrated into a display such as a computer monitor, a laptop computer, a tablet computer, a somewhat smaller portable device such as a wrist-watch device, pendant device, or other wearable or miniature device, a cellular telephone, a media player, a tablet computer, a gaming device, a navigation device, a computer monitor, a television, or other electronic equipment. As shown in FIG. 1, device 10 may include a display such as display 14. Display 14 may include light-emitting components 24, touch-sensor circuitry 22, display driver circuitry 20 for operating display 14, and other display components. Display 14 may be a variable frame rate display operable to display content using an adjustable frame rate. Light-emitting components 24 may include an array of display pixels formed from reflective components, liquid crystal display (LCD) components, organic light-emitting diode (OLED) components, or other suitable display pixel structures. To provide display 14 with the ability to display color images, light-emitting components 24 may include

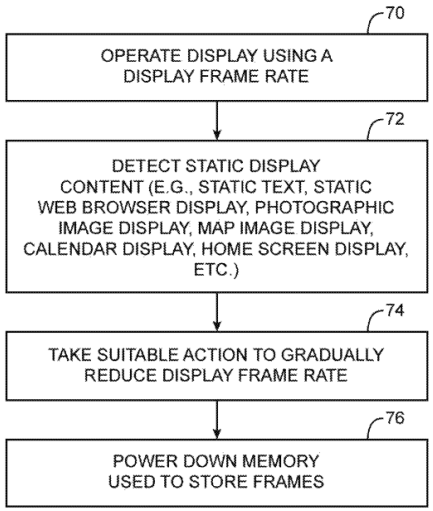
Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
	display pixels having color filter elements. Display touch-sensor circuitry 22 may include capacitive touch electrodes (e.g., indium tin oxide electrodes or other suitable transparent electrodes) or other touch sensor components (e.g., resistive touch technologies, acoustic touch technologies, touch sensor arrangements using light sensors, force sensors, etc.). Display 14 may be a touch screen that incorporates display touch circuitry 22 or may be a display that is not touch sensitive. Display driver circuitry 20 may include a driver integrated circuit that is mounted, for example, to a display layer such as a thin-film-transistor layer of a liquid crystal display. Display driver circuitry 20 may include display pixel control lines and other circuitry for operating the display pixels of display 14. Display driver circuitry 20 may be coupled to control circuitry such as storage and processing circuitry 12 in device 10. Display 14 may include additional circuitry such as demultiplexer circuitry, display signal lines for delivering display signals to light-emitting components 24 (FIG. 1), and gate driver circuitry. Display driver circuitry 20 may be implemented using one or more integrated circuits (ICs) and may sometimes be referred to as a driver IC, display driver integrated circuit, or display driver. Display driver integrated circuit 20 may be mounted on an edge of a thin-film transistor substrate layer in display 14 (as an example). The thin-film transistor substrate layer may sometimes be referred to as a thin-film transistor (TFT) layer." *See* 3:35-4:35.

Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
	 FIG. 1 "During operation of device 10, control circuitry such as storage and processing circuitry 12 may provide data to display driver 20. For example, circuitry 12 may supply display driver 20 with digital data corresponding to text, graphics, video, or other images to be

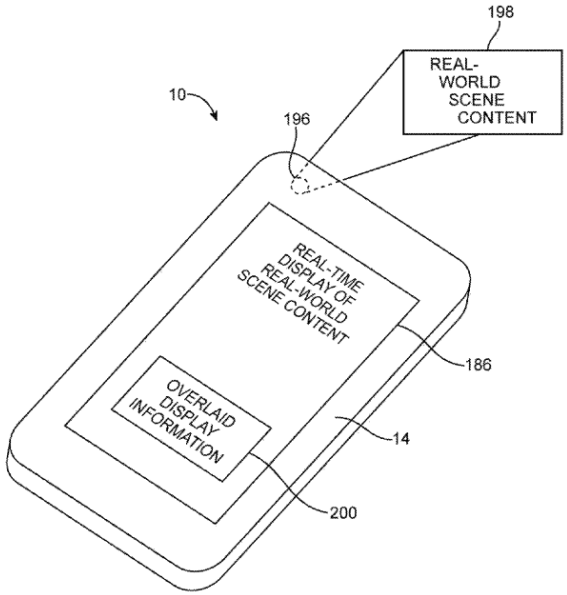
Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
	displayed on display 14. Display driver 20 may convert the data that is received into signals for controlling the display pixels. During the process of displaying images on display 14, display driver integrated circuit 20 may receive digital data from circuitry 12 and may produce corresponding analog data (e.g., voltages with magnitudes representing pixel brightness levels) for light-emitting components 24. The analog data signals may be demultiplexed to produce corresponding color-coded analog data line signals (e.g., data signals for a red channel, data signals for a green channel, and data signals for a blue channel)." *See* 4:36-51. "Device 10 may include monitoring circuitry for monitoring the operation of the electronic device. The monitoring circuitry may be formed as a portion of storage and processing circuitry 12, as a portion of display driver circuitry 20, as a separate integrated circuit (e.g., an integrated circuitry mounted on a printed circuit board or on a rigid layer of display 14), or may be a system monitoring engine implemented in part or completely using software running on processing circuitry 12. Control circuitry such as storage and processing circuitry 12 may be used in running software for device 10. For example, circuitry 12 may be configured to execute code in connection with the displaying of images on display 14 (e.g., text, pictures, video, etc.)." *See* 5:28-41. "FIG. 2 is a diagram showing examples of operating environment attributes and other aspects of device operations for a device of the type shown in FIG. 1 that may be monitored for determining a frame rate for display 14. As shown in FIG. 2, display 14 may be used for displaying static content or dynamic content at a variable frame rate. The variable frame rate may be actively determined during operation of device 10 based on whether static or dynamic display content is to be displayed, based on whether device 10 is receiving power from a battery such as battery 34 or a power cable such as power cable 30, based on user input such as a swipe by a user finger 38, based on the operational status of other device components 40 such as a camera, a video card, or other

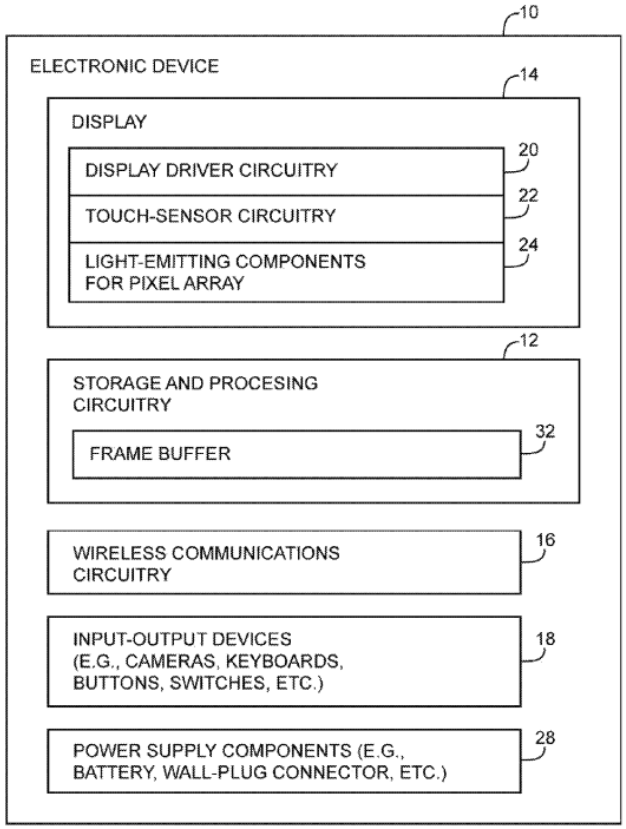
Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
	components, or based on whether one or more particular software applications 36 with one or more settings has been launched. FIG. 3 shows illustrative steps involved in adjusting the frame rate for a display such as display 14 of FIG. 1 in response to information related to the operation of a device. Device monitoring operations may be performed at step 50. The operations of step 50 may be performed using control circuitry such as storage and processing circuitry 12, display driver circuitry 20, standalone monitoring circuitry, and/or other device resources." *See* 6:6-28.  FIG. 2

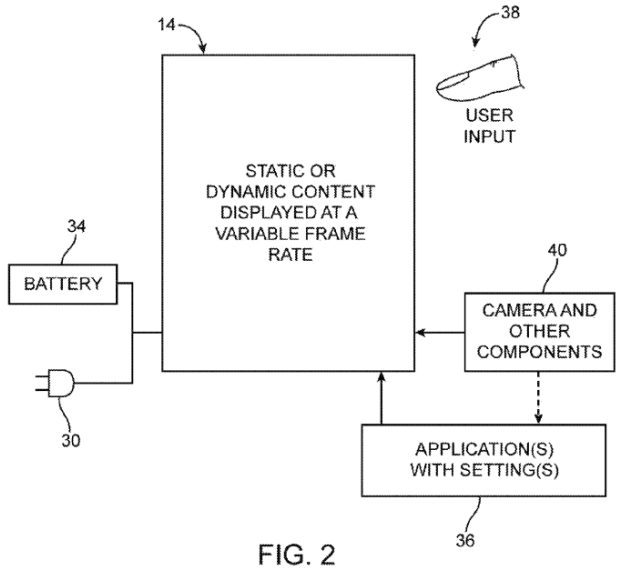
Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
	 FIG. 3 "At step 72, circuitry 12 may determine that the display content to be displayed is static display content. Static display content may include display content such as static text, static web browser content, photographic image content, map image content, calendar image content, or device operating system display content such a device home-screen display." *See* 7:45-50.

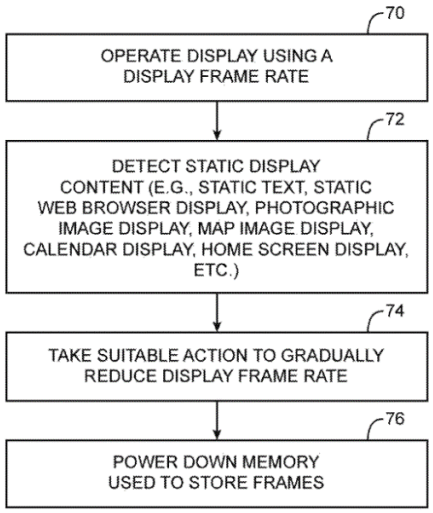
Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
	 FIG. 5 "In some scenarios, a software application running on circuitry such as circuitry 12 of device 10 (FIG. 1) may provide display content to display 14 that includes dynamic display content. Examples of this type of application-specific display content may include displaying a turning page of a book or magazine in an electronic book application or displaying text or other information overlaid on moving video images (e.g., images concurrently captured using a camera in the device)." *See* 10:17-24. "During operation of a device such as device 10, a camera may be used to capture image data of the environment surrounding the device while the captured image data is concurrently displayed on the display. In some scenarios such as scenarios in which device 10 is used to run an augmented-reality software application, additional content may be overlaid on the concurrently displayed captured images. Dynamic display content may be displayed on display 14 if the device is moved during capture and

Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
	concurrent display of image data. Illustrative steps that may be used in setting a display frame rate based on detected concurrent camera operation are shown in FIG. 18. At step 190, a display such as display 14 may be operated using a frame rate. At step 192, circuitry that is monitoring the operational environment of the device may detect concurrent camera operation. At step 194, control circuitry such as circuitry 12 may take suitable action for increasing the display frame rate for improved display performance. The display circuitry may increase the frame rate to all of the display pixels of the display or may increase the frame rate to only a portion of the display pixels (e.g., the display pixels that will be used for displaying images captured by the camera). As shown in FIG. 19, a camera such as camera 196 in device 10 may be used while running, for example, an augmented-reality software application to capture images of real-world scene content 198. While capturing the images of scene content 198, the captured images may be concurrently displayed on a portion such as portion 186 of display 14. Circuitry such as circuitry 12 of FIG. 1 may be used to overlay additional display content such as overlaid display information 200 on the displayed captured images of scene 198. If desired, the frame rate for display 14 may be set in response to detection of the concurrent operation of the camera or in response to detection of augmented-reality-specific application content." *See* 11:54-12:24.

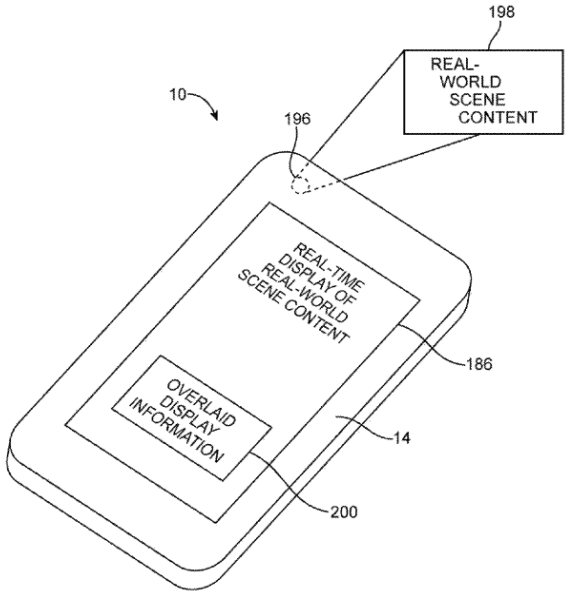
Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
	 FIG. 19 This limitation would have been obvious to a person of ordinary skill in the art based on (1) Tripathi alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element 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;	Tripathi expressly and/or inherently discloses and/or renders obvious obtaining a digital image from a camera. *See*, *e.g.*, disclosures below.

Asserted Claim of the ’109 Patent	Exemplary Citations to Tripathi
	 FIG. 1 “The variable frame rate may be actively determined during operation of device 10 based on whether static or dynamic display content is to be displayed, based on whether device 10 is receiving power from a battery such as battery 34 or a power cable such as power cable 30, based on user input such as a swipe by a user finger 38, based on the operational status of other device components 40 such as a camera, a video card, or other

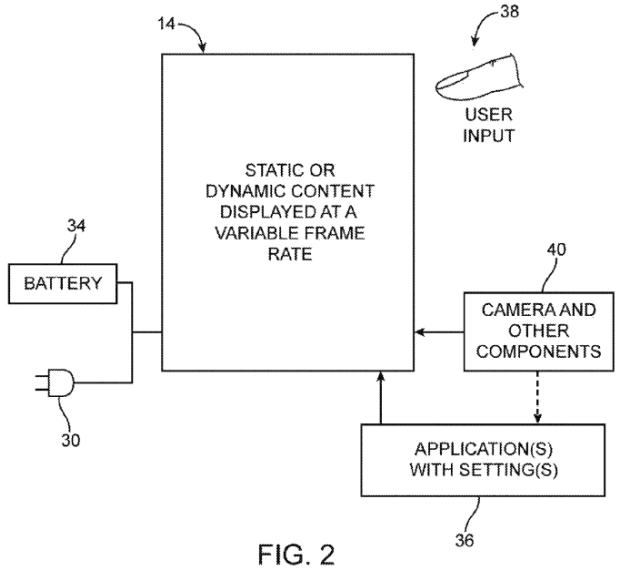
Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
	components, or based on whether one or more particular software applications 36 with one or more settings has been launched." *See* 6:10-20.  FIG. 2 "At step 72, circuitry 12 may determine that the display content to be displayed is static display content. Static display content may include display content such as static text, static web browser content, photographic image content, map image content, calendar image content, or device operating system display content such a device home-screen display." *See* 7:45-50.

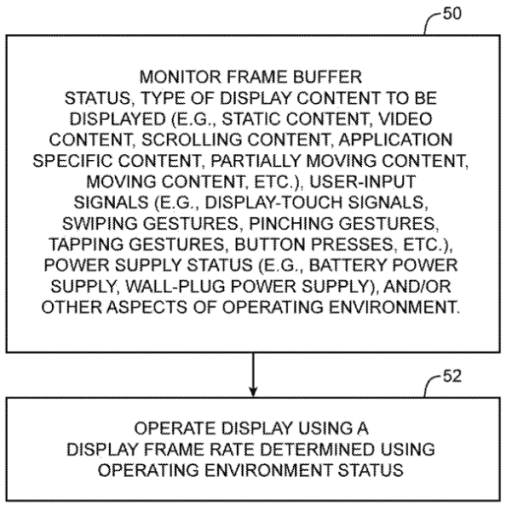
Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
	 FIG. 5 "In some scenarios, a software application running on circuitry such as circuitry 12 of device 10 (FIG. 1) may provide display content to display 14 that includes dynamic display content. Examples of this type of application-specific display content may include displaying a turning page of a book or magazine in an electronic book application or displaying text or other information overlaid on moving video images (e.g., images concurrently captured using a camera in the device)." *See* 10:17-24. "During operation of a device such as device 10, a camera may be used to capture image data of the environment surrounding the device while the captured image data is concurrently displayed on the display. In some scenarios such as scenarios in which device 10 is used to run an augmented-reality software application, additional content may be overlaid on the concurrently displayed captured images. Dynamic display content may be displayed on display 14 if the device is moved during capture and

Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
	concurrent display of image data. Illustrative steps that may be used in setting a display frame rate based on detected concurrent camera operation are shown in FIG. 18. At step 190, a display such as display 14 may be operated using a frame rate. At step 192, circuitry that is monitoring the operational environment of the device may detect concurrent camera operation. At step 194, control circuitry such as circuitry 12 may take suitable action for increasing the display frame rate for improved display performance. The display circuitry may increase the frame rate to all of the display pixels of the display or may increase the frame rate to only a portion of the display pixels (e.g., the display pixels that will be used for displaying images captured by the camera). As shown in FIG. 19, a camera such as camera 196 in device 10 may be used while running, for example, an augmented-reality software application to capture images of real-world scene content 198. While capturing the images of scene content 198, the captured images may be concurrently displayed on a portion such as portion 186 of display 14. Circuitry such as circuitry 12 of FIG. 1 may be used to overlay additional display content such as overlaid display information 200 on the displayed captured images of scene 198. If desired, the frame rate for display 14 may be set in response to detection of the concurrent operation of the camera or in response to detection of augmented-reality-specific application content." *See* 11:44-12:24.

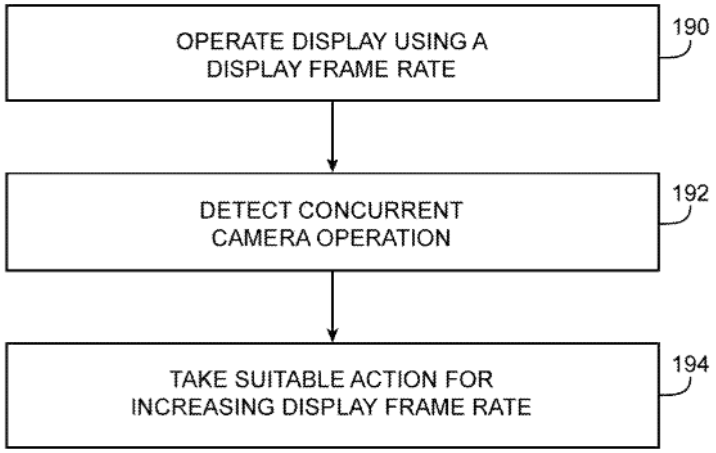
Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
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1[b]. flipping the image about a vertical axis so as to reverse right and left sides of the image;	Tripathi expressly and/or inherently discloses and/or renders obvious this limitation. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Tripathi 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

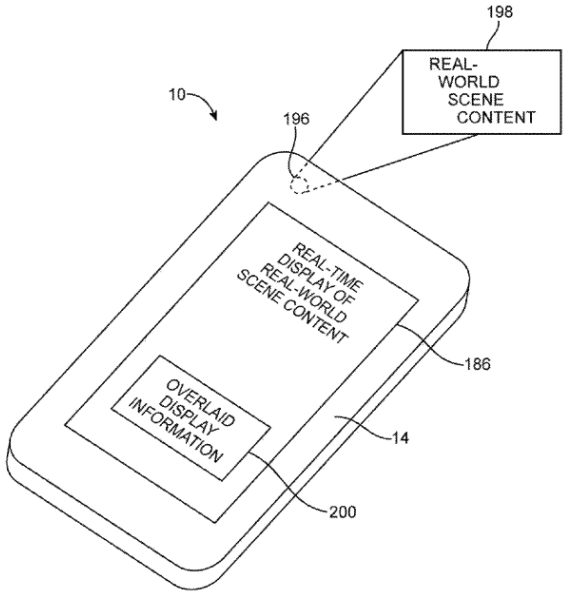
Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
	Defendants' invalidity contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[c]. applying a transformation mapping to the image to modify the image such that it appears to mimic a reflection of a mirror;	Tripathi 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. "An illustrative electronic device of the type that may be provided with a display is shown in FIG. 1. Electronic device 10 may be a computer such as a computer that is integrated into a display such as a computer monitor, a laptop computer, a tablet computer, a somewhat smaller portable device such as a wrist-watch device, pendant device, or other wearable or miniature device, a cellular telephone, a media player, a tablet computer, a gaming device, a navigation device, a computer monitor, a television, or other electronic equipment." *See* 3:53-61. "FIG. 2 is a diagram showing examples of operating environment attributes and other aspects of device operations for a device of the type shown in FIG. 1 that may be monitored for determining a frame rate for display 14. As shown in FIG. 2, display 14 may be used for displaying static content or dynamic content at a variable frame rate. The variable frame rate may be actively determined during operation of device 10 based on whether static or dynamic display content is to be displayed, based on whether device 10 is receiving power from a battery such as battery 34 or a power cable such as power cable 30, based on user input such as a swipe by a user finger 38, based on the operational status of other device components 40 such as a camera, a video card, or other components, or based on whether one or more particular software applications 36 with one or more settings has been launched. FIG. 3 shows illustrative steps involved in adjusting the frame rate for a display such as display 14 of FIG. 1 in response to information related to the operation of a device.

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	Device monitoring operations may be performed at step 50. The operations of step 50 may be performed using control circuitry such as storage and processing circuitry 12, display driver circuitry 20, standalone monitoring circuitry, and/or other device resources." *See* 6:6-28.  FIG. 2

Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
	 FIG. 3 "Common-vector motion display content may include scrolling content, page-changing content, zooming content or other common-vector motion content. It may therefore be desirable to adjust the frame rate for a display when displaying dynamic display content such as common-vector motion display content." *See* 9:62-67. "During operation of a device such as device 10, the user input may be provided to device 10 (e.g., using input-output components such as buttons, keyboards, or touch-sensor electrodes in the display) that generates a change in display content to be displayed. Examples of user-input that may generate a change in display content include swiping a finger across the display to scroll through text or pinching the display with multiple fingers to zoom into or out of a map or other image. Illustrative steps that may be used in setting a display frame rate based on detected user input to a device are shown in FIG. 13." *See* 10:40-50.

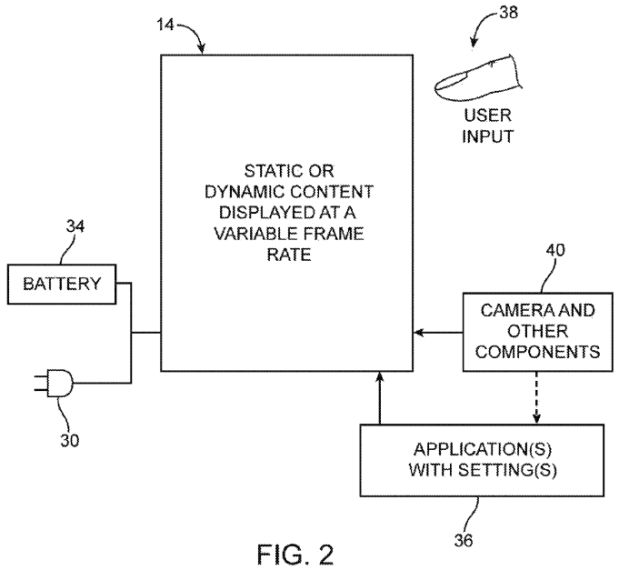
Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
	"In some scenarios, a software application running on circuitry such as circuitry 12 of device 10 (FIG. 1) may provide display content to display 14 that includes dynamic display content. Examples of this type of application-specific display content may include displaying a turning page of a book or magazine in an electronic book application or displaying text or other information overlaid on moving video images (e.g., images concurrently captured using a camera in the device)." *See* 10:17-24. "During operation of a device such as device 10, a camera may be used to capture image data of the environment surrounding the device while the captured image data is concurrently displayed on the display. In some scenarios such as scenarios in which device 10 is used to run an augmented-reality software application, additional content may be overlaid on the concurrently displayed captured images. Dynamic display content may be displayed on display 14 if the device is moved during capture and concurrent display of image data. Illustrative steps that may be used in setting a display frame rate based on detected concurrent camera operation are shown in FIG. 18. At step 190, a display such as display 14 may be operated using a frame rate. At step 192, circuitry that is monitoring the operational environment of the device may detect concurrent camera operation. At step 194, control circuitry such as circuitry 12 may take suitable action for increasing the display frame rate for improved display performance. The display circuitry may increase the frame rate to all of the display pixels of the display or may increase the frame rate to only a portion of the display pixels (e.g., the display pixels that will be used for displaying images captured by the camera). As shown in FIG. 19, a camera such as camera 196 in device 10 may be used while running, for example, an augmented-reality software application to capture images of real-world scene content 198. While capturing the images of scene content 198, the captured images may be concurrently displayed on a portion such as portion 186 of display 14. Circuitry such as circuitry 12 of FIG. 1 may be used to overlay additional

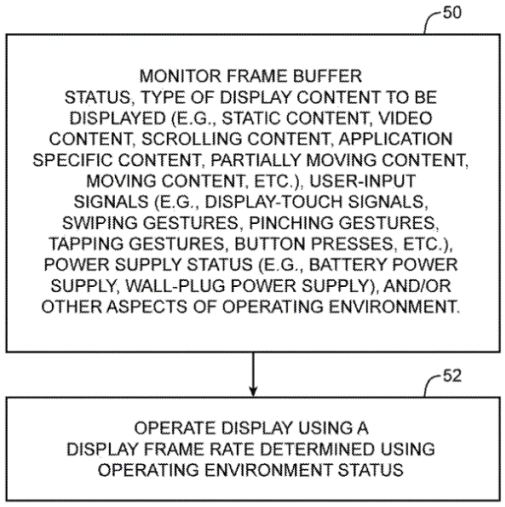
Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
	display content such as overlaid display information 200 on the displayed captured images of scene 198. If desired, the frame rate for display 14 may be set in response to detection of the concurrent operation of the camera or in response to detection of augmented-reality-specific application content." *See* 11:54-12:24.  FIG. 18

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	 FIG. 19 This limitation would have been obvious to a person of ordinary skill in the art based on (1) Tripathi 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;	Tripathi 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 illustrative electronic device of the type that may be provided with a display is shown in FIG. 1. Electronic device 10 may be a computer such as a computer that is

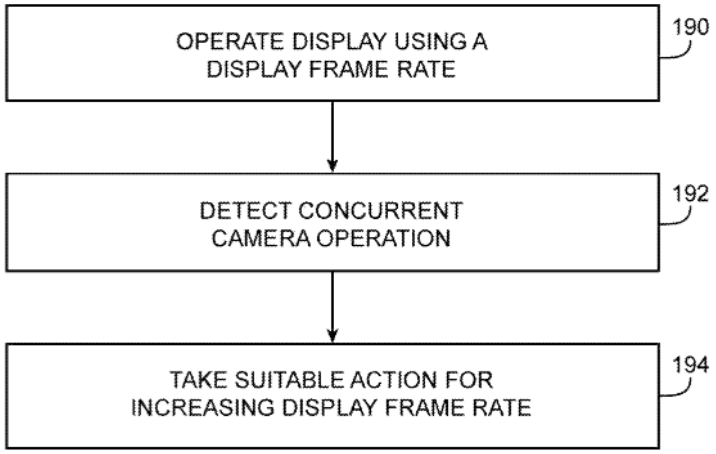
Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
	integrated into a display such as a computer monitor, a laptop computer, a tablet computer, a somewhat smaller portable device such as a wrist-watch device, pendant device, or other wearable or miniature device, a cellular telephone, a media player, a tablet computer, a gaming device, a navigation device, a computer monitor, a television, or other electronic equipment." *See* 3:53-61. "Common-vector motion display content may include scrolling content, page-changing content, zooming content or other common-vector motion content. It may therefore be desirable to adjust the frame rate for a display when displaying dynamic display content such as common-vector motion display content." *See* 9:62-67. "During operation of a device such as device 10, the user input may be provided to device 10 (e.g., using input-output components such as buttons, keyboards, or touch-sensor electrodes in the display) that generates a change in display content to be displayed. Examples of user-input that may generate a change in display content include swiping a finger across the display to scroll through text or pinching the display with multiple fingers to zoom into or out of a map or other image. Illustrative steps that may be used in setting a display frame rate based on detected user input to a device are shown in FIG. 13." *See* 10:40-50. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Tripathi 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;	Tripathi 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 illustrative electronic device of the type that may be provided with a display is shown in FIG. 1. Electronic device 10 may be a computer such as a computer that is

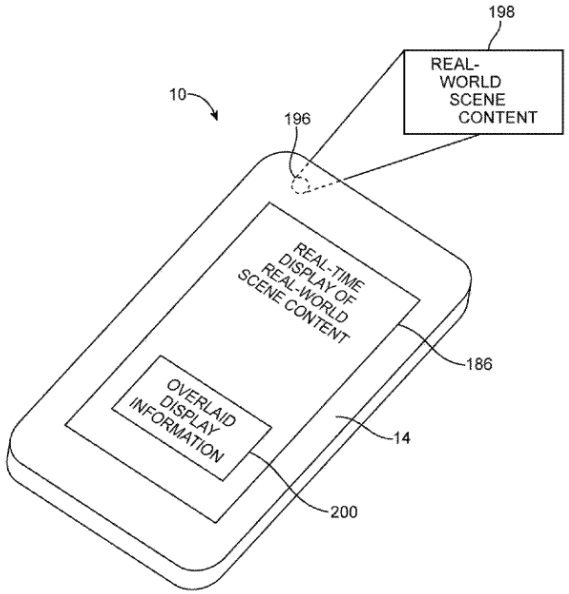
Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
	integrated into a display such as a computer monitor, a laptop computer, a tablet computer, a somewhat smaller portable device such as a wrist-watch device, pendant device, or other wearable or miniature device, a cellular telephone, a media player, a tablet computer, a gaming device, a navigation device, a computer monitor, a television, or other electronic equipment." *See* 3:53-61. "FIG. 2 is a diagram showing examples of operating environment attributes and other aspects of device operations for a device of the type shown in FIG. 1 that may be monitored for determining a frame rate for display 14. As shown in FIG. 2, display 14 may be used for displaying static content or dynamic content at a variable frame rate. The variable frame rate may be actively determined during operation of device 10 based on whether static or dynamic display content is to be displayed, based on whether device 10 is receiving power from a battery such as battery 34 or a power cable such as power cable 30, based on user input such as a swipe by a user finger 38, based on the operational status of other device components 40 such as a camera, a video card, or other components, or based on whether one or more particular software applications 36 with one or more settings has been launched. FIG. 3 shows illustrative steps involved in adjusting the frame rate for a display such as display 14 of FIG. 1 in response to information related to the operation of a device. Device monitoring operations may be performed at step 50. The operations of step 50 may be performed using control circuitry such as storage and processing circuitry 12, display driver circuitry 20, standalone monitoring circuitry, and/or other device resources." *See* 6:6-28.

Asserted Claim of the ’109 Patent	Exemplary Citations to Tripathi
	 FIG. 2

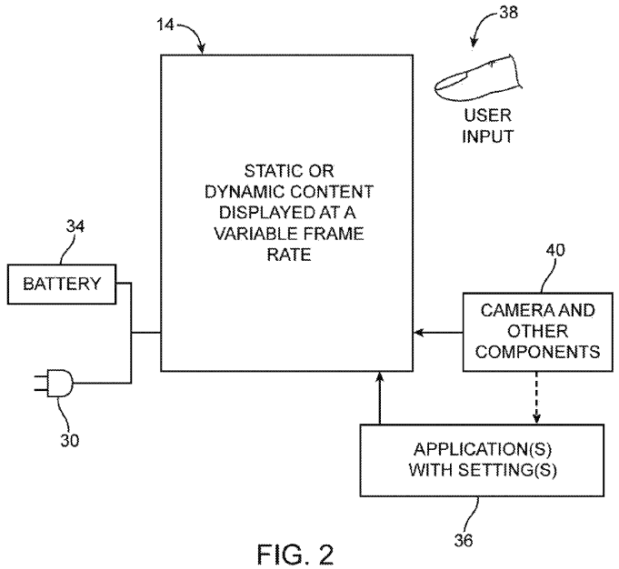
Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
	 FIG. 3 "Common-vector motion display content may include scrolling content, page-changing content, zooming content or other common-vector motion content. It may therefore be desirable to adjust the frame rate for a display when displaying dynamic display content such as common-vector motion display content." *See* 9:62-67. "During operation of a device such as device 10, the user input may be provided to device 10 (e.g., using input-output components such as buttons, keyboards, or touch-sensor electrodes in the display) that generates a change in display content to be displayed. Examples of user-input that may generate a change in display content include swiping a finger across the display to scroll through text or pinching the display with multiple fingers to zoom into or out of a map or other image. Illustrative steps that may be used in setting a display frame rate based on detected user input to a device are shown in FIG. 13." *See* 10:40-50.

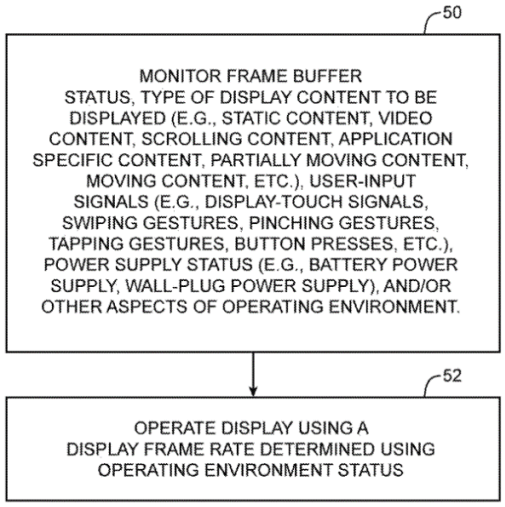
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	"In some scenarios, a software application running on circuitry such as circuitry 12 of device 10 (FIG. 1) may provide display content to display 14 that includes dynamic display content. Examples of this type of application-specific display content may include displaying a turning page of a book or magazine in an electronic book application or displaying text or other information overlaid on moving video images (e.g., images concurrently captured using a camera in the device)." *See* 10:17-24. "During operation of a device such as device 10, a camera may be used to capture image data of the environment surrounding the device while the captured image data is concurrently displayed on the display. In some scenarios such as scenarios in which device 10 is used to run an augmented-reality software application, additional content may be overlaid on the concurrently displayed captured images. Dynamic display content may be displayed on display 14 if the device is moved during capture and concurrent display of image data. Illustrative steps that may be used in setting a display frame rate based on detected concurrent camera operation are shown in FIG. 18. At step 190, a display such as display 14 may be operated using a frame rate. At step 192, circuitry that is monitoring the operational environment of the device may detect concurrent camera operation. At step 194, control circuitry such as circuitry 12 may take suitable action for increasing the display frame rate for improved display performance. The display circuitry may increase the frame rate to all of the display pixels of the display or may increase the frame rate to only a portion of the display pixels (e.g., the display pixels that will be used for displaying images captured by the camera). As shown in FIG. 19, a camera such as camera 196 in device 10 may be used while running, for example, an augmented-reality software application to capture images of real-world scene content 198. While capturing the images of scene content 198, the captured images may be concurrently displayed on a portion such as portion 186 of display 14. Circuitry such as circuitry 12 of FIG. 1 may be used to overlay additional

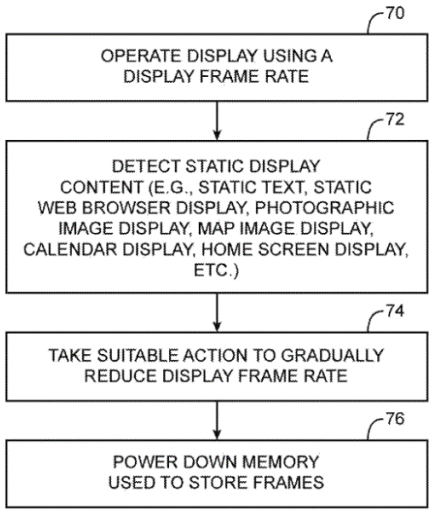
Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
	display content such as overlaid display information 200 on the displayed captured images of scene 198. If desired, the frame rate for display 14 may be set in response to detection of the concurrent operation of the camera or in response to detection of augmented-reality-specific application content." *See* 11:54-12:24.  FIG. 18

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1[f]. wherein the non-ordered steps are performed on a series of images of a live video feed from the camera;	Tripathi 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. "FIG. 2 is a diagram showing examples of operating environment attributes and other aspects of device operations for a device of the type shown in FIG. 1 that may be

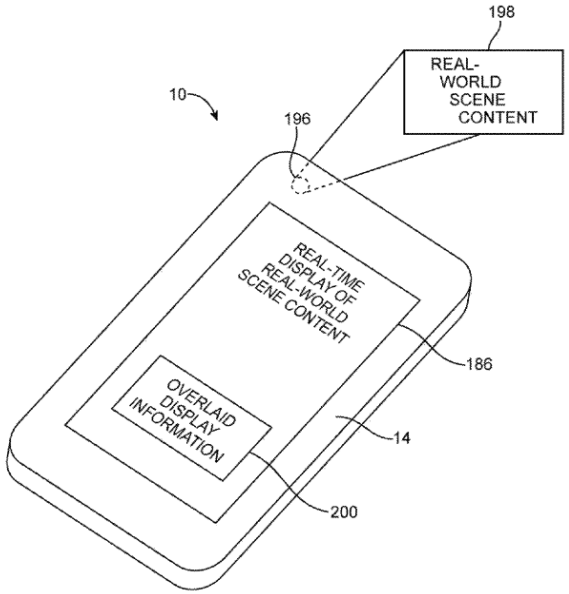
Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
	monitored for determining a frame rate for display 14. As shown in FIG. 2, display 14 may be used for displaying static content or dynamic content at a variable frame rate. The variable frame rate may be actively determined during operation of device 10 based on whether static or dynamic display content is to be displayed, based on whether device 10 is receiving power from a battery such as battery 34 or a power cable such as power cable 30, based on user input such as a swipe by a user finger 38, based on the operational status of other device components 40 such as a camera, a video card, or other components, or based on whether one or more particular software applications 36 with one or more settings has been launched. FIG. 3 shows illustrative steps involved in adjusting the frame rate for a display such as display 14 of FIG. 1 in response to information related to the operation of a device. Device monitoring operations may be performed at step 50. The operations of step 50 may be performed using control circuitry such as storage and processing circuitry 12, display driver circuitry 20, standalone monitoring circuitry, and/or other device resources." *See* 6:6-28.

Asserted Claim of the ’109 Patent	Exemplary Citations to Tripathi
	 FIG. 2

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	 FIG. 3 "At step 72, circuitry 12 may determine that the display content to be displayed is static display content. Static display content may include display content such as static text, static web browser content, photographic image content, map image content, calendar image content, or device operating system display content such a device home-screen display." *See* 7:45-50.

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	 FIG. 5 "In some scenarios, a software application running on circuitry such as circuitry 12 of device 10 (FIG. 1) may provide display content to display 14 that includes dynamic display content. Examples of this type of application-specific display content may include displaying a turning page of a book or magazine in an electronic book application or displaying text or other information overlaid on moving video images (e.g., images concurrently captured using a camera in the device)." *See* 10:17-24. "During operation of a device such as device 10, a camera may be used to capture image data of the environment surrounding the device while the captured image data is concurrently displayed on the display. In some scenarios such as scenarios in which device 10 is used to run an augmented-reality software application, additional content may be overlaid on the concurrently displayed captured images. Dynamic display content may be displayed on display 14 if the device is moved during capture and

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	concurrent display of image data. Illustrative steps that may be used in setting a display frame rate based on detected concurrent camera operation are shown in FIG. 18. At step 190, a display such as display 14 may be operated using a frame rate. At step 192, circuitry that is monitoring the operational environment of the device may detect concurrent camera operation. At step 194, control circuitry such as circuitry 12 may take suitable action for increasing the display frame rate for improved display performance. The display circuitry may increase the frame rate to all of the display pixels of the display or may increase the frame rate to only a portion of the display pixels (e.g., the display pixels that will be used for displaying images captured by the camera). As shown in FIG. 19, a camera such as camera 196 in device 10 may be used while running, for example, an augmented-reality software application to capture images of real-world scene content 198. While capturing the images of scene content 198, the captured images may be concurrently displayed on a portion such as portion 186 of display 14. Circuitry such as circuitry 12 of FIG. 1 may be used to overlay additional display content such as overlaid display information 200 on the displayed captured images of scene 198. If desired, the frame rate for display 14 may be set in response to detection of the concurrent operation of the camera or in response to detection of augmented-reality-specific application content." *See* 11:54-12:24.

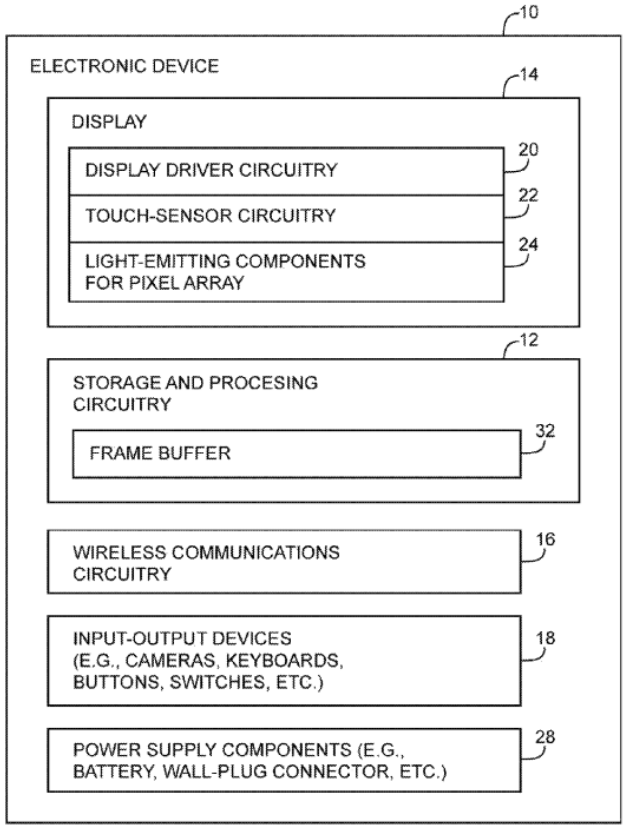
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1[g]. determining distance to a user appearing in the live video feed; and	Tripathi expressly and/or inherently discloses and/or renders obvious this limitation. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Tripathi 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.	Tripathi 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. "This relates generally to displays, and more particularly, to electronic devices with displays. Electronic devices such as computers, televisions, portable computers, and cellular telephones are often provided with displays. A display often includes a frame buffer for buffering information to be displayed on the display and display driver circuitry that periodically refreshes display pixels in the display. The frequency at which the display pixels are periodically refreshed is commonly called the frame rate of the display. Conventional displays use a fixed standard frame rate such as the 24 frames-per-second frame rate that is often used for displaying television and movie content. In some scenarios a user may be able to select a fixed frame rate for a display from a set of fixed standard frame rates that are available for that display. However, in some scenarios, display content or other operating environment characteristics of a device may change during operation of an electronic device resulting in a configuration for which a different frame rate for the display may be desirable. Changes of this type may occur on time scales that are too short for a user of a device to effectively choose a frame rate for each configuration. It would therefore be desirable to be able to provide improved displays for electronic devices." *See* 1:6-31. "Electronic devices may be provided that contain displays. The display may include display pixels and display driver circuitry for operating the display pixels. The electronic

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	device may include control circuitry. The control circuitry may monitor the device operating environment and other aspects of the operation of the electronic device. The control circuitry may configure operational attributes of the display in response to monitored operating environment information or other information obtained while monitoring the operation of the electronic device. The display driver circuitry may operate the display pixels by periodically refreshing light-emitting elements in the display. The frequency at which the display control circuitry refreshes the light-emitting elements of the display may be referred to as the display frame rate or the frame rate. Configuring operational attributes of the display may include increasing or decreasing the display frame rate of the display. Monitoring the device operating environment and other aspects of the operation of the electronic device may include monitoring the status of a frame buffer that stores display data to be displayed on the display, monitoring the type of display content to be displayed with the display, monitoring user-input signals, monitoring the device power supply status, and/or monitoring other aspects of the operation of the electronic device. In some situations, the control circuitry may reduce the display frame rate in response to detection of, for example, static display content to be displayed. Static display content may include static text, a static web browser webpage or other stationary display content. Reducing the display frame rate may reduce power consumption for the device and may allow powering down of memory needed for storing display data to be displayed. In some situations, the control circuitry may increase the display frame rate in response to detection of, for example, dynamic display content to be displayed. Dynamic display content may include scrolling content, video content, common-vector motion content, or other non-stationary display content. Increasing the display frame rate may result in a higher perceived display resolution for a user of the electric device.

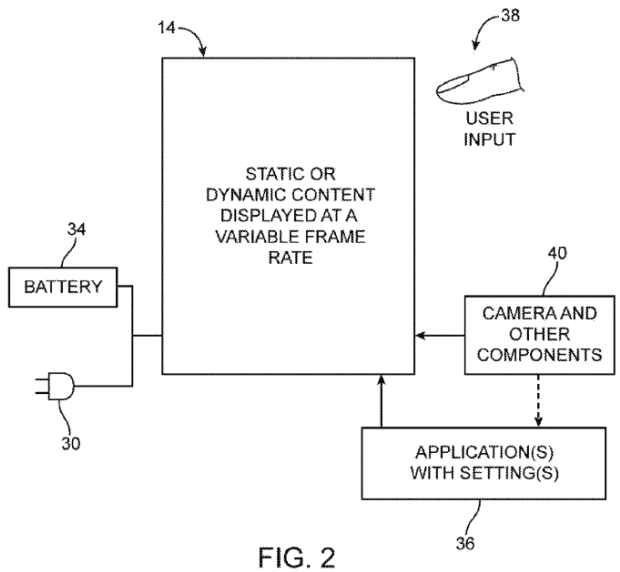
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	Further features of the invention, its nature and various advantages will be more apparent from the accompanying drawings and the following detailed description of the preferred embodiments." *See* 1:35-2:12. "Electronic devices such as cellular telephones, media players, computers, set-top boxes, wireless access points, and other electronic equipment may be provided displays. Displays may include liquid-crystal display (LCD) screens, light-emitting diodes (LEDs), organic light-emitting diodes (OLEDs), and other components such as touch-sensitive components that present visual information and status data and/or gather user input data. Operational attributes of the display such as the display frame rate (i.e., the frequency at which display signals are provided to display pixels) may be controlled and configured by control circuitry in the electronic device. Operational status information may be gathered using control circuitry in the electronic device that monitors the operation of the device. The control circuitry may adjust the display frame rate (also sometimes referred to herein as the frame rate, the display refresh rate, or the refresh rate) in response to the operational status information. An illustrative electronic device of the type that may be provided with a display is shown in FIG. 1. Electronic device 10 may be a computer such as a computer that is integrated into a display such as a computer monitor, a laptop computer, a tablet computer, a somewhat smaller portable device such as a wrist-watch device, pendant device, or other wearable or miniature device, a cellular telephone, a media player, a tablet computer, a gaming device, a navigation device, a computer monitor, a television, or other electronic equipment. As shown in FIG. 1, device 10 may include a display such as display 14. Display 14 may include light-emitting components 24, touch-sensor circuitry 22, display driver circuitry 20 for operating display 14, and other display components. Display 14 may be a variable frame rate display operable to display content using an adjustable frame rate.

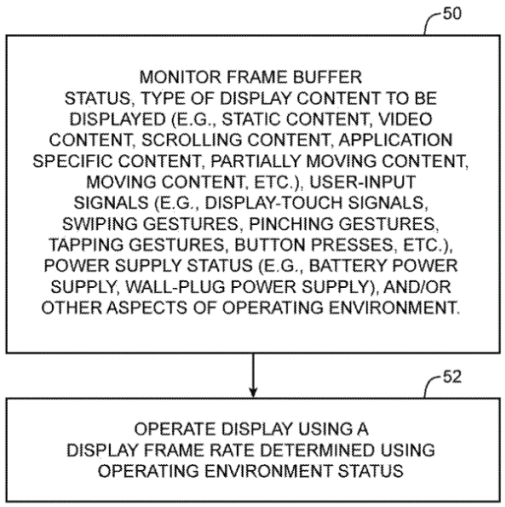
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	Light-emitting components 24 may include an array of display pixels formed from reflective components, liquid crystal display (LCD) components, organic light-emitting diode (OLED) components, or other suitable display pixel structures. To provide display 14 with the ability to display color images, light-emitting components 24 may include display pixels having color filter elements. Display touch-sensor circuitry 22 may include capacitive touch electrodes (e.g., indium tin oxide electrodes or other suitable transparent electrodes) or other touch sensor components (e.g., resistive touch technologies, acoustic touch technologies, touch sensor arrangements using light sensors, force sensors, etc.). Display 14 may be a touch screen that incorporates display touch circuitry 22 or may be a display that is not touch sensitive. Display driver circuitry 20 may include a driver integrated circuit that is mounted, for example, to a display layer such as a thin-film-transistor layer of a liquid crystal display. Display driver circuitry 20 may include display pixel control lines and other circuitry for operating the display pixels of display 14. Display driver circuitry 20 may be coupled to control circuitry such as storage and processing circuitry 12 in device 10. Display 14 may include additional circuitry such as demultiplexer circuitry, display signal lines for delivering display signals to light-emitting components 24 (FIG. 1), and gate driver circuitry. Display driver circuitry 20 may be implemented using one or more integrated circuits (ICs) and may sometimes be referred to as a driver IC, display driver integrated circuit, or display driver. Display driver integrated circuit 20 may be mounted on an edge of a thin-film transistor substrate layer in display 14 (as an example). The thin-film transistor substrate layer may sometimes be referred to as a thin-film transistor (TFT) layer." *See* 3:35-4:35.

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	 FIG. 1 "Storage and processing circuitry 12 may include one or more frame buffers such as frame buffer 32 for temporarily storing display data to be displayed on display 14. Display content may be generated or received by circuitry 12 and stored, frame-by-frame, in frame buffer 32. Display driver circuitry 20 may generate display signals for light-emitting components 24 based on the display data stored in frame buffer 32.

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	Display driver circuitry 20 may receive display data from frame buffer 32 and provide display signals associated with that received display data to light-emitting components 24 at a display refresh rate (also referred to herein as a display frame rate or frame rate). Storage and processing circuitry 12 may be implemented separately from display 14 or may include portions that are integrated with display driver circuitry 20 of display 14." *See* 5:1-16. "Control circuitry such as storage and processing circuitry 12 may be used in running software for device 10. For example, circuitry 12 may be configured to execute code in connection with the displaying of images on display 14 (e.g., text, pictures, video, etc.). Circuitry 12 may be used to monitor various attributes of the operation of the electronic device such as the activity of frame buffer 32 (e.g., the rate at which the frame buffer is updated with new display data to be displayed display), the type of display content to be displayed with the display (e.g., dynamic content, video content, high-frame-rate video content, common-vector motion content, and static content), user-input signals such as touch-sensor input signals, the device power supply status, and/or other aspects of the operating environment of the electronic device. Circuitry 12 may configure operational attributes of the display such as the display frame rate in response to monitored operating information gathered by circuitry 12. For example, circuitry 12 may increase or decrease the frame rate for the display when displaying static or moving (dynamic) display content respectively. Control circuitry 12 may be used to monitor operating environment attributes and other aspects of device operations (e.g., the rate at which new display data is provided to frame buffer 32, the display content being delivered to frame buffer 32, user-input signals, the operational status of other components, and the device power supply status) and provide signals to display driver circuitry 20 resulting in an increased or decreased the display frame rate. Increasing the display frame rate may result in a higher perceived display resolution for a user of the electric device. Decreasing the display frame rate may reduce

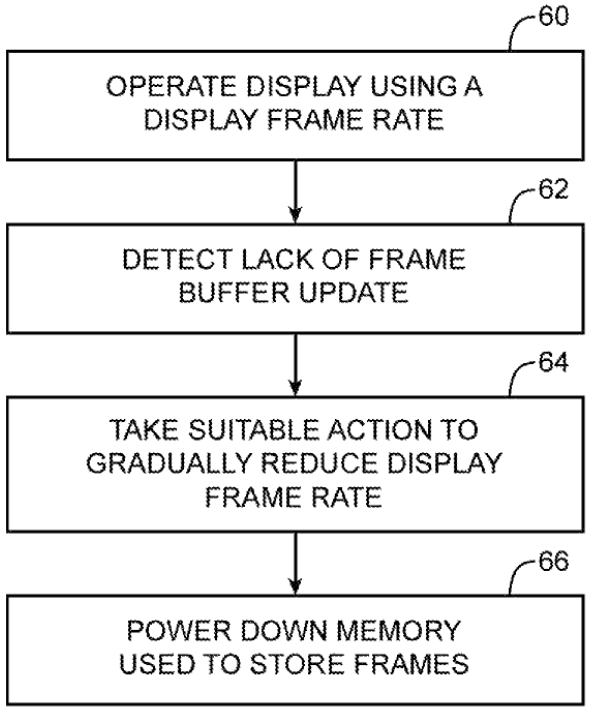
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	power consumption for the device and may allow powering down of memory associated with, for example, frame buffer 32. FIG. 2 is a diagram showing examples of operating environment attributes and other aspects of device operations for a device of the type shown in FIG. 1 that may be monitored for determining a frame rate for display 14. As shown in FIG. 2, display 14 may be used for displaying static content or dynamic content at a variable frame rate. The variable frame rate may be actively determined during operation of device 10 based on whether static or dynamic display content is to be displayed, based on whether device 10 is receiving power from a battery such as battery 34 or a power cable such as power cable 30, based on user input such as a swipe by a user finger 38, based on the operational status of other device components 40 such as a camera, a video card, or other components, or based on whether one or more particular software applications 36 with one or more settings has been launched." *See* 5:37-6:20.

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	 FIG. 2 "FIG. 3 shows illustrative steps involved in adjusting the frame rate for a display such as display 14 of FIG. 1 in response to information related to the operation of a device. Device monitoring operations may be performed at step 50. The operations of step 50 may be performed using control circuitry such as storage and processing circuitry 12, display driver circuitry 20, standalone monitoring circuitry, and/or other device resources. At step 50, control circuitry may be used to monitor the status of a frame buffer such a frame buffer 32, the type of display content to be displayed (e.g., static display content, dynamic display content, video display content, scrolling display content, application-specific display content, partially-moving display content, moving display content, etc.), user-input signals (e.g., display-touch signals, swiping gestures, pinching gestures, tapping gestures, button presses, etc.), device power supply status (e.g., a battery power

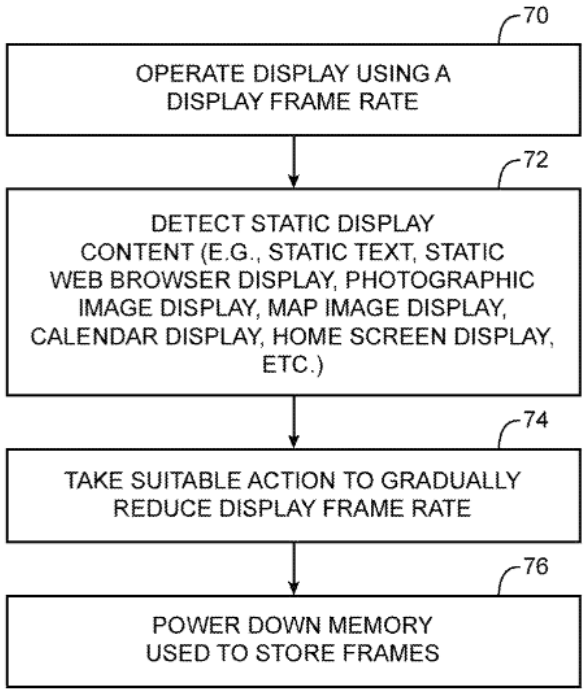
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	supply or line power supply, and/or other aspects of the operating environment of the device. At step 52, a display such as display 14 may be operated using a display frame rate that is determined in response to operational status information obtained at step 50." *See* 6:21-42.  FIG. 3 "As an example of adjusting a display frame rate in response to monitored device operations, illustrative steps that may be used in adjusting a display frame rate in response to monitored frame buffer activity are shown in FIG. 4. At step 60, a display may be operated using a display frame rate (e.g., by providing display signals to the array of display pixels at a frame rate of 24 frames per second, 60

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	frames per second, 25 frames per second, more than 25 frames per second, hundreds of frames per second, or less than 24 frames per second). The display frame rate may be greater than or less than the rate at which new display data is provided to the frame buffer. For display data that is updated at a rate that is less than the display frame rate (e.g., static display content) display control circuitry may sometimes display the same display content from the frame buffer during multiple display refreshes. Circuitry 12 may therefore be used to monitor the activity of the frame buffer by, for example, monitoring the rate at which display data is updated (sometimes referred to herein as the frame buffer update rate). At step 62, circuitry 12 may determine whether display data stored in a frame buffer such as frame buffer 32 (FIG. 2) has been updated. Circuitry 12 may, for example, determine that the frame buffer has not been updated (i.e., the circuitry may detect the lack of a frame buffer update). At step 64, control circuitry such as control circuitry 12 may take suitable action to reduce the display frame rate in response to the detection of the lack of frame buffer update. Suitable action for reducing the display frame rate may include providing increased blanking data in display data being provided to frame buffer 32 such as increased vertical (i.e., inter-frame) blanking data or increased horizontal (i.e., inter-line) blanking data. For example, during some modes of operation display frames including 1000 rows of display pixel data, each with 900 lines of active display data and 100 lines of vertical blanking data may be provided to display 14 at a frame rate of 60 Hz. In order to reduce the display frame rate to, for example, 30 Hz by increasing a vertical blanking interval, display 14 may be provided with display frames having 2000 lines of display pixel data that include 900 lines of active display data and 1100 lines of blanking data. Each line of display pixel data may, for example, include 600 display pixel signals composed of active display data for a row of 550 display pixels and 50 horizontal

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	blanking signals. In order to reduce the display frame rate to, for example, 30 Hz by increasing a horizontal blanking interval, display 14 may be provided with display frames having 1000 lines of display pixel data each including 1200 display pixel signals composed of active display data for 550 pixels and 650 blanking signals. However, these examples are merely illustrative. If desired, other methods of reducing the display frame rate may be used. For example, suitable action for reducing the display frame rate may, if desired, include reducing a clock speed associated with timing circuitry in device 10. At step 66, if desired, memory such as a portion of frame buffer 32 may be powered down in order to reduce power consumption while relatively little or no new display content is being generated." *See* 6:43-7:35.

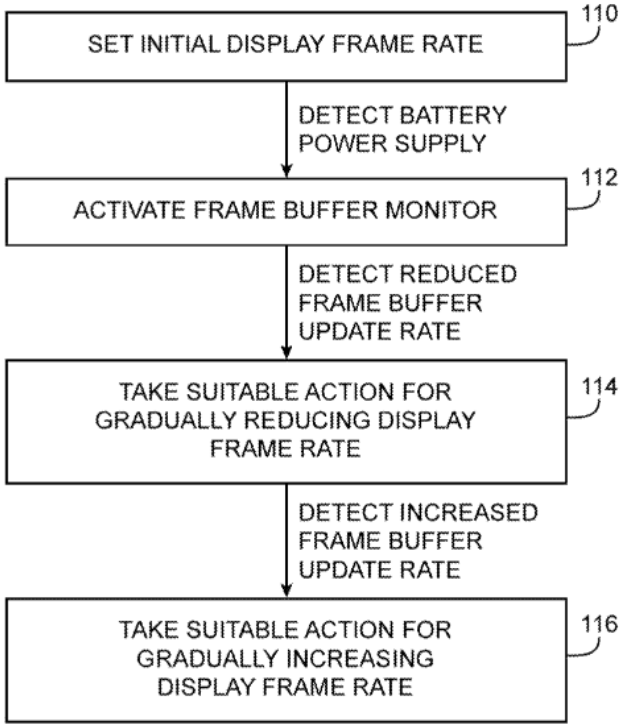
Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
	 FIG. 4 "As another example of adjusting a display frame rate in response to monitored device operations, illustrative steps that may be used in monitoring the type of display content (e.g., static display content or dynamic display content) being provided to a display and setting the display frame rate in response to the monitored display content are shown in FIG. 5. At step 70, a display may be operated using a display frame rate.

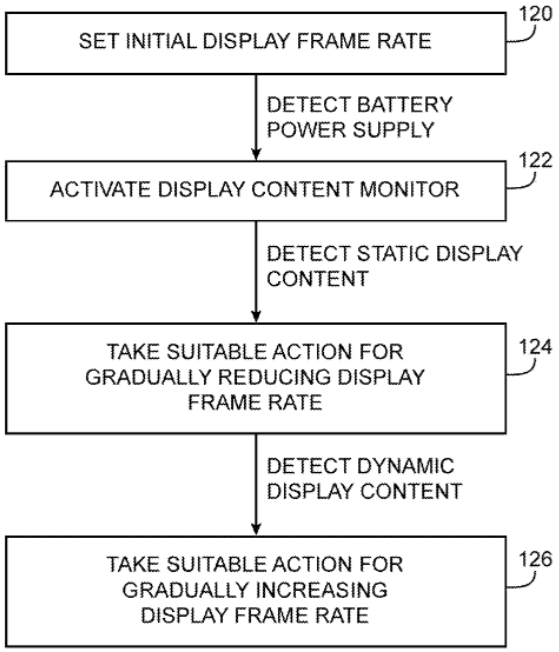
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	At step 72, circuitry 12 may determine that the display content to be displayed is static display content. Static display content may include display content such as static text, static web browser content, photographic image content, map image content, calendar image content, or device operating system display content such a device home-screen display. At step 74, control circuitry such as storage and processing circuitry 12 may take suitable action to reduce the display frame rate in response to determining that static display content is to be displayed. As described above in connection with FIG. 4, suitable action for reducing the display frame rate may include providing increased blanking data in display data to be displayed, reducing a clock speed associated with timing circuitry in the device or other suitable action for reducing the frame rate. At step 76, if desired, memory such as a portion of frame buffer 32 may be powered down in order to reduce power consumption while no new display content is being generated." *See* 7:36-63.

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	 FIG. 5 "Illustrative steps that may be used in setting a display frame rate based on multiple operating environment attributes such as the device power supply status and the display content type are shown in FIG. 10. At step 120, an initial display frame rate may be set. At step 122, in response to detecting a battery power supply source, a display content monitor for monitoring display content may be activated. The display content monitor

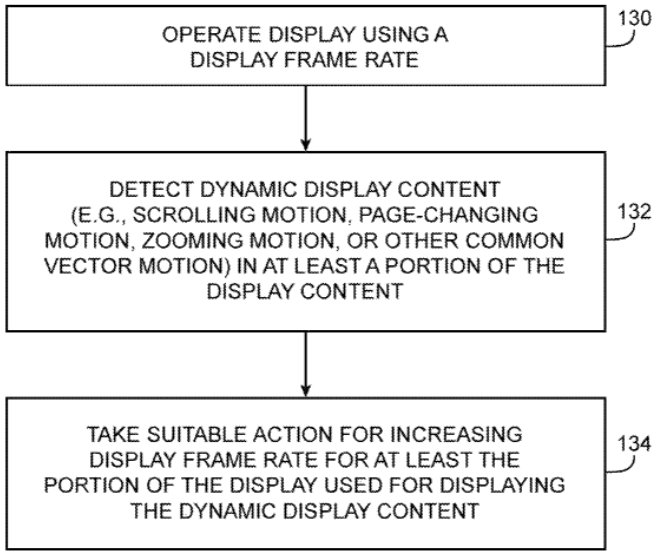
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	may be implemented as a standalone monitoring circuit or may be formed as a portion of circuitry 12 or display driver circuitry 20 (FIG. 1). At step 124, in response to detecting static display content (e.g., static text, a photographic image, or other static display content) to be displayed, control circuitry such as circuitry 12 may take suitable action for reducing the display frame rate as described above in connection with (for example) FIG. 4 for reduced power consumption. At step 126, in response to detecting subsequent dynamic display content (e.g., video display content, scrolling display content, etc.) to be displayed, control circuitry such as circuitry 12 may take suitable action for increasing the display frame rate for improved display performance. Consider, as an example of a scenario in which the steps of FIGS. 9 and/or 10 may be used, a user of device 10 launching software such as a web browser running on circuitry 12 to access a web page. While operating the device using battery power, the user may view a web page for an extended period of time (e.g., while reading a news article). During that time, no new display content is generated and display 14 may be operated using a reduced display frame rate. The display frame rate may be gradually reduced to avoid noticeable changes to the user of device 10. When the user changes the display content (e.g., by scrolling to another portion of the web page or navigating to another web page or another software application), circuitry 12 may detect a change in the frame buffer content or display content and increase the display frame rate. The perceived resolution of a display (i.e., the resolution perceived by a user of the device) depends on factors such as the actual resolution of the display (i.e., the density of display pixels), the type of display content being displayed, and the display frame rate. Some types of dynamic display content can induce a blurring effect related to the interaction of the display and the user's eye (sometimes referred to as retinal blur). One type of dynamic display content that is particularly retinal-blur inducing is display

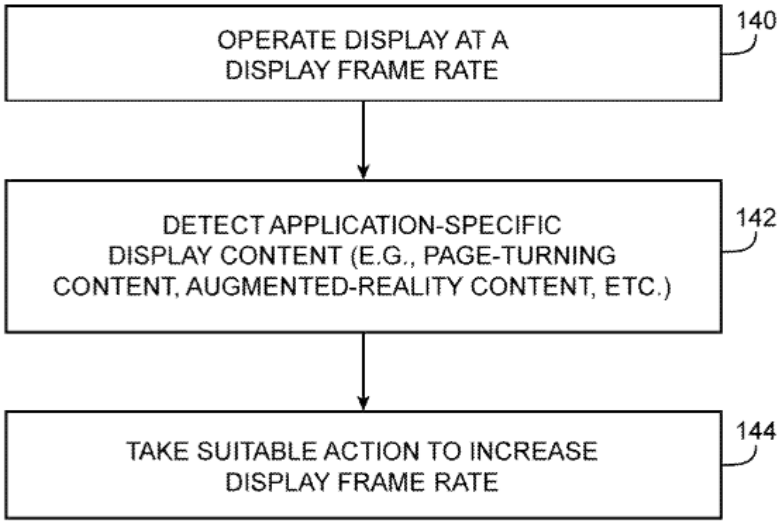
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	content in which some or all of the display content moves across the display with a common motion vector (sometimes referred to herein as common-vector motion). Common-vector motion display content may include scrolling content, page-changing content, zooming content or other common-vector motion content. It may therefore be desirable to adjust the frame rate for a display when displaying dynamic display content such as common-vector motion display content." *See* 9:12-67.

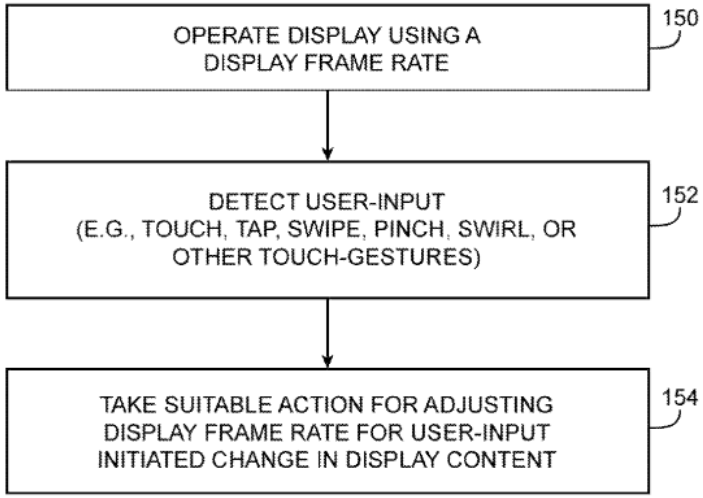
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	 FIG. 9

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	 FIG. 10 "Illustrative steps that may be used in setting a display frame rate in response to detected dynamic display content are shown in FIG. 11. At step 130, a display such as display 14 may be operated using a frame rate. At step 132, circuitry that is monitoring the display content to be displayed may detect dynamic display content such as common-vector motion content in at least a portion of the display content.

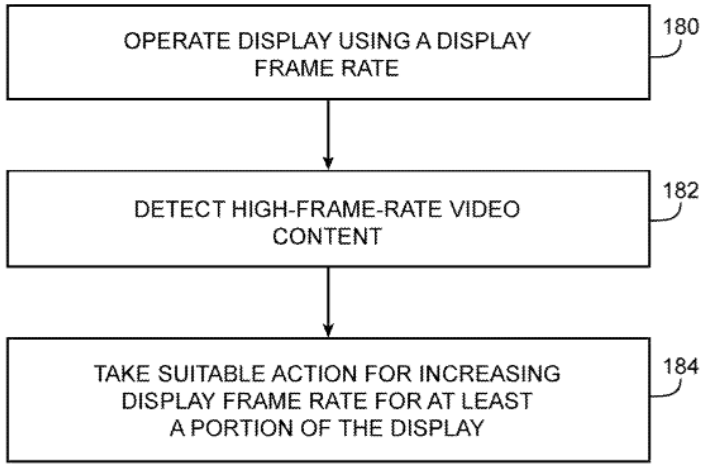
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	At step 134, control circuitry such as circuitry 12 may take suitable action for increasing the display frame rate for improved display performance. The display circuitry may increase the frame rate to all of the display pixels of the display or may increase the frame rate to only a portion of the display pixels (e.g., the display pixels that will be used for displaying the dynamic display content). In some scenarios, a software application running on circuitry such as circuitry 12 of device 10 (FIG. 1) may provide display content to display 14 that includes dynamic display content. Examples of this type of application-specific display content may include displaying a turning page of a book or magazine in an electronic book application or displaying text or other information overlaid on moving video images (e.g., images concurrently captured using a camera in the device)." *See* 10:1-24.

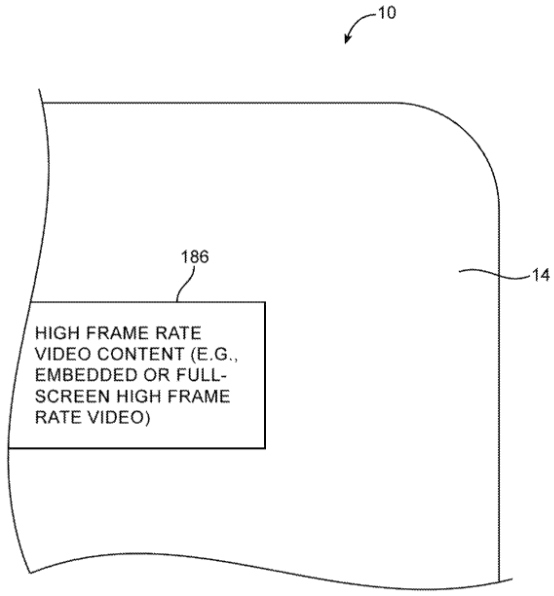
Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
	 FIG. 11 "Illustrative steps that may be used in setting a display frame rate in response to application-specific display content are shown in FIG. 12. At step 140, a display such as display 14 may be operated using a frame rate. At step 142, circuitry that is monitoring the operation of the device may detect the launch of a specific application or a change in one or more settings of a specific application. At step 144, control circuitry such as circuitry 12 may take suitable action for increasing the display frame rate for improved display performance. The display circuitry may increase the frame rate to all of the display pixels of the display or may increase the

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	frame rate to only a portion of the display pixels (e.g., the display pixels that will be used for displaying the application-specific content)." *See* 10:25-39.  FIG. 12 "During operation of a device such as device 10, the user input may be provided to device 10 (e.g., using input-output components such as buttons, keyboards, or touch-sensor electrodes in the display) that generates a change in display content to be displayed. Examples of user-input that may generate a change in display content include swiping a finger across the display to scroll through text or pinching the display with multiple fingers to zoom into or out of a map or other image. Illustrative steps that may be used in setting a display frame rate based on detected user input to a device are shown in FIG. 13.

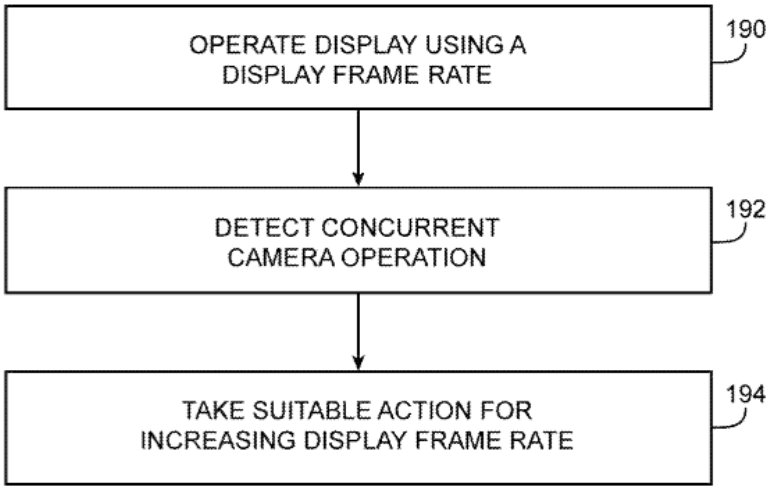
Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
	At step 150, a display such as display 14 may be operated using a frame rate. At step 152, circuitry that is monitoring user-input components of the device may detect user input to the device. At step 154, control circuitry such as circuitry 12 may take suitable action for increasing the display frame rate for improved display performance. The display circuitry may increase the frame rate to all of the display pixels of the display or may increase the frame rate to only a portion of the display pixels." *See* 10:40-60.  FIG. 13 "FIGS. 14 and 15 show examples of dynamic display content that includes common-vector display content, application-specific display content and user-input affected

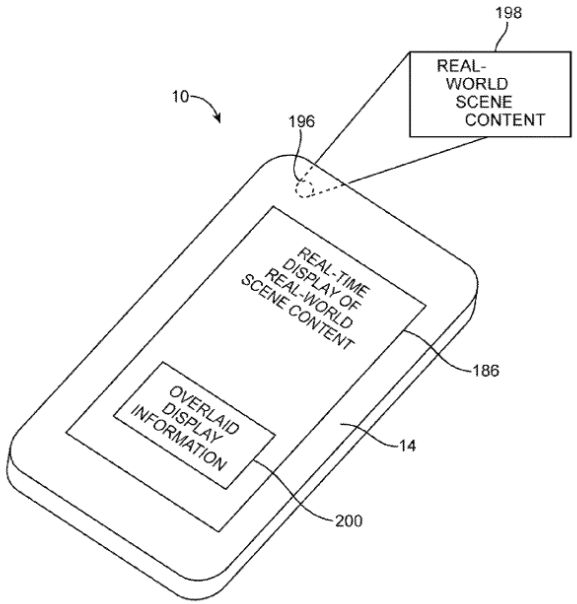
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	display content that may be displayed on display 14 using an adaptively adjusted display frame rate. As shown in FIG. 14, display 14 may display a text list such as a list of song titles when device 10 is running, for example, a music-player software application. A user may use a finger such as finger 162 to swipe touch sensitive components such as touch-sensor electrodes 99 in display 14 as indicated by arrows 164. Swiping touch-sensor electrodes 99 may cause the list of songs displayed on display 14 to scroll (e.g., to move with a common motion vector) as indicated by arrows 160. If desired, the frame rate for display 14 may be set in response to detection of any or all of the scrolling display content, user-input signals detected by electrodes 99 and the music-player-specific display content. As shown in FIG. 15, display 14 may display a page such as page 170 of a virtual book when device 10 is running, for example, an electronic reader software application. A user may use a finger such as finger 162 to swipe touch sensitive components such as touch-sensor electrodes 99 in display 14 as indicated by arrows 164. Swiping touch-sensor electrodes 99 may cause page 170 to be changed on display 14 as indicated by arrow 172 (e.g., portions of page 170 may move across display 14 with a common motion vector). If desired, the frame rate for display 14 may be set in response to detection of any or all of the common-vector motion display content, user-input signals detected by electrodes 99 and the electronic-reader-specific display content." *See* 10:61-11:24. "During operation of a device such as device 10, a portion of the display content to be displayed on display 14 may include embedded video content. The embedded video content may have a video frame rate that is greater than the frame rate being used to operate the array of display pixels in the display. Illustrative steps that may be used in setting a display frame rate based on this type of detected high-frame-rate video are shown in FIG. 16. At step 180, a display such as display 14 may be operated using a frame rate.

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	At step 182, circuitry that is monitoring the display content may detect high-frame-rate video content to be displayed on at least a portion of the display. At step 184, control circuitry such as circuitry 12 may take suitable action for increasing the display frame rate for improved display performance. The display circuitry may increase the frame rate for all of the display pixels of the display or may increase the frame rate for only a portion of the display pixels (e.g., the display pixels that will be used for displaying the high-frame-rate video content)." *See* 11:25-44.  FIG. 16 "As shown in FIG. 17, a portion such as portion 186 of display 14 may be used to display high-frame-rate video content such as full-screen or embedded video content in a web browser software application. The video content may have a video frame rate (e.g., a rate

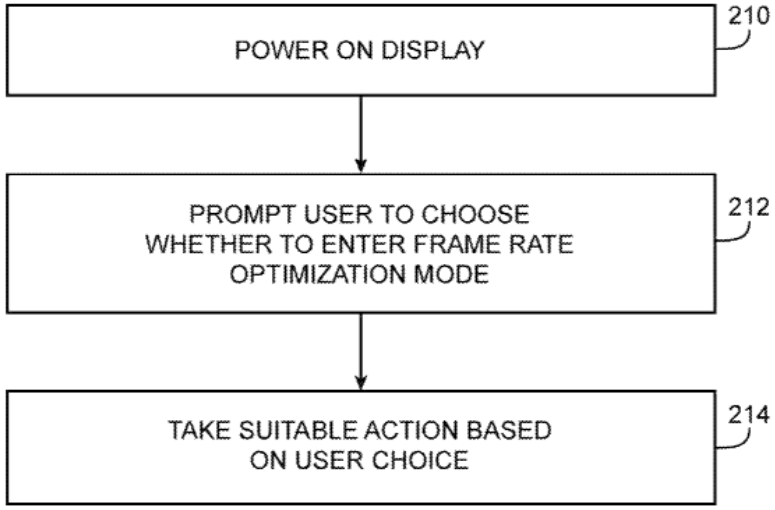
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	at which frames of video data are provided to device 10) that is greater than the frame rate being used to operate the array of display pixels in the display. If desired, the frame rate for display 14 may be set in response to detection of the high-frame-rate video content." *See* 11:45-53.  FIG. 17 "During operation of a device such as device 10, a camera may be used to capture image data of the environment surrounding the device while the captured image data is concurrently displayed on the display. In some scenarios such as scenarios in which device 10 is used to run an augmented-reality software application, additional content may be overlaid on the concurrently displayed captured images. Dynamic display content may be displayed on display 14 if the device is moved during capture and

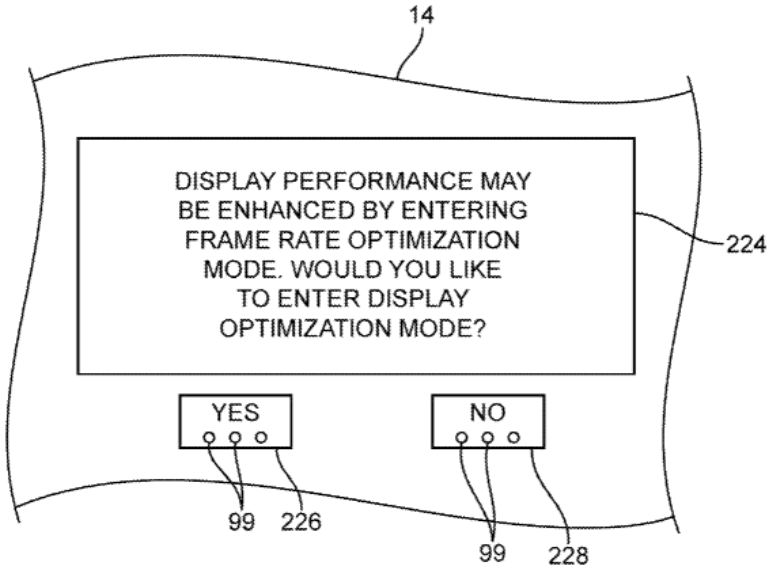
Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
	concurrent display of image data. Illustrative steps that may be used in setting a display frame rate based on detected concurrent camera operation are shown in FIG. 18. At step 190, a display such as display 14 may be operated using a frame rate. At step 192, circuitry that is monitoring the operational environment of the device may detect concurrent camera operation. At step 194, control circuitry such as circuitry 12 may take suitable action for increasing the display frame rate for improved display performance. The display circuitry may increase the frame rate to all of the display pixels of the display or may increase the frame rate to only a portion of the display pixels (e.g., the display pixels that will be used for displaying images captured by the camera)." *See* 11:54-12:10.

Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
	 FIG. 18 "As shown in FIG. 19, a camera such as camera 196 in device 10 may be used while running, for example, an augmented-reality software application to capture images of real-world scene content 198. While capturing the images of scene content 198, the captured images may be concurrently displayed on a portion such as portion 186 of display 14. Circuitry such as circuitry 12 of FIG. 1 may be used to overlay additional display content such as overlaid display information 200 on the displayed captured images of scene 198. If desired, the frame rate for display 14 may be set in response to detection of the concurrent operation of the camera or in response to detection of augmented-reality-specific application content. If desired, control circuitry such as control circuitry 12 of FIG. 1 may be configured to operate display 14 in a fixed frame rate mode or in a variable frame rate operational

Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
	mode such as a frame rate optimization mode. The frame rate used to operate the array of display pixels in the display may remain fixed when the display is operated in the fixed frame rate operational mode and may be adjusted (e.g., increased or decreased) in response to monitored operation of the electronic device as described above in connection with FIGS. 1-21 when the display is operated in the variable frame rate operational mode." *See* 12:11-35.  FIG. 19 "A user of a device such as device 10 may be prompted to decide whether to enter the frame rate optimization mode. Illustrative steps that may be used in prompting a user of

Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
	device 10 to decide whether to operate the display in a fixed or variable frame rate operational mode are shown in FIG. 20. At step 210, a display such as display 14 may be powered on. At step 212, circuitry that is operating the display may prompt a user to decide whether to enter a variable frame rate operational mode such as a frame rate optimization mode. At step 214, control circuitry such as circuitry 12 may take suitable action in response to the user choice. Suitable action may include entering a fixed frame rate mode of operation if the user chooses not to enter the frame rate optimization mode or may include entering the variable frame rate optimization mode if the user chooses to enter the variable frame rate optimization mode." *See* 12:36-53.

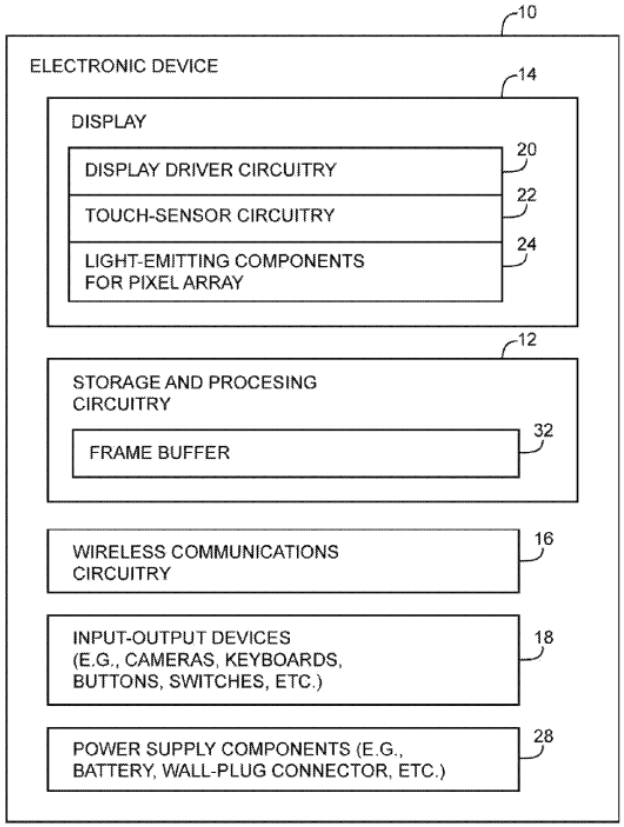
Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
	 FIG. 20 "As shown in FIG. 21, a user prompt such as prompt 224 may be displayed on a portion of display 14 to provide a text question to the user of the device to choose whether or not to enter the frame rate optimization mode. The user may, as an example, use touch-sensor electrodes 99 in the display to enter an affirmative response using virtual button 226 or a negative response using virtual button 228. However, this is merely illustrative. Any user input component may be used to input a response to prompt 224. In response to an affirmative response, circuitry such as circuitry 12 of FIG. 1 may begin actively adjusting (e.g., increasing or decreasing) the frame rate for display 14 in response to monitored operation of the electronic device as described above in connection with FIGS. 1-21." *See* 12:54-67.

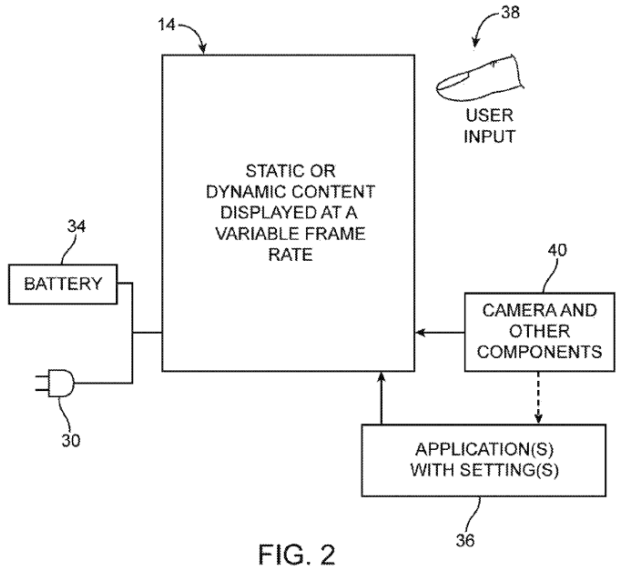
Asserted Claim of the ’109 Patent	Exemplary Citations to Tripathi
	 FIG. 21 This limitation would have been obvious to a person of ordinary skill in the art based on (1) Tripathi alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element 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.

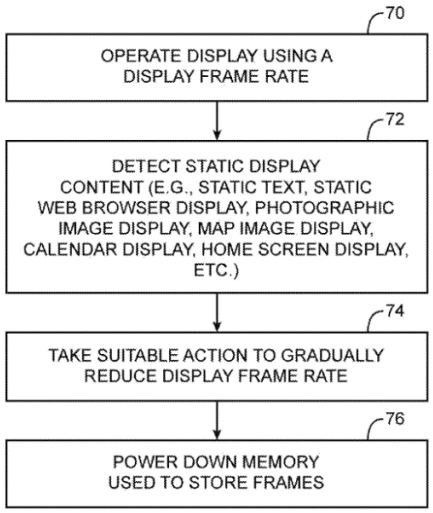
Asserted Claim of the ’109 Patent	Exemplary Citations to Tripathi
Claim 2	

Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
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.	Tripathi expressly and/or inherently discloses and/or renders obvious this limitation. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Tripathi 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.

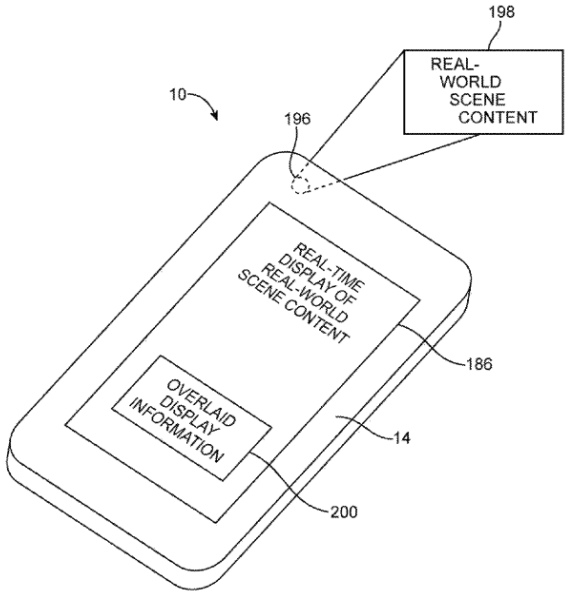
Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
Claim 7	
7[pre]. The method of claim 1, further comprising the steps:	To the extent the preamble is limiting, Tripathi expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. *See* Claim Limitations 1[pre]-1[h]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Tripathi 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;	To the extent the preamble is limiting, Tripathi expressly and/or inherently discloses and/or renders obvious obtaining a reference image. *See*, *e.g.*, disclosures below.

Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
	 FIG. 1 "The variable frame rate may be actively determined during operation of device 10 based on whether static or dynamic display content is to be displayed, based on whether device 10 is receiving power from a battery such as battery 34 or a power cable such as power cable 30, based on user input such as a swipe by a user finger 38, based on the operational status of other device components 40 such as a camera, a video card, or other

Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
	components, or based on whether one or more particular software applications 36 with one or more settings has been launched." *See* 6:10-20.  FIG. 2 "At step 72, circuitry 12 may determine that the display content to be displayed is static display content. Static display content may include display content such as static text, static web browser content, photographic image content, map image content, calendar image content, or device operating system display content such a device home-screen display." *See* 7:45-50.

Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
	 FIG. 5 "In some scenarios, a software application running on circuitry such as circuitry 12 of device 10 (FIG. 1) may provide display content to display 14 that includes dynamic display content. Examples of this type of application-specific display content may include displaying a turning page of a book or magazine in an electronic book application or displaying text or other information overlaid on moving video images (e.g., images concurrently captured using a camera in the device)." *See* 10:17-24. "During operation of a device such as device 10, a camera may be used to capture image data of the environment surrounding the device while the captured image data is concurrently displayed on the display. In some scenarios such as scenarios in which device 10 is used to run an augmented-reality software application, additional content may be overlaid on the concurrently displayed captured images. Dynamic display content may be displayed on display 14 if the device is moved during capture and

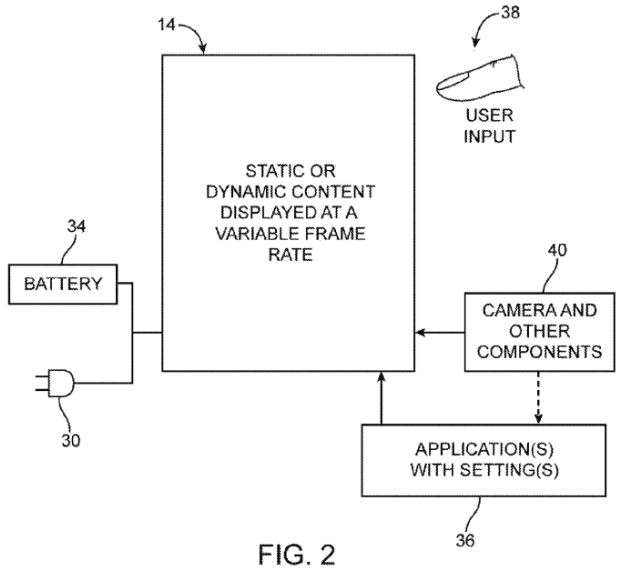
Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
	concurrent display of image data. Illustrative steps that may be used in setting a display frame rate based on detected concurrent camera operation are shown in FIG. 18. At step 190, a display such as display 14 may be operated using a frame rate. At step 192, circuitry that is monitoring the operational environment of the device may detect concurrent camera operation. At step 194, control circuitry such as circuitry 12 may take suitable action for increasing the display frame rate for improved display performance. The display circuitry may increase the frame rate to all of the display pixels of the display or may increase the frame rate to only a portion of the display pixels (e.g., the display pixels that will be used for displaying images captured by the camera). As shown in FIG. 19, a camera such as camera 196 in device 10 may be used while running, for example, an augmented-reality software application to capture images of real-world scene content 198. While capturing the images of scene content 198, the captured images may be concurrently displayed on a portion such as portion 186 of display 14. Circuitry such as circuitry 12 of FIG. 1 may be used to overlay additional display content such as overlaid display information 200 on the displayed captured images of scene 198. If desired, the frame rate for display 14 may be set in response to detection of the concurrent operation of the camera or in response to detection of augmented-reality-specific application content." *See* 11:44-12:24.

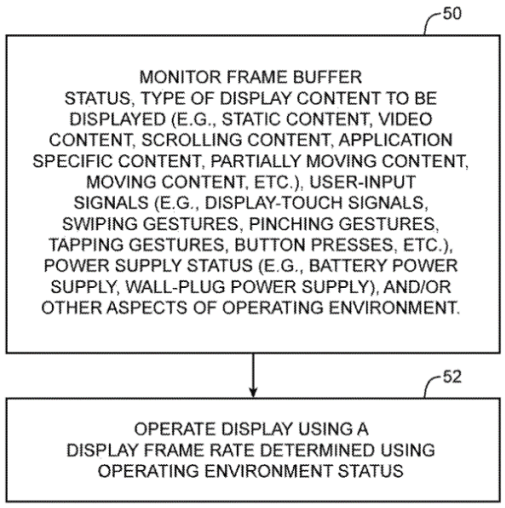
Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
	 FIG. 19 This limitation would have been obvious to a person of ordinary skill in the art based on (1) Tripathi alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element 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;	Tripathi expressly and/or inherently discloses and/or renders obvious performing registration of the digital image with the reference image. *See*, *e.g.*, disclosures below. "Display driver circuitry 20 may include a driver integrated circuit that is mounted, for example, to a display layer such as a thin-film-transistor layer of a liquid crystal display. Display driver circuitry 20 may include display pixel control lines and other circuitry for

Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
	operating the display pixels of display 14. Display driver circuitry 20 may be coupled to control circuitry such as storage and processing circuitry 12 in device 10. Display 14 may include additional circuitry such as demultiplexer circuitry, display signal lines for delivering display signals to light-emitting components 24 (FIG. 1), and gate driver circuitry. Display driver circuitry 20 may be implemented using one or more integrated circuits (ICs) and may sometimes be referred to as a driver IC, display driver integrated circuit, or display driver. Display driver integrated circuit 20 may be mounted on an edge of a thin-film transistor substrate layer in display 14 (as an example). The thin-film transistor substrate layer may sometimes be referred to as a thin-film transistor (TFT) layer. During operation of device 10, control circuitry such as storage and processing circuitry 12 may provide data to display driver 20. For example, circuitry 12 may supply display driver 20 with digital data corresponding to text, graphics, video, or other images to be displayed on display 14. Display driver 20 may convert the data that is received into signals for controlling the display pixels. During the process of displaying images on display 14, display driver integrated circuit 20 may receive digital data from circuitry 12 and may produce corresponding analog data (e.g., voltages with magnitudes representing pixel brightness levels) for light-emitting components 24. The analog data signals may be demultiplexed to produce corresponding color-coded analog data line signals (e.g., data signals for a red channel, data signals for a green channel, and data signals for a blue channel). Storage and processing circuitry 12 may include microprocessors, microcontrollers, digital signal processor integrated circuits, application-specific integrated circuits, and other processing circuitry. Volatile and non-volatile memory circuits such as random-access memory, read-only memory, hard disk drive storage, solid state drives, and other storage circuitry may also be included in processing circuitry 12.

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	Processing circuitry 12 may use wireless communications circuitry 16 and/or input-output devices 18 to obtain user input and to provide output to a user. Input-output devices 18 may include speakers, microphones, sensors, buttons, keyboards, displays, touch sensors, and other components for receiving input and supplying output. Wireless communications circuitry may include wireless local area network transceiver circuitry, cellular telephone network transceiver circuitry, and other components for wireless communication. Storage and processing circuitry 12 may include one or more frame buffers such as frame buffer 32 for temporarily storing display data to be displayed on display 14. Display content may be generated or received by circuitry 12 and stored, frame-by-frame, in frame buffer 32. Display driver circuitry 20 may generate display signals for light-emitting components 24 based on the display data stored in frame buffer 32. Display driver circuitry 20 may receive display data from frame buffer 32 and provide display signals associated with that received display data to light-emitting components 24 at a display refresh rate (also referred to herein as a display frame rate or frame rate). Storage and processing circuitry 12 may be implemented separately from display 14 or may include portions that are integrated with display driver circuitry 20 of display 14." 4:16-5:15. "Device 10 may include monitoring circuitry for monitoring the operation of the electronic device. The monitoring circuitry may be formed as a portion of storage and processing circuitry 12, as a portion of display driver circuitry 20, as a separate integrated circuit (e.g., an integrated circuitry mounted on a printed circuit board or on a rigid layer of display 14), or may be a system monitoring engine implemented in part or completely using software running on processing circuitry 12. Control circuitry such as storage and processing circuitry 12 may be used in running software for device 10. For example, circuitry 12 may be configured to execute code in connection with the displaying of images on display 14 (e.g., text, pictures, video, etc.).

Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
	Circuitry 12 may be used to monitor various attributes of the operation of the electronic device such as the activity of frame buffer 32 (e.g., the rate at which the frame buffer is updated with new display data to be displayed display), the type of display content to be displayed with the display (e.g., dynamic content, video content, high-frame-rate video content, common-vector motion content, and static content), user-input signals such as touch-sensor input signals, the device power supply status, and/or other aspects of the operating environment of the electronic device. Circuitry 12 may configure operational attributes of the display such as the display frame rate in response to monitored operating information gathered by circuitry 12. For example, circuitry 12 may increase or decrease the frame rate for the display when displaying static or moving (dynamic) display content respectively. Control circuitry 12 may be used to monitor operating environment attributes and other aspects of device operations (e.g., the rate at which new display data is provided to frame buffer 32, the display content being delivered to frame buffer 32, user-input signals, the operational status of other components, and the device power supply status) and provide signals to display driver circuitry 20 resulting in an increased or decreased the display frame rate. Increasing the display frame rate may result in a higher perceived display resolution for a user of the electric device. Decreasing the display frame rate may reduce power consumption for the device and may allow powering down of memory associated with, for example, frame buffer 32." *See* 5:28-6:3. "FIG. 2 is a diagram showing examples of operating environment attributes and other aspects of device operations for a device of the type shown in FIG. 1 that may be monitored for determining a frame rate for display 14. As shown in FIG. 2, display 14 may be used for displaying static content or dynamic content at a variable frame rate. The variable frame rate may be actively determined during operation of device 10 based on whether static or dynamic display content is to be displayed, based on whether device 10 is receiving power from a battery such as battery 34 or a power cable such as power cable 30, based on user input such as a swipe by a user finger 38, based on the operational

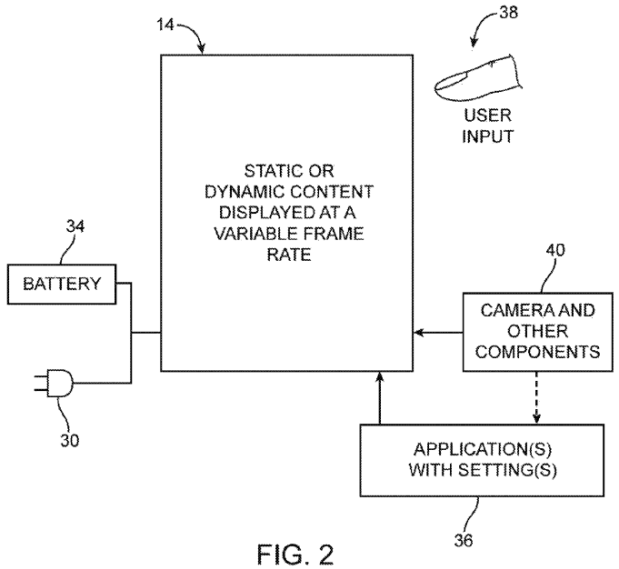
Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
	status of other device components 40 such as a camera, a video card, or other components, or based on whether one or more particular software applications 36 with one or more settings has been launched. FIG. 3 shows illustrative steps involved in adjusting the frame rate for a display such as display 14 of FIG. 1 in response to information related to the operation of a device. Device monitoring operations may be performed at step 50. The operations of step 50 may be performed using control circuitry such as storage and processing circuitry 12, display driver circuitry 20, standalone monitoring circuitry, and/or other device resources." *See* 6:6-28.  FIG. 2

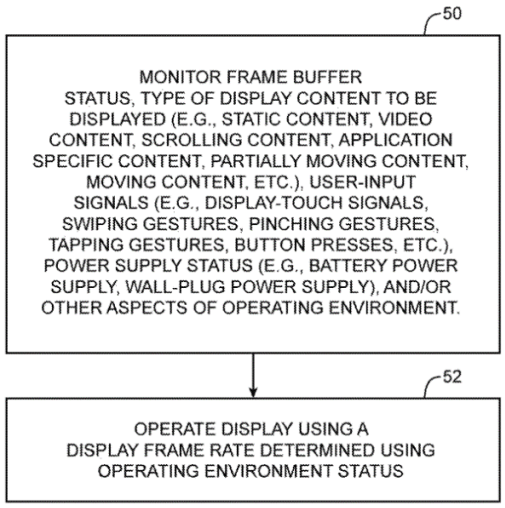
Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
	 FIG. 3 "At step 74, control circuitry such as storage and processing circuitry 12 may take suitable action to reduce the display frame rate in response to determining that static display content is to be displayed. As described above in connection with FIG. 4, suitable action for reducing the display frame rate may include providing increased blanking data in display data to be displayed, reducing a clock speed associated with timing circuitry in the device or other suitable action for reducing the frame rate. At step 76, if desired, memory such as a portion of frame buffer 32 may be powered down in order to reduce power consumption while no new display content is being generated.

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	Illustrative steps that may be used in setting a display frame rate based on a monitored power-supply status of a device such as the presence of a line power supply source are shown in FIG. 6." *See* 7:51-67. "At step 104, control circuitry such as storage and processing circuitry 12 may take suitable action for optimizing power and display performance. Suitable action for optimizing power and display performance may include decreasing the display frame rate as described above in connection with (for example) FIG. 4 for reduced power consumption, leaving a currently set display frame rate unchanged, increasing the display frame rate for improved display performance, and/or monitoring other device operating attributes (e.g., the display content to be displayed and/or a frame buffer refresh rate). If desired, display 14 may be operated using a display frame rate that is determined based on multiple operational attributes of the device. Illustrative steps that may be used in setting a display frame rate based on multiple operational attributes such as the device power supply status and frame buffer activity are shown in FIG. 9. At step 110, an initial display frame rate may be set. The initial display frame rate may be set by control circuitry such as storage and processing circuitry 12 and/or display driver circuitry 20. At step 112, in response to detecting a battery power supply source, a frame buffer monitor for monitoring the activity of a frame buffer such as frame buffer 32 (FIG. 2) may be activated. The frame buffer monitor may be implemented as a standalone monitoring circuit or may be formed as a portion of circuitry 12 or display driver circuitry 20 (FIG. 1). At step 114, in response to detecting a reduced frame buffer update rate, control circuitry such as circuitry 12 may take suitable action for reducing the display frame rate as

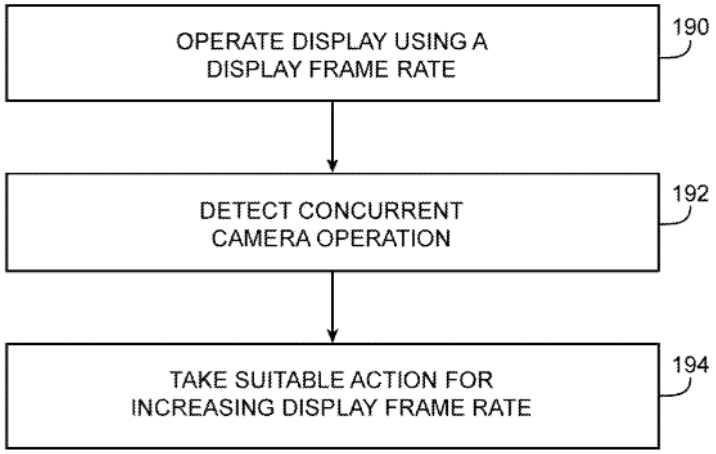
Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
	described above in connection with (for example) FIG. 4 for reduced power consumption. At step 116, in response to detecting a subsequently increased frame buffer update rate, control circuitry such as circuitry 12 may take suitable action for increasing the display frame rate for improved display performance." *See* 8:44-9:11. "During operation of a device such as device 10, the user input may be provided to device 10 (e.g., using input-output components such as buttons, keyboards, or touch-sensor electrodes in the display) that generates a change in display content to be displayed. Examples of user-input that may generate a change in display content include swiping a finger across the display to scroll through text or pinching the display with multiple fingers to zoom into or out of a map or other image. Illustrative steps that may be used in setting a display frame rate based on detected user input to a device are shown in FIG. 13. At step 150, a display such as display 14 may be operated using a frame rate. At step 152, circuitry that is monitoring user-input components of the device may detect user input to the device. At step 154, control circuitry such as circuitry 12 may take suitable action for increasing the display frame rate for improved display performance. The display circuitry may increase the frame rate to all of the display pixels of the display or may increase the frame rate to only a portion of the display pixels." *See* 10:40-60. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Tripathi 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.

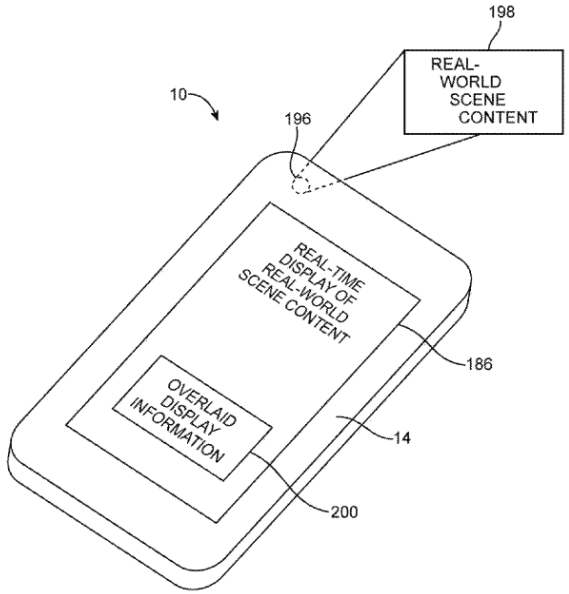
Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
7[c]. using data obtained from the registration to generate the transformation mapping.	Tripathi expressly and/or inherently discloses and/or renders obvious using data obtained from the registration to generate the transformation mapping. *See*, *e.g.*, disclosures below. "An illustrative electronic device of the type that may be provided with a display is shown in FIG. 1. Electronic device 10 may be a computer such as a computer that is integrated into a display such as a computer monitor, a laptop computer, a tablet computer, a somewhat smaller portable device such as a wrist-watch device, pendant device, or other wearable or miniature device, a cellular telephone, a media player, a tablet computer, a gaming device, a navigation device, a computer monitor, a television, or other electronic equipment." *See* 3:53-61. "FIG. 2 is a diagram showing examples of operating environment attributes and other aspects of device operations for a device of the type shown in FIG. 1 that may be monitored for determining a frame rate for display 14. As shown in FIG. 2, display 14 may be used for displaying static content or dynamic content at a variable frame rate. The variable frame rate may be actively determined during operation of device 10 based on whether static or dynamic display content is to be displayed, based on whether device 10 is receiving power from a battery such as battery 34 or a power cable such as power cable 30, based on user input such as a swipe by a user finger 38, based on the operational status of other device components 40 such as a camera, a video card, or other components, or based on whether one or more particular software applications 36 with one or more settings has been launched. FIG. 3 shows illustrative steps involved in adjusting the frame rate for a display such as display 14 of FIG. 1 in response to information related to the operation of a device. Device monitoring operations may be performed at step 50. The operations of step 50 may be performed using control circuitry such as storage and processing circuitry 12,

Asserted Claim of the ’109 Patent	Exemplary Citations to Tripathi
	display driver circuitry 20, standalone monitoring circuitry, and/or other device resources.” *See* 6:6-28.  FIG. 2

Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
	 FIG. 3 "Common-vector motion display content may include scrolling content, page-changing content, zooming content or other common-vector motion content. It may therefore be desirable to adjust the frame rate for a display when displaying dynamic display content such as common-vector motion display content." *See* 9:62-67. "During operation of a device such as device 10, the user input may be provided to device 10 (e.g., using input-output components such as buttons, keyboards, or touch-sensor electrodes in the display) that generates a change in display content to be displayed. Examples of user-input that may generate a change in display content include swiping a finger across the display to scroll through text or pinching the display with multiple fingers to zoom into or out of a map or other image. Illustrative steps that may be used in setting a display frame rate based on detected user input to a device are shown in FIG. 13." *See* 10:40-50.

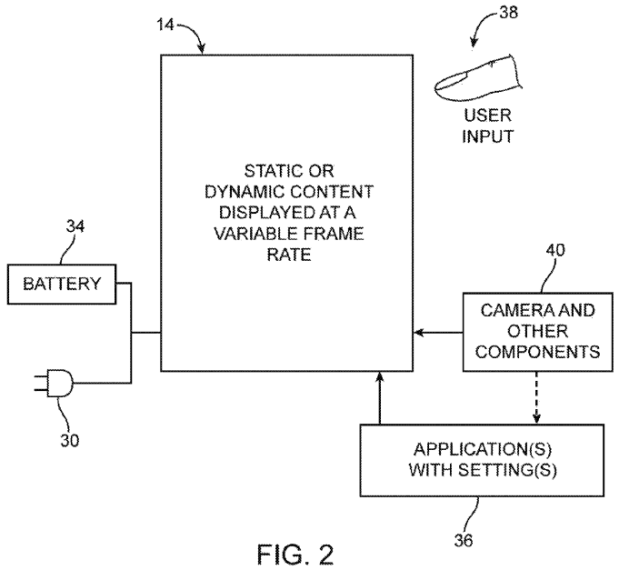
Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
	"In some scenarios, a software application running on circuitry such as circuitry 12 of device 10 (FIG. 1) may provide display content to display 14 that includes dynamic display content. Examples of this type of application-specific display content may include displaying a turning page of a book or magazine in an electronic book application or displaying text or other information overlaid on moving video images (e.g., images concurrently captured using a camera in the device)." *See* 10:17-24. "During operation of a device such as device 10, a camera may be used to capture image data of the environment surrounding the device while the captured image data is concurrently displayed on the display. In some scenarios such as scenarios in which device 10 is used to run an augmented-reality software application, additional content may be overlaid on the concurrently displayed captured images. Dynamic display content may be displayed on display 14 if the device is moved during capture and concurrent display of image data. Illustrative steps that may be used in setting a display frame rate based on detected concurrent camera operation are shown in FIG. 18. At step 190, a display such as display 14 may be operated using a frame rate. At step 192, circuitry that is monitoring the operational environment of the device may detect concurrent camera operation. At step 194, control circuitry such as circuitry 12 may take suitable action for increasing the display frame rate for improved display performance. The display circuitry may increase the frame rate to all of the display pixels of the display or may increase the frame rate to only a portion of the display pixels (e.g., the display pixels that will be used for displaying images captured by the camera). As shown in FIG. 19, a camera such as camera 196 in device 10 may be used while running, for example, an augmented-reality software application to capture images of real-world scene content 198. While capturing the images of scene content 198, the captured images may be concurrently displayed on a portion such as portion 186 of display 14. Circuitry such as circuitry 12 of FIG. 1 may be used to overlay additional

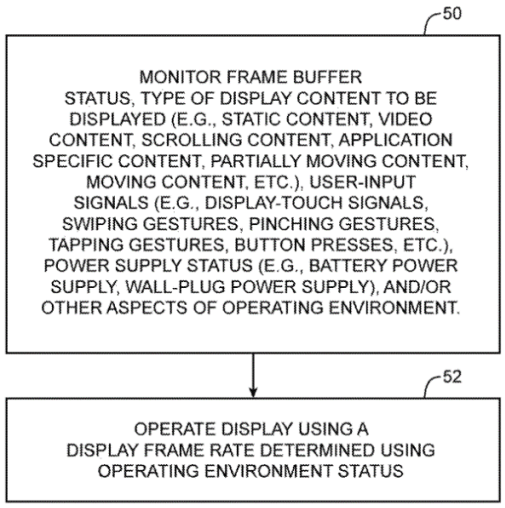
Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
	display content such as overlaid display information 200 on the displayed captured images of scene 198. If desired, the frame rate for display 14 may be set in response to detection of the concurrent operation of the camera or in response to detection of augmented-reality-specific application content." *See* 11:54-12:24.  FIG. 18

Asserted Claim of the ’109 Patent	Exemplary Citations to Tripathi
	 FIG. 19 This limitation would have been obvious to a person of ordinary skill in the art based on (1) Tripathi 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.

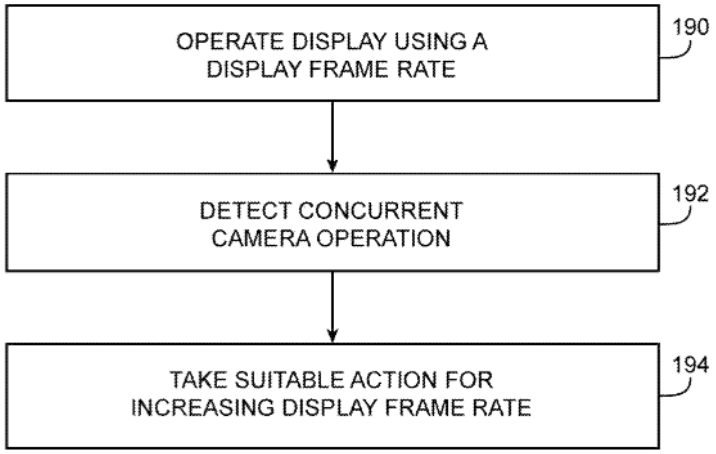
Asserted Claim of the ’109 Patent	Exemplary Citations to Tripathi
Claim 8	

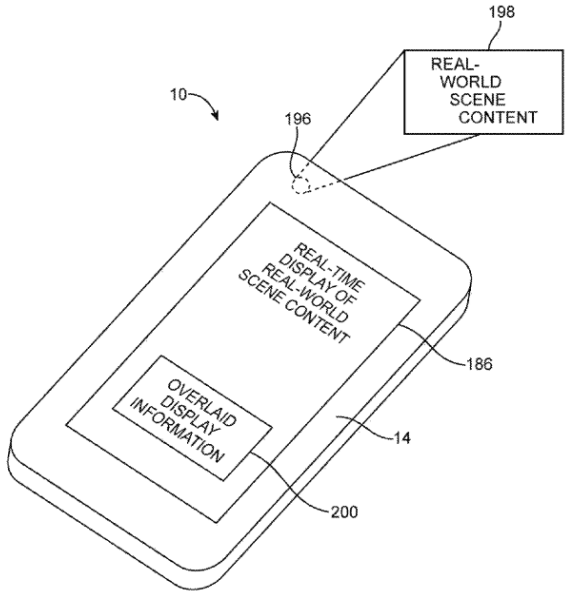
Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
8. The method of claim 1, further comprising applying a translation transformation to move the image within display area of the monitor.	Tripathi expressly and/or inherently discloses and/or renders obvious applying a translation transformation to move the image within display area of the monitor. *See*, *e.g.*, disclosures below. "An illustrative electronic device of the type that may be provided with a display is shown in FIG. 1. Electronic device 10 may be a computer such as a computer that is integrated into a display such as a computer monitor, a laptop computer, a tablet computer, a somewhat smaller portable device such as a wrist-watch device, pendant device, or other wearable or miniature device, a cellular telephone, a media player, a tablet computer, a gaming device, a navigation device, a computer monitor, a television, or other electronic equipment." *See* 3:53-61. "FIG. 2 is a diagram showing examples of operating environment attributes and other aspects of device operations for a device of the type shown in FIG. 1 that may be monitored for determining a frame rate for display 14. As shown in FIG. 2, display 14 may be used for displaying static content or dynamic content at a variable frame rate. The variable frame rate may be actively determined during operation of device 10 based on whether static or dynamic display content is to be displayed, based on whether device 10 is receiving power from a battery such as battery 34 or a power cable such as power cable 30, based on user input such as a swipe by a user finger 38, based on the operational status of other device components 40 such as a camera, a video card, or other components, or based on whether one or more particular software applications 36 with one or more settings has been launched. FIG. 3 shows illustrative steps involved in adjusting the frame rate for a display such as display 14 of FIG. 1 in response to information related to the operation of a device. Device monitoring operations may be performed at step 50. The operations of step 50 may be performed using control circuitry such as storage and processing circuitry 12,

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	display driver circuitry 20, standalone monitoring circuitry, and/or other device resources.” *See* 6:6-28.  FIG. 2

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	 FIG. 3 "Common-vector motion display content may include scrolling content, page-changing content, zooming content or other common-vector motion content. It may therefore be desirable to adjust the frame rate for a display when displaying dynamic display content such as common-vector motion display content." *See* 9:62-67. "During operation of a device such as device 10, the user input may be provided to device 10 (e.g., using input-output components such as buttons, keyboards, or touch-sensor electrodes in the display) that generates a change in display content to be displayed. Examples of user-input that may generate a change in display content include swiping a finger across the display to scroll through text or pinching the display with multiple fingers to zoom into or out of a map or other image. Illustrative steps that may be used in setting a display frame rate based on detected user input to a device are shown in FIG. 13." *See* 10:40-50.

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	"In some scenarios, a software application running on circuitry such as circuitry 12 of device 10 (FIG. 1) may provide display content to display 14 that includes dynamic display content. Examples of this type of application-specific display content may include displaying a turning page of a book or magazine in an electronic book application or displaying text or other information overlaid on moving video images (e.g., images concurrently captured using a camera in the device)." *See* 10:17-24. "During operation of a device such as device 10, a camera may be used to capture image data of the environment surrounding the device while the captured image data is concurrently displayed on the display. In some scenarios such as scenarios in which device 10 is used to run an augmented-reality software application, additional content may be overlaid on the concurrently displayed captured images. Dynamic display content may be displayed on display 14 if the device is moved during capture and concurrent display of image data. Illustrative steps that may be used in setting a display frame rate based on detected concurrent camera operation are shown in FIG. 18. At step 190, a display such as display 14 may be operated using a frame rate. At step 192, circuitry that is monitoring the operational environment of the device may detect concurrent camera operation. At step 194, control circuitry such as circuitry 12 may take suitable action for increasing the display frame rate for improved display performance. The display circuitry may increase the frame rate to all of the display pixels of the display or may increase the frame rate to only a portion of the display pixels (e.g., the display pixels that will be used for displaying images captured by the camera). As shown in FIG. 19, a camera such as camera 196 in device 10 may be used while running, for example, an augmented-reality software application to capture images of real-world scene content 198. While capturing the images of scene content 198, the captured images may be concurrently displayed on a portion such as portion 186 of display 14. Circuitry such as circuitry 12 of FIG. 1 may be used to overlay additional

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	display content such as overlaid display information 200 on the displayed captured images of scene 198. If desired, the frame rate for display 14 may be set in response to detection of the concurrent operation of the camera or in response to detection of augmented-reality-specific application content." *See* 11:54-12:24.  FIG. 18

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	 FIG. 19 This limitation would have been obvious to a person of ordinary skill in the art based on (1) Tripathi 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 9	

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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.	Tripathi expressly and/or inherently discloses and/or renders obvious comprising 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. "Electronic devices such as computers, televisions, portable computers, and cellular telephones are often provided with displays. A display often includes a frame buffer for buffering information to be displayed on the display and display driver circuitry that periodically refreshes display pixels in the display. The frequency at which the display pixels are periodically refreshed is commonly called the frame rate of the display." *See* 1:8-15. "Electronic devices may be provided that contain displays. The display may include display pixels and display driver circuitry for operating the display pixels. The electronic device may include control circuitry. The control circuitry may monitor the device operating environment and other aspects of the operation of the electronic device. The control circuitry may configure operational attributes of the display in response to monitored operating environment information or other information obtained while monitoring the operation of the electronic device. The display driver circuitry may operate the display pixels by periodically refreshing light-emitting elements in the display. The frequency at which the display control circuitry refreshes the light-emitting elements of the display may be referred to as the display frame rate or the frame rate. Configuring operational attributes of the display may include increasing or decreasing the display frame rate of the display." *See* 1:35-1:51. "Electronic devices such as cellular telephones, media players, computers, set-top boxes, wireless access points, and other electronic equipment may be provided displays. Displays may include liquid-crystal display (LCD) screens, light-emitting diodes (LEDs), organic light-emitting diodes (OLEDs), and other components such as touch-

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	sensitive components that present visual information and status data and/or gather user input data. Operational attributes of the display such as the display frame rate (i.e., the frequency at which display signals are provided to display pixels) may be controlled and configured by control circuitry in the electronic device. Operational status information may be gathered using control circuitry in the electronic device that monitors the operation of the device. The control circuitry may adjust the display frame rate (also sometimes referred to herein as the frame rate, the display refresh rate, or the refresh rate) in response to the operational status information." *See* 3:35-3:52. "As shown in FIG. 1, device 10 may include a display such as display 14. Display 14 may include light-emitting components 24, touch-sensor circuitry 22, display driver circuitry 20 for operating display 14, and other display components. Display 14 may be a variable frame rate display operable to display content using an adjustable frame rate. Light-emitting components 24 may include an array of display pixels formed from reflective components, liquid crystal display (LCD) components, organic light-emitting diode (OLED) components, or other suitable display pixel structures. To provide display 14 with the ability to display color images, light-emitting components 24 may include display pixels having color filter elements. Display touch-sensor circuitry 22 may include capacitive touch electrodes (e.g., indium tin oxide electrodes or other suitable transparent electrodes) or other touch sensor components (e.g., resistive touch technologies, acoustic touch technologies, touch sensor arrangements using light sensors, force sensors, etc.). Display 14 may be a touch screen that incorporates display touch circuitry 22 or may be a display that is not touch sensitive. Display driver circuitry 20 may include a driver integrated circuit that is mounted, for example, to a display layer such as a thin-film-transistor layer of a liquid crystal display. Display driver circuitry 20 may include display pixel control lines and other circuitry for

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	operating the display pixels of display 14. Display driver circuitry 20 may be coupled to control circuitry such as storage and processing circuitry 12 in device 10. Display 14 may include additional circuitry such as demultiplexer circuitry, display signal lines for delivering display signals to light-emitting components 24 (FIG. 1), and gate driver circuitry. Display driver circuitry 20 may be implemented using one or more integrated circuits (ICs) and may sometimes be referred to as a driver IC, display driver integrated circuit, or display driver. Display driver integrated circuit 20 may be mounted on an edge of a thin-film transistor substrate layer in display 14 (as an example). The thin-film transistor substrate layer may sometimes be referred to as a thin-film transistor (TFT) layer. During operation of device 10, control circuitry such as storage and processing circuitry 12 may provide data to display driver 20. For example, circuitry 12 may supply display driver 20 with digital data corresponding to text, graphics, video, or other images to be displayed on display 14. Display driver 20 may convert the data that is received into signals for controlling the display pixels. During the process of displaying images on display 14, display driver integrated circuit 20 may receive digital data from circuitry 12 and may produce corresponding analog data (e.g., voltages with magnitudes representing pixel brightness levels) for light-emitting components 24. The analog data signals may be demultiplexed to produce corresponding color-coded analog data line signals (e.g., data signals for a red channel, data signals for a green channel, and data signals for a blue channel)." *See* 3:62-4:51. "Storage and processing circuitry 12 may include one or more frame buffers such as frame buffer 32 for temporarily storing display data to be displayed on display 14. Display content may be generated or received by circuitry 12 and stored, frame-by-frame, in frame buffer 32. Display driver circuitry 20 may generate display signals for light-emitting components 24 based on the display data stored in frame buffer 32. Display driver circuitry 20 may receive display data from frame buffer 32 and provide display signals associated with that received display data to light-emitting components

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	24 at a display refresh rate (also referred to herein as a display frame rate or frame rate)." *See* 5:1-12. "At step 126, in response to detecting subsequent dynamic display content (e.g., video display content, scrolling display content, etc.) to be displayed, control circuitry such as circuitry 12 may take suitable action for increasing the display frame rate for improved display performance. Consider, as an example of a scenario in which the steps of FIGS. 9 and/or 10 may be used, a user of device 10 launching software such as a web browser running on circuitry 12 to access a web page. While operating the device using battery power, the user may view a web page for an extended period of time (e.g., while reading a news article). During that time, no new display content is generated and display 14 may be operated using a reduced display frame rate. The display frame rate may be gradually reduced to avoid noticeable changes to the user of device 10. When the user changes the display content (e.g., by scrolling to another portion of the web page or navigating to another web page or another software application), circuitry 12 may detect a change in the frame buffer content or display content and increase the display frame rate. The perceived resolution of a display (i.e., the resolution perceived by a user of the device) depends on factors such as the actual resolution of the display (i.e., the density of display pixels), the type of display content being displayed, and the display frame rate. Some types of dynamic display content can induce a blurring effect related to the interaction of the display and the user's eye (sometimes referred to as retinal blur). One type of dynamic display content that is particularly retinal-blur inducing is display content in which some or all of the display content moves across the display with a common motion vector (sometimes referred to herein as common-vector motion). Common-vector motion display content may include scrolling content, page-changing content, zooming content or other common-vector motion content. It may therefore be

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	desirable to adjust the frame rate for a display when displaying dynamic display content such as common-vector motion display content. Illustrative steps that may be used in setting a display frame rate in response to detected dynamic display content are shown in FIG. 11. At step 130, a display such as display 14 may be operated using a frame rate. At step 132, circuitry that is monitoring the display content to be displayed may detect dynamic display content such as common-vector motion content in at least a portion of the display content. At step 134, control circuitry such as circuitry 12 may take suitable action for increasing the display frame rate for improved display performance. The display circuitry may increase the frame rate to all of the display pixels of the display or may increase the frame rate to only a portion of the display pixels (e.g., the display pixels that will be used for displaying the dynamic display content). In some scenarios, a software application running on circuitry such as circuitry 12 of device 10 (FIG. 1) may provide display content to display 14 that includes dynamic display content. Examples of this type of application-specific display content may include displaying a turning page of a book or magazine in an electronic book application or displaying text or other information overlaid on moving video images (e.g., images concurrently captured using a camera in the device)." *See* 9:30-10:24. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Tripathi 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, Tripathi 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) Tripathi 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,	Tripathi expressly and/or inherently discloses and/or renders obvious this limitation. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Tripathi 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.	Tripathi expressly and/or inherently discloses and/or renders obvious varying resolution of the image according to the distance. *See*, *e.g.*, disclosures below. "Electronic devices may be provided that contain displays. The display may include display pixels and display driver circuitry for operating the display pixels. The electronic device may include control circuitry. The control circuitry may monitor the device operating environment and other aspects of the operation of the electronic device. The control circuitry may configure operational attributes of the display in response to monitored operating environment information or other information obtained while monitoring the operation of the electronic device. The display driver circuitry may operate the display pixels by periodically refreshing light-emitting elements in the display. The frequency at which the display control

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	circuitry refreshes the light-emitting elements of the display may be referred to as the display frame rate or the frame rate. Configuring operational attributes of the display may include increasing or decreasing the display frame rate of the display. Monitoring the device operating environment and other aspects of the operation of the electronic device may include monitoring the status of a frame buffer that stores display data to be displayed on the display, monitoring the type of display content to be displayed with the display, monitoring user-input signals, monitoring the device power supply status, and/or monitoring other aspects of the operation of the electronic device. In some situations, the control circuitry may reduce the display frame rate in response to detection of, for example, static display content to be displayed. Static display content may include static text, a static web browser webpage or other stationary display content. Reducing the display frame rate may reduce power consumption for the device and may allow powering down of memory needed for storing display data to be displayed. In some situations, the control circuitry may increase the display frame rate in response to detection of, for example, dynamic display content to be displayed. Dynamic display content may include scrolling content, video content, common-vector motion content, or other non-stationary display content. Increasing the display frame rate may result in a higher perceived display resolution for a user of the electric device. Further features of the invention, its nature and various advantages will be more apparent from the accompanying drawings and the following detailed description of the preferred embodiments." *See* 1:35-2:12. "Control circuitry 12 may be used to monitor operating environment attributes and other aspects of device operations (e.g., the rate at which new display data is provided to frame buffer 32, the display content being delivered to frame buffer 32, user-input signals, the operational status of other components, and the device power supply status) and provide signals to display driver circuitry 20 resulting in an increased or decreased the display frame rate. Increasing the display frame rate may result in a higher perceived display

Asserted Claim of the '109 Patent	Exemplary Citations to Tripathi
	resolution for a user of the electric device. Decreasing the display frame rate may reduce power consumption for the device and may allow powering down of memory associated with, for example, frame buffer 32." *See* 5:58-6:3. "At step 60, a display may be operated using a display frame rate (e.g., by providing display signals to the array of display pixels at a frame rate of 24 frames per second, 60 frames per second, 25 frames per second, more than 25 frames per second, hundreds of frames per second, or less than 24 frames per second)." *See* 6:47-52. "For example, during some modes of operation display frames including 1000 rows of display pixel data, each with 900 lines of active display data and 100 lines of vertical blanking data may be provided to display 14 at a frame rate of 60 Hz. In order to reduce the display frame rate to, for example, 30 Hz by increasing a vertical blanking interval, display 14 may be provided with display frames having 2000 lines of display pixel data that include 900 lines of active display data and 1100 lines of blanking data. Each line of display pixel data may, for example, include 600 display pixel signals composed of active display data for a row of 550 display pixels and 50 horizontal blanking signals. In order to reduce the display frame rate to, for example, 30 Hz by increasing a horizontal blanking interval, display 14 may be provided with display frames having 1000 lines of display pixel data each including 1200 display pixel signals composed of active display data for 550 pixels and 650 blanking signals. However, these examples are merely illustrative. If desired, other methods of reducing the display frame rate may be used." *See* 7:9-7:28. "At step 126, in response to detecting subsequent dynamic display content (e.g., video display content, scrolling display content, etc.) to be displayed, control circuitry such as circuitry 12 may take suitable action for increasing the display frame rate for improved display performance. Consider, as an example of a scenario in which the steps of FIGS. 9 and/or 10 may be used, a user of device 10 launching software such as a web browser running on circuitry

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	12 to access a web page. While operating the device using battery power, the user may view a web page for an extended period of time (e.g., while reading a news article). During that time, no new display content is generated and display 14 may be operated using a reduced display frame rate. The display frame rate may be gradually reduced to avoid noticeable changes to the user of device 10. When the user changes the display content (e.g., by scrolling to another portion of the web page or navigating to another web page or another software application), circuitry 12 may detect a change in the frame buffer content or display content and increase the display frame rate. The perceived resolution of a display (i.e., the resolution perceived by a user of the device) depends on factors such as the actual resolution of the display (i.e., the density of display pixels), the type of display content being displayed, and the display frame rate. Some types of dynamic display content can induce a blurring effect related to the interaction of the display and the user's eye (sometimes referred to as retinal blur). One type of dynamic display content that is particularly retinal-blur inducing is display content in which some or all of the display content moves across the display with a common motion vector (sometimes referred to herein as common-vector motion). Common-vector motion display content may include scrolling content, page-changing content, zooming content or other common-vector motion content. It may therefore be desirable to adjust the frame rate for a display when displaying dynamic display content such as common-vector motion display content. Illustrative steps that may be used in setting a display frame rate in response to detected dynamic display content are shown in FIG. 11. At step 130, a display such as display 14 may be operated using a frame rate. At step 132, circuitry that is monitoring the display content to be displayed may detect dynamic display content such as common-vector motion content in at least a portion of the display content.

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	At step 134, control circuitry such as circuitry 12 may take suitable action for increasing the display frame rate for improved display performance. The display circuitry may increase the frame rate to all of the display pixels of the display or may increase the frame rate to only a portion of the display pixels (e.g., the display pixels that will be used for displaying the dynamic display content).” *See* 9:12-67. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Tripathi 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-18: Invalidity of U.S. Patent No. 8,982,109 in view of IconNicholson "Magic Mirror" System Art ("Magic Mirror")

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.

The IconNicholson "Magic Mirror" System expressly and/or inherently discloses and/or renders obvious the Asserted Claims of U.S. Patent No. 8,982,109 (the "'109 Patent"), as set forth in the chart below. On information and belief, Magic Mirror is described at least in the following documents:

- "Dressing Rooms of the Future." *Forbes*, 22 July 2008, https://www.forbes.com/2008/07/22/style-shopping-retailer-forbeslife-cx_jp_0722style.html?sh=73a0c3a56ced. ("Forbes")

- "The Web, Camera, and Texting in Fitting Room." *CNN Money*, 22 January 2007, https://money.cnn.com/2007/01/22/news/companies/retail_innovation/index.htm?postversion=2007012218. ("CNN Money")

- "Mirror, Mirror on the Wall, Which Pair of Pants is the Fairest of All?" *CBC News*, 19 January 2007, https://www.cbc.ca/news/mirror-mirror-on-the-wall-which-pair-of-pants-is-the-fairest-of-all-1.685896. ("CBC")

- "Mirror, Mirror, What Do My Online Friends Say about this Bloomie's outfit?" *Digital Commerce 360*, 15 March, 2007, https://www.digitalcommerce360.com/2007/03/15/mirror-mirror-what-do-my-online-friends-say-about-this-bloomie/. ("Digital Commerce 360")

- "Magic Mirror Puts You in the Picture." *The Sydney Morning Herald*, 18 January 2007, https://www.smh.com.au/technology/magic-mirror-puts-you-in-the-picture-20070118-gdp9sy.html. ("Sydney Morning Herald")

- "Magic Mirror on the Wall." *Chain Store Age*, 1 March 2006, https://chainstoreage.com/news/magic-mirror-wall. ("CSA")

Magic Mirror anticipates the Asserted Claims of the '109 Patent. To the extent it is found Magic Mirror 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 Magic Mirror does not anticipate the Asserted Claims, Magic Mirror 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 Magic Mirror
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, Magic Mirror expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. "IconNicholson, a digital design agency, devised a system in 2007 at the request of designer Nanette Lepore that would make retailing a more social experience. Through an interactive mirror and webcam in the designer's space in Bloomingdale's New York flagship store, customers were able to include friends or parents in their shopping experience." *See* Forbes at 2-3. "Through inventory tagging, the dressing room registers the items shoppers take in to try on and produces video and images of the merchandise. A touch screen gives shoppers the option to invite friends. Through their personal cellphone or key pad, they can then send an e-mail or text message to friends. By clicking on a url and logging on to a Web site, the friends can see the items being tried on and make comments." *See* Forbes at 3. "A new dressing room technology called the 'Magic Mirror' from New York-based digital technology developer IconNicholson claims to do just that. The company debuted its Magic Mirror concept last week at the National Retail Federation's industry conference in New York amid plenty of buzz. The high-tech, three-paneled interactive mirror has two cameras located on either side. "Using a cell phone equipped with wireless technology, shoppers point the camera at the mirror and transmit their image to a Web site - yet to be determined - where family and friends can see them model different outfits. Through the Web site, friends can vote on the outfits as well text-message their opinions to shoppers. Shoppers can text-message back using their cell phones. Those messages then appear on the interactive mirror. Additionally, the mirror displays recommendations of other styles and accessories that shoppers can try on. By touching those options, shoppers can see close-ups of the clothes, where they're located in the store and their prices.

Asserted Claim of the ’109 Patent	Exemplary Citations to Magic Mirror
	. . . “According to Olewitz, the interactive mirrors are only one tool in the total concept. ‘The real innovation here is social retailing,’ Olewitz said. ‘We're bringing together the entire universe of networking concepts through the use of the Internet, the webcam, the webcast to enable shoppers to interact with their friends.’ ‘In the end, the idea is that the customer is 'virtually' supported by their friends and family when they're shopping. In turn, it also gives friends the opportunity to participate in the shopping experience,’ he said.” *See* CNN Money at 1. “The Social Retailing platform, from New York-based digital technology firm IconNicholson, lets a store shopper use a full-length mirror to transmit her image to friends over the web and receive their friends’ comments and images of alternative products. “Social Retailing, originally designed by IconNicholson for apparel fashion client Nanette Lepore Inc., combines social networking and the brick-and-mortar store so customers can connect live with their online friends while they shop. Social Retailing uses an interactive mirror, also called a Magic Mirror, to transmit high-bandwidth video to friends, who can respond to the customer’s selections via instant messaging sent to the mirror. Friends can also send suggestions in the form of product images from an online catalog tied to the Social Retailing application.” *See* Digital Commerce 360 at 2. “The mirrors also allow shoppers to use touchscreen panels to select matching shoes and accessories. Consumers can also select other outfits from a database to be projected on the mirror in front of them, allowing them to try on the outfit without actually putting on the clothes.” *See* CBC at 1-2. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Magic Mirror 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 Magic Mirror
	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;	Magic Mirror expressly and/or inherently discloses and/or renders obvious obtaining a digital image from a camera. *See*, *e.g.*, disclosures below. "IconNicholson, a digital design agency, devised a system in 2007 at the request of designer Nanette Lepore that would make retailing a more social experience. Through an interactive mirror and webcam in the designer's space in Bloomingdale's New York flagship store, customers were able to include friends or parents in their shopping experience." *See* Forbes at 2-3. "A new dressing room technology called the 'Magic Mirror' from New York-based digital technology developer IconNicholson claims to do just that. The company debuted its Magic Mirror concept last week at the National Retail Federation's industry conference in New York amid plenty of buzz. The high-tech, three-paneled interactive mirror has two cameras located on either side. "Using a cell phone equipped with wireless technology, shoppers point the camera at the mirror and transmit their image to a Web site - yet to be determined - where family and friends can see them model different outfits. Through the Web site, friends can vote on the outfits as well text-message their opinions to shoppers. Shoppers can text-message back using their cell phones. Those messages then appear on the interactive mirror. Additionally, the mirror displays recommendations of other styles and accessories that shoppers can try on. By touching those options, shoppers can see close-ups of the clothes, where they're located in the store and their prices." *See* CNN Money at 1. "Social Retailing, originally designed by IconNicholson for apparel fashion client Nanette Lepore Inc., combines social networking and the brick-and-mortar store so customers can connect live with their online friends while they shop. Social Retailing uses an interactive mirror, also called a Magic Mirror, to transmit high-bandwidth video to friends, who can respond to the customer's selections via instant messaging sent to

Asserted Claim of the '109 Patent	Exemplary Citations to Magic Mirror
	the mirror. Friends can also send suggestions in the form of product images from an online catalog tied to the Social Retailing application." *See* Digital Commerce 360 at 2. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Magic Mirror 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;	Magic Mirror 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) Magic Mirror 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;	Magic Mirror 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. "A new dressing room technology called the 'Magic Mirror' from New York-based digital technology developer IconNicholson claims to do just that. The company debuted its Magic Mirror concept last week at the National Retail Federation's industry conference in New York amid plenty of buzz. The high-tech, three-paneled interactive mirror has two cameras located on either side." *See* CNN Money at 1. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Magic Mirror 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 Magic Mirror
	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;	Magic Mirror 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. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Magic Mirror 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;	Magic Mirror 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. "Through inventory tagging, the dressing room registers the items shoppers take in to try on and produces video and images of the merchandise. A touch screen gives shoppers the option to invite friends. Through their personal cellphone or key pad, they can then send an e-mail or text message to friends. By clicking on a url and logging on to a Web site, the friends can see the items being tried on and make comments." *See* Forbes at 3. "Using a cell phone equipped with wireless technology, shoppers point the camera at the mirror and transmit their image to a Web site - yet to be determined - where family and friends can see them model different outfits. Through the Web site, friends can vote on the outfits as well text-message their opinions to shoppers. Shoppers can text-message back using their cell phones. Those messages then appear on the interactive mirror. Additionally, the mirror displays recommendations of other styles and accessories that shoppers can try on. By touching those options, shoppers can see close-ups of the clothes, where they're located in the store and their prices." *See* CNN Money at 1. "The mirrors also allow shoppers to use touchscreen panels to select matching shoes and accessories. Consumers can also select other outfits from a database to be projected on

Asserted Claim of the '109 Patent	Exemplary Citations to Magic Mirror
	the mirror in front of them, allowing them to try on the outfit without actually putting on the clothes." *See* CBC at 1-2. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Magic Mirror 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;	Magic Mirror 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. "Social Retailing, originally designed by IconNicholson for apparel fashion client Nanette Lepore Inc., combines social networking and the brick-and-mortar store so customers can connect live with their online friends while they shop. Social Retailing uses an interactive mirror, also called a Magic Mirror, to transmit high-bandwidth video to friends, who can respond to the customer's selections via instant messaging sent to the mirror. Friends can also send suggestions in the form of product images from an online catalog tied to the Social Retailing application." *See* Digital Commerce 360 at 2. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Magic Mirror 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	Magic Mirror 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.

Asserted Claim of the '109 Patent	Exemplary Citations to Magic Mirror
	"A New York-based designer has come up with a mirror equipped with infrared technology that sends a live video feed to any mobile phone, email account or personal digital assistant device selected by a shopper." *See* Sydney Morning Herald. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Magic Mirror 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.	Magic Mirror 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. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Magic Mirror 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 Magic Mirror
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.	Magic Mirror 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. "A new dressing room technology called the 'Magic Mirror' from New York-based digital technology developer IconNicholson claims to do just that. The company debuted its Magic Mirror concept last week at the National Retail Federation's industry

Asserted Claim of the '109 Patent	Exemplary Citations to Magic Mirror
	conference in New York amid plenty of buzz. The high-tech, three-paneled interactive mirror has two cameras located on either side." *See* CNN Money at 1. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Magic Mirror 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 Magic Mirror
Claim 7	
7[pre]. The method of claim 1, further comprising the steps:	To the extent the preamble is limiting, Magic Mirror 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) Magic Mirror 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;	Magic Mirror expressly and/or inherently discloses and/or renders obvious obtaining a reference image. *See*, *e.g.*, disclosures below. "IconNicholson, a digital design agency, devised a system in 2007 at the request of designer Nanette Lepore that would make retailing a more social experience. Through an interactive mirror and webcam in the designer's space in Bloomingdale's New York

Asserted Claim of the ’109 Patent	Exemplary Citations to Magic Mirror
	flagship store, customers were able to include friends or parents in their shopping experience.” *See* Forbes at 2-3. “A new dressing room technology called the ‘Magic Mirror’ from New York-based digital technology developer IconNicholson claims to do just that. The company debuted its Magic Mirror concept last week at the National Retail Federation's industry conference in New York amid plenty of buzz. The high-tech, three-paneled interactive mirror has two cameras located on either side. “Using a cell phone equipped with wireless technology, shoppers point the camera at the mirror and transmit their image to a Web site - yet to be determined - where family and friends can see them model different outfits. Through the Web site, friends can vote on the outfits as well text-message their opinions to shoppers. Shoppers can text-message back using their cell phones. Those messages then appear on the interactive mirror. Additionally, the mirror displays recommendations of other styles and accessories that shoppers can try on. By touching those options, shoppers can see close-ups of the clothes, where they're located in the store and their prices.” *See* CNN Money at 1. “Social Retailing, originally designed by IconNicholson for apparel fashion client Nanette Lepore Inc., combines social networking and the brick-and-mortar store so customers can connect live with their online friends while they shop. Social Retailing uses an interactive mirror, also called a Magic Mirror, to transmit high-bandwidth video to friends, who can respond to the customer’s selections via instant messaging sent to the mirror. Friends can also send suggestions in the form of product images from an online catalog tied to the Social Retailing application.” *See* Digital Commerce 360 at 2. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Magic Mirror 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 Magic Mirror
7[b]. performing registration of the digital image with the reference image;	Magic Mirror expressly and/or inherently discloses and/or renders obvious performing registration of the digital image with the reference image. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Magic Mirror 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.	Magic Mirror 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. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Magic Mirror 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 Magic Mirror
Claim 8	
8. The method of claim 1, further comprising applying a translation transformation to move the image within display area of the monitor.	Magic Mirror expressly and/or inherently discloses and/or renders obvious comprising applying a translation transformation to move the image within display area of the monitor. *See*, *e.g.*, disclosures below. "A new dressing room technology called the 'Magic Mirror' from New York-based digital technology developer IconNicholson claims to do just that. The company debuted its Magic Mirror concept last week at the National Retail Federation's industry conference in New York amid plenty of buzz. The high-tech, three-paneled interactive mirror has two cameras located on either side." *See* CNN Money at 1.

Asserted Claim of the '109 Patent	Exemplary Citations to Magic Mirror
	This limitation would have been obvious to a person of ordinary skill in the art based on (1) Magic Mirror 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 Magic Mirror
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.	Magic Mirror 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) Magic Mirror 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 Magic Mirror
Claim 11	
11[pre]. The method of claim 1, further comprising:	To the extent the preamble is limiting, Magic Mirror 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 Magic Mirror
	This limitation would have been obvious to a person of ordinary skill in the art based on (1) Magic Mirror 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,	Magic Mirror 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]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Magic Mirror 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.	Magic Mirror expressly and/or inherently discloses and/or renders obvious varying resolution of the image according to the distance.This limitation would have been obvious to a person of ordinary skill in the art based on (1) Magic Mirror 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-19: Invalidity of U.S. Patent No. 8,982,109 in view of Saccade Mirror System ("Okumura II")

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.

The Saccade Mirror System ("Okumura II") expressly and/or inherently discloses and/or renders obvious the Asserted Claims of U.S. Patent No. 8,982,109 (the "'109 Patent"), as set forth in the chart below. 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.

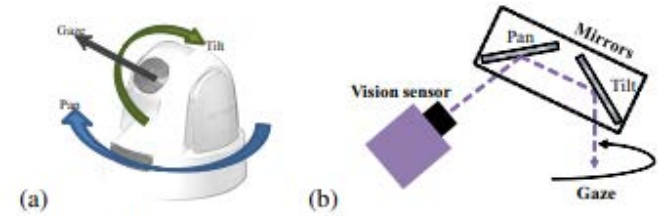
Okumura II anticipates the Asserted Claims of the '109 Patent. To the extent it is found Okumura II does not expressly disclose certain limitations in the Asserted Claims, such limitations are at least implicitly or inherently disclosed. Moreover, to the extent it is found that Okumura II does not anticipate the Asserted Claims, Okumura II 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.

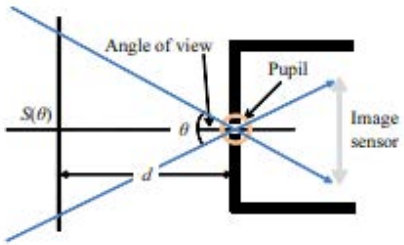
In these contentions, Defendants have relied in part on Plaintiff's Infringement Contentions. In those contentions, Plaintiff appears to pursue overly broad claim constructions in an effort to assert infringement where none exists, and to accuse products that do not infringe the claims. Defendants' assertion 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.

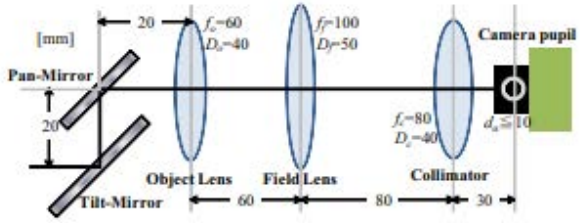
Defendants have endeavored to provide as much detail as possible in these contentions and, in doing so, have exceeded the level of detail required. The inclusion of specific details in some areas is not a concession that such details are required or that the omission of similar details in other areas 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.

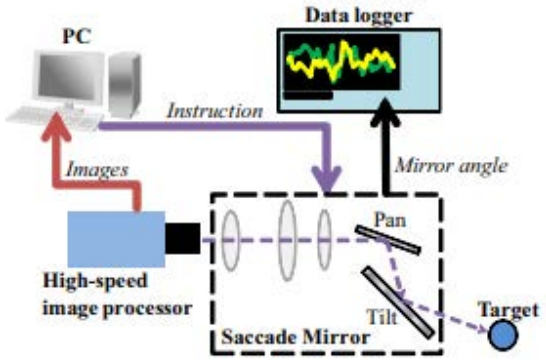
Asserted Claim of the '109 Patent	Exemplary Citations to Okumura II
Claim 1	
1[pre]. A method for operating a system having a monitor, a camera, and a processor, so as to display a mirror-mimicking image on the monitor, by performing non-ordered steps comprising:	To the extent the preamble is limiting, Okumura II expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. "Abstract—We developed an optical high-speed gaze controller, called the "Saccade Mirror", and used it to realize a high-speed pan/tilt camera with a high-speed image processor. Generally, in a pan/tilt camera, the gaze is controlled mechanically by rotational actuators. However, because pan/tilt cameras will be expected to use high-speed image processing (≥ 1000 fps), sufficiently high-speed performance of the gaze controller, comparable to the high frame rate, cannot be obtained with the usual method. In our system, the camera itself was fixed, and an external Saccade Mirror subsystem was used for optical gaze control. An arbitrary gaze direction within ±30 deg could be achieved in less than 3.5 ms." *See* page 6186. "The purpose of our study was to realize a high-speed pan/tilt camera that has the ability to change its gaze direction extremely quickly, at speeds comparable to the processing speed of a high-speed image processor, while still providing a sufficient angle of view. The term "gaze" used here means the direction in which images are captured by the camera, and "high-speed image processor" means a kind of camera (a vision sensor) that can realize both capturing and processing of more than 1000 images per second. The background of this research follows. It is said that more than 80 % of the sensory information that humans obtain is from the visual organs. For robots as well, visual servo systems have been widely used to grasp changing external environments. Vision sensors with a frame rate of 30 fps, such as CCDs, are mainly used in visual information processing. However, this approach cannot realize high-speed visual control because the image sampling rate in visual information processing is restricted to at most 30 Hz. In such cases, a high-speed image processor has been demonstrated to be quite useful [1]. On the other hand, in some applications, it is necessary to acquire images over a range wider than the camera's original angle of view. Hence, cameras whose gaze can be controlled, called pan/tilt cameras (or active vision systems), have been developed mainly for the purpose of monitoring, inspection, and so on. In a general pan/tilt camera,

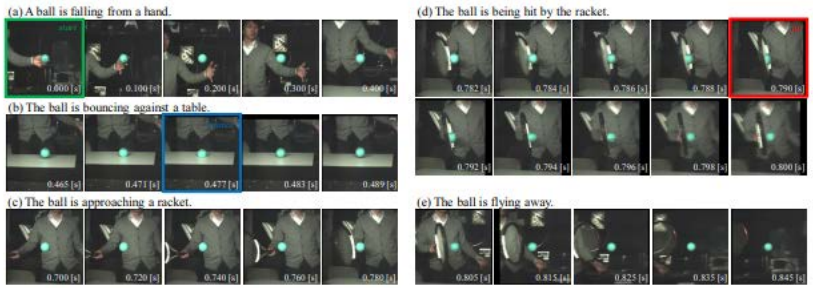
Asserted Claim of the '109 Patent	Exemplary Citations to Okumura II
	the camera is mounted on a two-axis rotational platform including actuators (Fig. 1(a)) [2]. If a high-speed image processor can control its gaze at a speed sufficiently high compared with its frame rate, various advanced applications are expected. Some examples are: • Observation of high-speed dynamic objects without motion blur. • Quasi-extension of the angle of view by combining multiple images taken from different gaze directions in real time. • Displaying multiple images from different gaze directions in real time using only one vision sensor. This kind of system is expected to be valuable in many vision applications, including robot vision, medical services, and broadcasting." *See* page 6186. "However, sufficient high-speed performance cannot be obtained even if the gaze direction of the high-speed image processor is controlled mechanically by rotational actuators. The time required to reach the desired gaze direction is usually more than 20 ms [3], whereas the imaging cycle of the high-speed image processor is less than 1 ms. This is a critical bottleneck to realize a high-speed pan/tilt camera, particularly for a visual servo system. To solve this issue, we developed an external high-speed gaze controller, called the Saccade Mirror. This name is based on the rapid movement of the human eye known as a saccade. Two-axis rotational mirrors, the critical parts of the system, respond in millisecond-order to rapidly control the gaze direction optically (Fig.1(b))." *See* page 6186.

Asserted Claim of the ’109 Patent	Exemplary Citations to Okumura II
	 Fig. 1. (a) Illustration of a general pan/tilt camera, and (b) our method involving gaze control using two-axis rotational mirrors. “A. Two-axis Rotational Mirrors for High-speed Gaze Control There have been several studies aimed at realizing a highspeed pan/tilt camera even with a conventional structure. However, the required level of performance has not been obtained. For example, Y. Nakabo has developed a 1 ms target tracking system, which is a good example of a pan/tilt camera with a high-speed image processor [3]. In this system, a high-speed image processor called Column Parallel Vision 1 (CPV1) is mounted on a two-axis rotational platform including high-speed actuators. Nevertheless, its response time for switching the gaze direction is more than 20 ms, much longer than the control cycle period of 1 ms. Also, the cutoff frequency of the gaze control in the visual feedback system is approximately 10 Hz, whereas the regulation, or imaging, rate is 1 kHz. For the millisecond-order control that we aim for, the inertia of the rotating parts must be reduced as much as possible. We focused attention on two-axis rotational mirrors for gaze control, as described in the introduction section. In this case, because the only rotating parts are the two mirrors, the inertia of that subsystem can be considerably reduced. However, two-axis rotational mirrors have not been adopted often for pan/tilt cameras. They are mainly used for scanning non-diverging bundles of rays, such as laser beams. For example, J. Taylor et al. and H. Kim et al. both developed depth measurement systems (a kind of laser range finder) using a camera, a laser, and two-axis rotational mirrors [4], [5].

Asserted Claim of the '109 Patent	Exemplary Citations to Okumura II
	If we use rotational mirrors for the pan/tilt camera, one critical issue is that the obtained angle of view is significantly restricted because the mirrors are small and are constructed to rotate on two axes. A model of the system geometry now follows. A pinhole camera model is shown in Fig. 2 [6]. The angle of view θ in Fig. 2 is defined as the angular extent of a given scene in the camera. Rays from the scene are concentrated at the pinhole. The point where the bundle of rays is concentrated is called the pupil. The relationship between θ and S(θ) in Fig. 2 is presented here. S(θ) is the area of a certain image plane a distance d away from the center of the pupil. If θ becomes larger, S(θ) will also obviously become larger. For gaze control with mirrors, if a wide angle of view is required, large mirrors will also be required. Thus, it is not easy to realize both a wide angle of view and high-speed performance at the same time because large mirrors are difficult to drive quickly. This will be even more difficult particularly when using independent two-axis mirrors. We call the mirror near the pupil the "pan-mirror" and the other one the "tilt-mirror." If a certain wide controllable gaze range is needed, the required size of the tilt-mirror will be larger than that of the pan-mirror because the area through which rays pass on the tilt-mirror varies depending on the driven angle of the pan-mirror." *See* page 6187.  Fig. 2. Angle of view in the model of a pinhole camera. "IV. PROTOTYPE SACCADE MIRROR

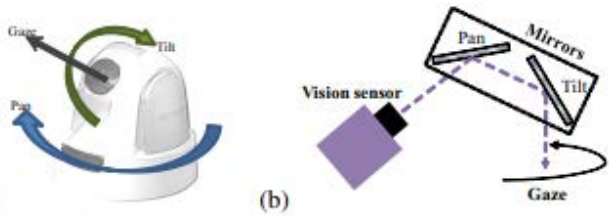
Asserted Claim of the '109 Patent	Exemplary Citations to Okumura II
	In this section, we describe a prototype Saccade Mirror developed with some commercially available devices. A. Optical Setup For high-speed gaze control, we used rotational mirrors originally designed for laser scanning (galvanometer mirrors M2 manufactured by GSI Group), and for the pupil shift lenses, we used three achromatic lenses (Edmund Optics). The setup is shown in Fig. 9, and the optical specifications were as follows: • Gazing angle range, ϕ: ±30 deg • Maximum beam aperture: 30 mm • Maximum angle of view, β: 38.6 deg (measured), 40 deg (designed)" *See* page 6189.  Fig. 9. The optical setup of the prototype. "V. MILLISECOND-ORDER HIGH-SPEED PAN/TILT CAMERA A. Setup for Target Tracking We developed a millisecond-order high-speed pan/tilt camera using the prototype Saccade Mirror described above and a high-speed image processor. We used the camera to implement a target tracking application (Fig. 11). We used IDP-512e as the high-speed

Asserted Claim of the '109 Patent	Exemplary Citations to Okumura II
	image processor [9] and a PC for both image processing and mirror control. The detailed specifications are as follows: • PC: DELL Precision T7400. • CPU: Xeon, 2.83 GHz. • RAM: 3.25 GB. • OS: Windows XP Professional, Service Pack 2." *See* page 6190.  Fig. 11. System setup for target tracking. "D. Observation of Moving Ball Our millisecond-order pan/tilt camera should be useful for observing or evaluating high-speed dynamic phenomena with high resolution and no motion blur. If only a high-speed camera is used, the entire range of the dynamic motion must be let into the visual field of the camera using a wide-angle lens. Thus, the resolution of the desired area becomes

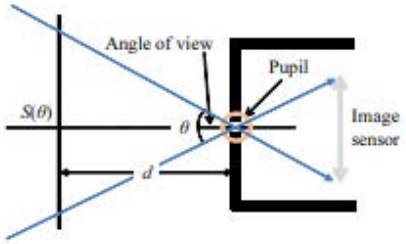
Asserted Claim of the ’109 Patent	Exemplary Citations to Okumura II
	relatively low. Moreover, motion blur also appears because the target moves at high speed. We focused on applications in the field of sports. Balls in baseball, football or tennis are difficult to observe continuously because the velocity vectors of the balls fluctuate extremely rapidly during games. The ability to acquire dynamic images of the fast-moving balls would make significant contributions to broadcasting techniques, practice for players, product development for sports goods manufacturers, and so on. Therefore, as an exploratory experiment, we observed a dynamic rubber ball using our millisecond-order pan/tilt camera. The target suddenly came into the visual field, bounced against a table, and was finally hit by a racket. The image sequences are shown in Fig. 13. To keep the images of the target ball stationary, they are corrected so that the center of mass in each image is placed at the center. Although the instant where the ball bounces or is hit (change of the velocity vector) is conventionally difficult to capture, clearly observable image sequences could be successfully obtained with our system. The ball’s estimated trajectory is also shown in Fig. 14.” *See* page 6190-6191.  Fig. 13. Image sequences of a dynamic rubber ball: The ball is (a) falling from a hand, (b) bouncing against a table, (c) approaching a racket, (d) being hit by the racket, and (e) flying away. “VI. CONCLUSION

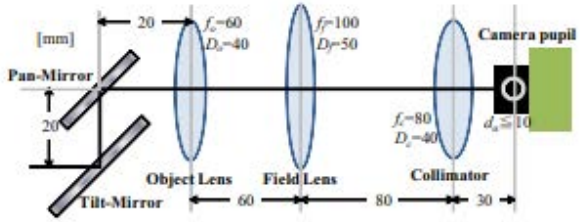
Asserted Claim of the '109 Patent	Exemplary Citations to Okumura II
	In this paper, we proposed an optical high-speed gaze controller, called the Saccade Mirror. The developed prototype successfully demonstrated a response time as low as 3.5 ms. We also developed a millisecond-order pan/tilt camera using this prototype and a high-speed image processor, and we used it to implement a target tracking application. The performance (in terms of cutoff frequency) was almost ten times higher than that of a conventional mechanical pan/tilt camera. We demonstrated the utility of the system for the field of sports with an exploratory experiment in which a fast-moving rubber ball was observed. In future work, we intend to make improvements to the prototype and other systems to be developed, such as construction of a higher performance prototype, implementing other practical applications, and so on." *See* page 6191. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Okumura 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[a]. obtaining a digital image from a camera;	To the extent the preamble is limiting, Okumura II expressly and/or inherently discloses and/or renders obvious obtaining a digital image from a camera. *See*, *e.g.*, disclosures below. "Abstract—We developed an optical high-speed gaze controller, called the "Saccade Mirror", and used it to realize a high-speed pan/tilt camera with a high-speed image processor. Generally, in a pan/tilt camera, the gaze is controlled mechanically by rotational actuators. However, because pan/tilt cameras will be expected to use high-speed image processing (≥ 1000 fps), sufficiently high-speed performance of the gaze controller, comparable to the high frame rate, cannot be obtained with the usual method. In our system, the camera itself was fixed, and an external Saccade Mirror subsystem

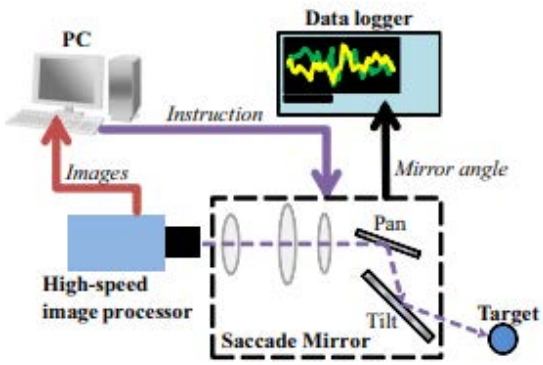
Asserted Claim of the '109 Patent	Exemplary Citations to Okumura II
	was used for optical gaze control. An arbitrary gaze direction within ±30 deg could be achieved in less than 3.5 ms." *See* page 6186. "The purpose of our study was to realize a high-speed pan/tilt camera that has the ability to change its gaze direction extremely quickly, at speeds comparable to the processing speed of a high-speed image processor, while still providing a sufficient angle of view. The term "gaze" used here means the direction in which images are captured by the camera, and "high-speed image processor" means a kind of camera (a vision sensor) that can realize both capturing and processing of more than 1000 images per second. The background of this research follows. It is said that more than 80 % of the sensory information that humans obtain is from the visual organs. For robots as well, visual servo systems have been widely used to grasp changing external environments. Vision sensors with a frame rate of 30 fps, such as CCDs, are mainly used in visual information processing. However, this approach cannot realize high-speed visual control because the image sampling rate in visual information processing is restricted to at most 30 Hz. In such cases, a high-speed image processor has been demonstrated to be quite useful [1]. On the other hand, in some applications, it is necessary to acquire images over a range wider than the camera's original angle of view. Hence, cameras whose gaze can be controlled, called pan/tilt cameras (or active vision systems), have been developed mainly for the purpose of monitoring, inspection, and so on. In a general pan/tilt camera, the camera is mounted on a two-axis rotational platform including actuators (Fig. 1(a)) [2]. If a high-speed image processor can control its gaze at a speed sufficiently high compared with its frame rate, various advanced applications are expected. Some examples are: • Observation of high-speed dynamic objects without motion blur. • Quasi-extension of the angle of view by combining multiple images taken from different gaze directions in real time.

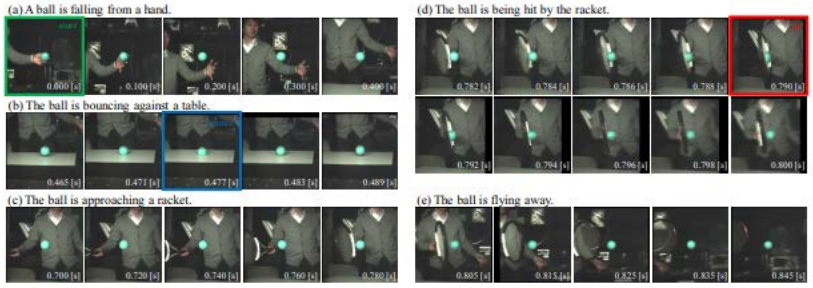
Asserted Claim of the '109 Patent	Exemplary Citations to Okumura II
	• Displaying multiple images from different gaze directions in real time using only one vision sensor. This kind of system is expected to be valuable in many vision applications, including robot vision, medical services, and broadcasting." *See* page 6186. "However, sufficient high-speed performance cannot be obtained even if the gaze direction of the high-speed image processor is controlled mechanically by rotational actuators. The time required to reach the desired gaze direction is usually more than 20 ms [3], whereas the imaging cycle of the high-speed image processor is less than 1 ms. This is a critical bottleneck to realize a high-speed pan/tilt camera, particularly for a visual servo system. To solve this issue, we developed an external high-speed gaze controller, called the Saccade Mirror. This name is based on the rapid movement of the human eye known as a saccade. Two-axis rotational mirrors, the critical parts of the system, respond in millisecond-order to rapidly control the gaze direction optically (Fig.1(b))." *See* page 6186.  Fig. 1. (a) Illustration of a general pan/tilt camera, and (b) our method involving gaze control using two-axis rotational mirrors. "A. Two-axis Rotational Mirrors for High-speed Gaze Control There have been several studies aimed at realizing a high1speed pan/tilt camera even with a conventional structure. However, the required level of performance has not been obtained. For example, Y. Nakabo has developed a 1 ms target tracking system, which is a good example of a pan/tilt camera with a high-speed image processor [3]. In this system, a high-speed image processor called Column Parallel Vision 1 (CPV1) is mounted on a two-axis rotational platform including high-speed actuators. Nevertheless, its response time for switching the gaze direction is more than 20 ms, much longer than the control

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	cycle period of 1 ms. Also, the cutoff frequency of the gaze control in the visual feedback system is approximately 10 Hz, whereas the regulation, or imaging, rate is 1 kHz. For the millisecond-order control that we aim for, the inertia of the rotating parts must be reduced as much as possible. We focused attention on two-axis rotational mirrors for gaze control, as described in the introduction section. In this case, because the only rotating parts are the two mirrors, the inertia of that subsystem can be considerably reduced. However, two-axis rotational mirrors have not been adopted often for pan/tilt cameras. They are mainly used for scanning non-diverging bundles of rays, such as laser beams. For example, J. Taylor et al. and H. Kim et al. both developed depth measurement systems (a kind of laser range finder) using a camera, a laser, and two-axis rotational mirrors [4], [5]. If we use rotational mirrors for the pan/tilt camera, one critical issue is that the obtained angle of view is significantly restricted because the mirrors are small and are constructed to rotate on two axes. A model of the system geometry now follows. A pinhole camera model is shown in Fig. 2 [6]. The angle of view θ in Fig. 2 is defined as the angular extent of a given scene in the camera. Rays from the scene are concentrated at the pinhole. The point where the bundle of rays is concentrated is called the pupil. The relationship between θ and S(θ) in Fig. 2 is presented here. S(θ) is the area of a certain image plane a distance d away from the center of the pupil. If θ becomes larger, S(θ) will also obviously become larger. For gaze control with mirrors, if a wide angle of view is required, large mirrors will also be required. Thus, it is not easy to realize both a wide angle of view and high-speed performance at the same time because large mirrors are difficult to drive quickly. This will be even more difficult particularly when using independent two-axis mirrors. We call the mirror near the pupil the "pan-mirror" and the other one the "tilt-mirror." If a certain wide controllable gaze range is needed, the required size of the tilt-mirror will be

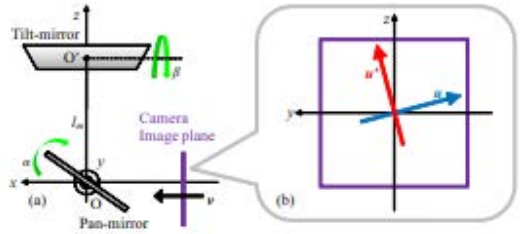
Asserted Claim of the '109 Patent	Exemplary Citations to Okumura II
	larger than that of the pan-mirror because the area through which rays pass on the tilt-mirror varies depending on the driven angle of the pan-mirror." *See* page 6187.  Fig. 2. Angle of view in the model of a pinhole camera. "IV. PROTOTYPE SACCADE MIRROR In this section, we describe a prototype Saccade Mirror developed with some commercially available devices. A. Optical Setup For high-speed gaze control, we used rotational mirrors originally designed for laser scanning (galvanometer mirrors M2 manufactured by GSI Group), and for the pupil shift lenses, we used three achromatic lenses (Edmund Optics). The setup is shown in Fig. 9, and the optical specifications were as follows: • Gazing angle range, ϕ: ±30 deg • Maximum beam aperture: 30 mm • Maximum angle of view, β: 38.6 deg (measured), 40 deg (designed)" *See* page 6189.

Asserted Claim of the ’109 Patent	Exemplary Citations to Okumura II
	 Fig. 9. The optical setup of the prototype. “V. MILLISECOND-ORDER HIGH-SPEED PAN/TILT CAMERA A. Setup for Target Tracking We developed a millisecond-order high-speed pan/tilt camera using the prototype Saccade Mirror described above and a high-speed image processor. We used the camera to implement a target tracking application (Fig. 11). We used IDP-512e as the high-speed image processor [9] and a PC for both image processing and mirror control. The detailed specifications are as follows: • PC: DELL Precision T7400. • CPU: Xeon, 2.83 GHz. • RAM: 3.25 GB. • OS: Windows XP Professional, Service Pack 2.” *See* page 6190.

Asserted Claim of the '109 Patent	Exemplary Citations to Okumura II
	 Fig. 11. System setup for target tracking. "D. Observation of Moving Ball Our millisecond-order pan/tilt camera should be useful for observing or evaluating high-speed dynamic phenomena with high resolution and no motion blur. If only a high-speed camera is used, the entire range of the dynamic motion must be let into the visual field of the camera using a wide-angle lens. Thus, the resolution of the desired area becomes relatively low. Moreover, motion blur also appears because the target moves at high speed. We focused on applications in the field of sports. Balls in baseball, football or tennis are difficult to observe continuously because the velocity vectors of the balls fluctuate extremely rapidly during games. The ability to acquire dynamic images of the fast-moving balls would make significant contributions to broadcasting techniques, practice for players, product development for sports goods manufacturers, and so on. Therefore, as an exploratory experiment, we observed a dynamic rubber ball using our millisecond-order pan/tilt camera. The target suddenly came into the visual field, bounced against a table, and was finally hit by a racket.

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	The image sequences are shown in Fig. 13. To keep the images of the target ball stationary, they are corrected so that the center of mass in each image is placed at the center. Although the instant where the ball bounces or is hit (change of the velocity vector) is conventionally difficult to capture, clearly observable image sequences could be successfully obtained with our system. The ball's estimated trajectory is also shown in Fig. 14." *See* page 6190-6191.  Fig. 13. Image sequences of a dynamic rubber ball: The ball is (a) falling from a hand, (b) bouncing against a table, (c) approaching a racket, (d) being hit by the racket, and (e) flying away. "VI. CONCLUSION In this paper, we proposed an optical high-speed gaze controller, called the Saccade Mirror. The developed prototype successfully demonstrated a response time as low as 3.5 ms. We also developed a millisecond-order pan/tilt camera using this prototype and a high-speed image processor, and we used it to implement a target tracking application. The performance (in terms of cutoff frequency) was almost ten times higher than that of a conventional mechanical pan/tilt camera. We demonstrated the utility of the system for the field of sports with an exploratory experiment in which a fast-moving rubber ball was observed.

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	In future work, we intend to make improvements to the prototype and other systems to be developed, such as construction of a higher performance prototype, implementing other practical applications, and so on." *See* page 6191. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Okumura 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[b]. flipping the image about a vertical axis so as to reverse right and left sides of the image;	Okumura II 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. "III. DETAILED OPTICAL THEORY A. Gaze and Visibility Model Here, the gaze direction and appearance of an image through two mirrors are mathematically considered. The two mirrors are mounted as shown in Fig.4.

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	 Fig. 4. (a) Mirror alignment, and (b) appearance of an image through the mirrors. The pan-mirror surface ($z = (\tan\alpha)x$) includes the origin, and its rotational axis is the y-axis. The tilt-mirror surface ($z = (\tan\beta)y + l_m$) includes $\mathbf{O}'(0, 0, l_m)$, and its rotational axis is parallel to the x-axis. The original gaze direction lies in the $+x$-axis direction ($\boldsymbol{v} = ^T (1, 0, 0)$). A matrix Sp that gives a line-symmetric transformation with respect to the pan-mirror surface and a matrix St that gives a line-symmetric transformation with respect to the tilt-mirror surface are expressed as:

$$\begin{cases} \mathbf{S_p} = \begin{bmatrix} \cos(2\alpha) & 0 & \sin(2\alpha) \\ 0 & 1 & 0 \\ -\sin(2\alpha) & 0 & \cos(2\alpha) \end{bmatrix} \\ \mathbf{S_t} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos(2\alpha) & -\sin(2\alpha) \\ 0 & \sin(2\alpha) & -\cos(2\alpha) \end{bmatrix} \end{cases} \quad (1)$$

Position vectors, $\boldsymbol{a} =^T (a_x, a_y, a_z)$ and $\boldsymbol{b} =^T (b_x, b_y, b_z)$ that satisfy $x < 0$ near the x-axis are considered. $\boldsymbol{a}^*$, the line-symmetric displacement mapping of $\boldsymbol{a}$ with respect to the two mirrors, is calculated as:

$$\boldsymbol{a}^* = \mathbf{S_t}\left(\mathbf{S_p}\begin{bmatrix} a_x \\ a_y \\ a_z \end{bmatrix} - \begin{bmatrix} 0 \\ 0 \\ l_m \end{bmatrix}\right) + \begin{bmatrix} 0 \\ 0 \\ l_m \end{bmatrix} \quad (2)$$

When $a_1 = b_1 - 1$, $a_2 = b_2$, and $a_3 = b_3$ are assumed, $\boldsymbol{b} - \boldsymbol{a} = \boldsymbol{v}$. Thus, the gaze direction through the mirrors, $\boldsymbol{b}^* - \boldsymbol{a}^* = \boldsymbol{v}^*$, is calculated using (2):

$$\boldsymbol{v}^* = \begin{bmatrix} -\sin\phi_p \\ \cos\phi_p \cos\phi_t \\ \cos\phi_p \sin\phi_t \end{bmatrix} \quad (3)$$

where $2\alpha = \frac{\pi}{2} + \phi_p$, $2\beta = \frac{\pi}{2} + \phi_t$. In addition, a general pan/tilt camera has a gaze vector $\boldsymbol{v_g}$:

$$\boldsymbol{v_g} = \begin{bmatrix} -\sin\phi_p \cos\phi_t \\ \cos\phi_p \\ \sin\phi_t \end{bmatrix} \quad (4)$$

On the other hand, when $a_1 = b_1$, $b_2 - a_2 = \cos\theta$, and $b_3 - a_3 = \sin\theta$ are assumed, $\boldsymbol{b} - \boldsymbol{a}$ is a vector $\boldsymbol{u} =^T (0, \cos\theta, \sin\theta)$ on the camera image plane. Then, its mapping with respect to the mirrors is as follows:

$$\boldsymbol{u}^* = \begin{bmatrix} \sin\theta\cos\phi_p \\ -\cos\theta\sin\phi_t + \sin\theta\sin\phi_t\cos\phi_t \\ \cos\theta\cos\phi_t + \sin\theta\sin\phi_p\sin\phi_t \end{bmatrix} \quad (5)$$

To compare $\boldsymbol{u}$ and $\boldsymbol{u}^*$, $\boldsymbol{u}^*$ is rotated onto the x-axis using a matrix:

$$\mathbf{R} = \begin{bmatrix} -\sin\phi_p & \cos\phi_p\cos\phi_t & \cos\phi_p\sin\phi_t \\ -\cos\phi_p & -\sin\phi_p\cos\phi_t & -\sin\phi_p\sin\phi_t \\ 0 & -\sin\phi_t & \cos\phi_t \end{bmatrix} \quad (6)$$

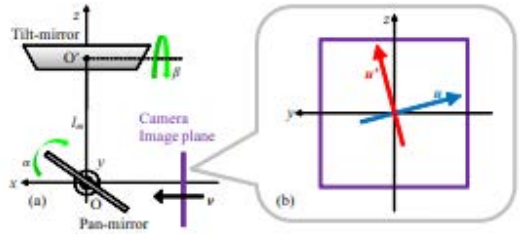
Then,

$$\boldsymbol{u}' = \mathbf{R}\boldsymbol{u}^* = \begin{bmatrix} 0 \\ -\sin\theta \\ cos\theta \end{bmatrix} = \begin{bmatrix} 0 \\ \cos(\theta + \frac{\pi}{2}) \\ \sin(\theta + \frac{\pi}{2}) \end{bmatrix} \quad (7)$$

is obtained. That is, the image through the mirrors is inclined at 90 deg, as shown in Fig. 4(b), and the camera should be tilted.

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	" *See* pages 6187-6188. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Okumura 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[c]. applying a transformation mapping to the image to modify the image such that it appears to mimic a reflection of a mirror;	Okumura II 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. "III. DETAILED OPTICAL THEORY A. Gaze and Visibility Model Here, the gaze direction and appearance of an image through two mirrors are mathematically considered. The two mirrors are mounted as shown in Fig.4.

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Position vectors, $\boldsymbol{a} =^T (a_x, a_y, a_z)$ and $\boldsymbol{b} =^T (b_x, b_y, b_z)$ that satisfy $x < 0$ near the x-axis are considered. $\boldsymbol{a}^*$, the line-symmetric displacement mapping of $\boldsymbol{a}$ with respect to the two mirrors, is calculated as:

$$\boldsymbol{a}^* = \mathbf{S_t}\left(\mathbf{S_p}\begin{bmatrix} a_x \\ a_y \\ a_z \end{bmatrix} - \begin{bmatrix} 0 \\ 0 \\ l_m \end{bmatrix}\right) + \begin{bmatrix} 0 \\ 0 \\ l_m \end{bmatrix} \quad (2)$$

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To compare $\boldsymbol{u}$ and $\boldsymbol{u}^*$, $\boldsymbol{u}^*$ is rotated onto the x-axis using a matrix:

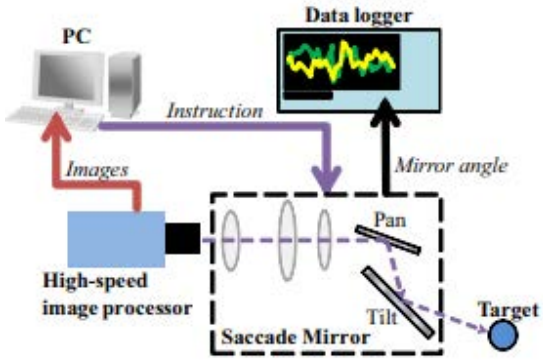
$$\mathbf{R} = \begin{bmatrix} -\sin\phi_p & \cos\phi_p\cos\phi_t & \cos\phi_p\sin\phi_t \\ -\cos\phi_p & -\sin\phi_p\cos\phi_t & -\sin\phi_p\sin\phi_t \\ 0 & -\sin\phi_t & \cos\phi_t \end{bmatrix} \quad (6)$$

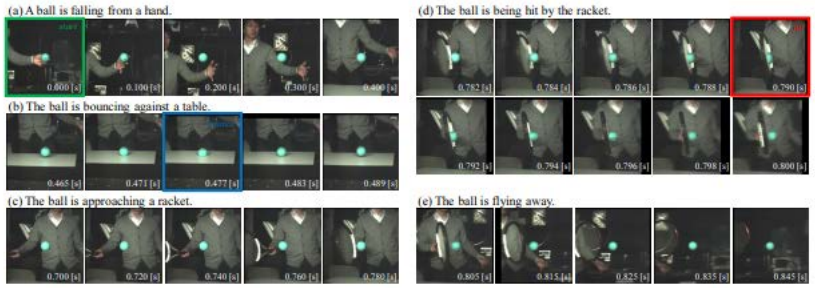
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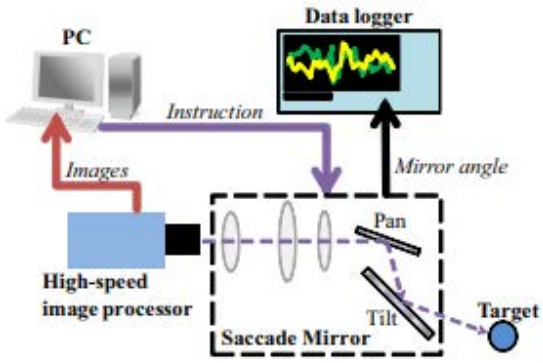
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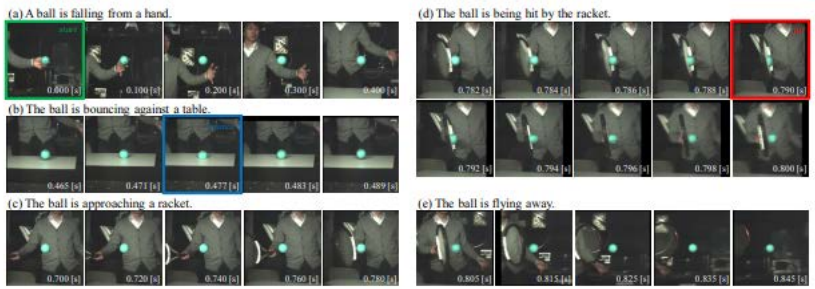
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1[d]. resizing the image to reduce variations caused by changes in object's distance to the camera;	Okumura II expressly and/or inherently discloses and/or renders obvious resizing the image to reduce variations caused by changes in object's distance to the camera. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Okumura 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[e]. displaying the image on the monitor after performing the flipping, transformation mapping, and resizing;	Okumura II 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. "V. MILLISECOND-ORDER HIGH-SPEED PAN/TILT CAMERA A. Setup for Target Tracking We developed a millisecond-order high-speed pan/tilt camera using the prototype Saccade Mirror described above and a high-speed image processor. We used the camera to implement a target tracking application (Fig. 11). We used IDP-512e as the high-speed image processor [9] and a PC for both image processing and mirror control. The detailed specifications are as follows: • PC: DELL Precision T7400.

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	• CPU: Xeon, 2.83 GHz. • RAM: 3.25 GB. • OS: Windows XP Professional, Service Pack 2." *See* page 6190.  Fig. 11. System setup for target tracking. "D. Observation of Moving Ball Our millisecond-order pan/tilt camera should be useful for observing or evaluating high-speed dynamic phenomena with high resolution and no motion blur. If only a high-speed camera is used, the entire range of the dynamic motion must be let into the visual field of the camera using a wide-angle lens. Thus, the resolution of the desired area becomes relatively low. Moreover, motion blur also appears because the target moves at high speed. We focused on applications in the field of sports. Balls in baseball, football or tennis are difficult to observe continuously because the velocity vectors of the balls fluctuate extremely rapidly during games. The ability to acquire dynamic images of the fast-

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	moving balls would make significant contributions to broadcasting techniques, practice for players, product development for sports goods manufacturers, and so on. Therefore, as an exploratory experiment, we observed a dynamic rubber ball using our millisecond-order pan/tilt camera. The target suddenly came into the visual field, bounced against a table, and was finally hit by a racket. The image sequences are shown in Fig. 13. To keep the images of the target ball stationary, they are corrected so that the center of mass in each image is placed at the center. Although the instant where the ball bounces or is hit (change of the velocity vector) is conventionally difficult to capture, clearly observable image sequences could be successfully obtained with our system. The ball's estimated trajectory is also shown in Fig. 14." *See* page 6190-6191.  Fig. 13. Image sequences of a dynamic rubber ball: The ball is (a) falling from a hand, (b) bouncing against a table, (c) approaching a racket, (d) being hit by the racket, and (e) flying away. "VI. CONCLUSION In this paper, we proposed an optical high-speed gaze controller, called the Saccade Mirror. The developed prototype successfully demonstrated a response time as low as 3.5 ms. We also developed a millisecond-order pan/tilt camera using this prototype and a high-speed image processor, and we used it to implement a target tracking application. The performance (in terms of cutoff frequency) was almost ten times higher than that of

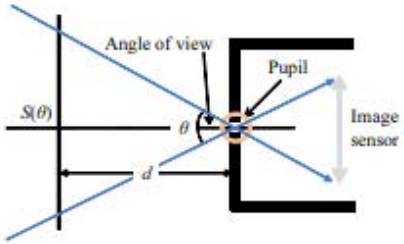
Asserted Claim of the '109 Patent	Exemplary Citations to Okumura II
	a conventional mechanical pan/tilt camera. We demonstrated the utility of the system for the field of sports with an exploratory experiment in which a fast-moving rubber ball was observed. In future work, we intend to make improvements to the prototype and other systems to be developed, such as construction of a higher performance prototype, implementing other practical applications, and so on." *See* page 6191. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Okumura 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 the non-ordered steps are performed on a series of images of a live video feed from the camera;	Okumura II 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. "V. MILLISECOND-ORDER HIGH-SPEED PAN/TILT CAMERA A. Setup for Target Tracking We developed a millisecond-order high-speed pan/tilt camera using the prototype Saccade Mirror described above and a high-speed image processor. We used the camera to implement a target tracking application (Fig. 11). We used IDP-512e as the high-speed image processor [9] and a PC for both image processing and mirror control. The detailed specifications are as follows: • PC: DELL Precision T7400. • CPU: Xeon, 2.83 GHz.

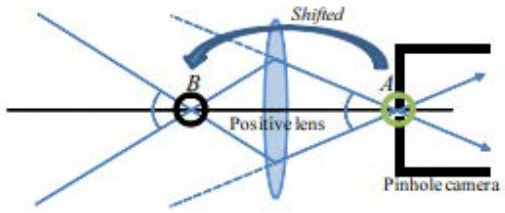
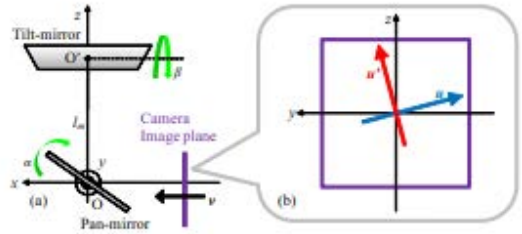
Asserted Claim of the '109 Patent	Exemplary Citations to Okumura II
	• RAM: 3.25 GB. • OS: Windows XP Professional, Service Pack 2." *See* page 6190.  Fig. 11. System setup for target tracking. "D. Observation of Moving Ball Our millisecond-order pan/tilt camera should be useful for observing or evaluating high-speed dynamic phenomena with high resolution and no motion blur. If only a high-speed camera is used, the entire range of the dynamic motion must be let into the visual field of the camera using a wide-angle lens. Thus, the resolution of the desired area becomes relatively low. Moreover, motion blur also appears because the target moves at high speed. We focused on applications in the field of sports. Balls in baseball, football or tennis are difficult to observe continuously because the velocity vectors of the balls fluctuate extremely rapidly during games. The ability to acquire dynamic images of the fast-moving balls would make significant contributions to broadcasting techniques, practice for players, product development for sports goods manufacturers, and so on.

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	Therefore, as an exploratory experiment, we observed a dynamic rubber ball using our millisecond-order pan/tilt camera. The target suddenly came into the visual field, bounced against a table, and was finally hit by a racket. The image sequences are shown in Fig. 13. To keep the images of the target ball stationary, they are corrected so that the center of mass in each image is placed at the center. Although the instant where the ball bounces or is hit (change of the velocity vector) is conventionally difficult to capture, clearly observable image sequences could be successfully obtained with our system. The ball's estimated trajectory is also shown in Fig. 14." *See* page 6190-6191.  Fig. 13. Image sequences of a dynamic rubber ball: The ball is (a) falling from a hand, (b) bouncing against a table, (c) approaching a racket, (d) being hit by the racket, and (e) flying away. "VI. CONCLUSION In this paper, we proposed an optical high-speed gaze controller, called the Saccade Mirror. The developed prototype successfully demonstrated a response time as low as 3.5 ms. We also developed a millisecond-order pan/tilt camera using this prototype and a high-speed image processor, and we used it to implement a target tracking application. The performance (in terms of cutoff frequency) was almost ten times higher than that of a conventional mechanical pan/tilt camera. We demonstrated the utility of the system for

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	the field of sports with an exploratory experiment in which a fast-moving rubber ball was observed. In future work, we intend to make improvements to the prototype and other systems to be developed, such as construction of a higher performance prototype, implementing other practical applications, and so on." *See* page 6191. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Okumura 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[g]. determining distance to a user appearing in the live video feed; and	Okumura II 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. "A. Two-axis Rotational Mirrors for High-speed Gaze Control There have been several studies aimed at realizing a high1speed pan/tilt camera even with a conventional structure. However, the required level of performance has not been obtained. For example, Y. Nakabo has developed a 1 ms target tracking system, which is a good example of a pan/tilt camera with a high-speed image processor [3]. In this system, a high-speed image processor called Column Parallel Vision 1 (CPV1) is mounted on a two-axis rotational platform including high-speed actuators. Nevertheless, its response time for switching the gaze direction is more than 20 ms, much longer than the control cycle period of 1 ms. Also, the cutoff frequency of the gaze control in the visual feedback system is approximately 10 Hz, whereas the regulation, or imaging, rate is 1 kHz. For the millisecond-order control that we aim for, the inertia of the rotating parts must be reduced as much as possible. We focused attention on two-axis rotational mirrors for gaze control, as described in the introduction section. In this case, because the only rotating parts are the two mirrors, the

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	inertia of that subsystem can be considerably reduced. However, two-axis rotational mirrors have not been adopted often for pan/tilt cameras. They are mainly used for scanning non-diverging bundles of rays, such as laser beams. For example, J. Taylor et al. and H. Kim et al. both developed depth measurement systems (a kind of laser range finder) using a camera, a laser, and two-axis rotational mirrors [4], [5]. If we use rotational mirrors for the pan/tilt camera, one critical issue is that the obtained angle of view is significantly restricted because the mirrors are small and are constructed to rotate on two axes. A model of the system geometry now follows. A pinhole camera model is shown in Fig. 2 [6]. The angle of view θ in Fig. 2 is defined as the angular extent of a given scene in the camera. Rays from the scene are concentrated at the pinhole. The point where the bundle of rays is concentrated is called the pupil. The relationship between θ and S(θ) in Fig. 2 is presented here. S(θ) is the area of a certain image plane a distance d away from the center of the pupil. If θ becomes larger, S(θ) will also obviously become larger. For gaze control with mirrors, if a wide angle of view is required, large mirrors will also be required. Thus, it is not easy to realize both a wide angle of view and high-speed performance at the same time because large mirrors are difficult to drive quickly. This will be even more difficult particularly when using independent two-axis mirrors. We call the mirror near the pupil the "pan-mirror" and the other one the "tilt-mirror." If a certain wide controllable gaze range is needed, the required size of the tilt-mirror will be larger than that of the pan-mirror because the area through which rays pass on the tilt-mirror varies depending on the driven angle of the pan-mirror." *See* page 6187.

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	 Fig. 2. Angle of view in the model of a pinhole camera. “B. Pupil Shift Lenses for Achieving Practical Angle of View We solved the issue described above by using positive lenses called “pupil shift lenses” [7]. The basic theory of the function of a pupil shift lens with a pinhole camera model is shown in Fig. 3. A bundle of rays can be refracted by the positive lens. Some of the bundle of rays that would otherwise be concentrated at B are also concentrated at the desired point A using the positive lens. Thinking of A as the pupil of the camera, this vision system including the positive lens has two pupils, the original one A and the shifted one B. This theory can be applied to our Saccade Mirror, enabling both a wide angle of view and high-speed performance to be realized at the same time. That is, if we need gaze control at a sufficiently high speed compared with the frame rate of a high-speed image processor, this combination should give a practical angle of view, or if we need a practical angle of view with a certain vision system, this combination give sufficiently high speed. For example, to obtain a 30 deg angle of view without pupil shift lenses, the inertia of the tilt-mirror is estimated to be more than one-hundred times larger compared with the case where pupil shift lenses are used.” *See* page 6187.

Asserted Claim of the ’109 Patent	Exemplary Citations to Okumura II
	 Fig. 3. Shift of the pupil using a positive lens. “III. DETAILED OPTICAL THEORY A. Gaze and Visibility Model Here, the gaze direction and appearance of an image through two mirrors are mathematically considered. The two mirrors are mounted as shown in Fig.4.  Fig. 4. (a) Mirror alignment, and (b) appearance of an image through the mirrors. The pan-mirror surface ($z = (\tan\alpha)x$) includes the origin, and its rotational axis is the y-axis. The tilt-mirror surface ($z = (\tan\beta)y + l_m$) includes $\mathbf{O}'(0, 0, l_m)$, and its rotational axis is parallel to the x-axis. The original gaze direction lies in the $+x$-axis direction ($\boldsymbol{v} = ^T (1, 0, 0)$).

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	A matrix Sp that gives a line-symmetric transformation with respect to the pan-mirror surface and a matrix St that gives a line-symmetric transformation with respect to the tilt-mirror surface are expressed as:

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$$\begin{cases} \mathbf{S_p} = \begin{bmatrix} \cos(2\alpha) & 0 & \sin(2\alpha) \\ 0 & 1 & 0 \\ -\sin(2\alpha) & 0 & \cos(2\alpha) \end{bmatrix} \\ \mathbf{S_t} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos(2\alpha) & -\sin(2\alpha) \\ 0 & \sin(2\alpha) & -\cos(2\alpha) \end{bmatrix} \end{cases} \quad (1)$$

Position vectors, $\boldsymbol{a} =^T (a_x, a_y, a_z)$ and $\boldsymbol{b} =^T (b_x, b_y, b_z)$ that satisfy $x < 0$ near the x-axis are considered. $\boldsymbol{a}^*$, the line-symmetric displacement mapping of $\boldsymbol{a}$ with respect to the two mirrors, is calculated as:

$$\boldsymbol{a}^* = \mathbf{S_t}\left(\mathbf{S_p}\begin{bmatrix} a_x \\ a_y \\ a_z \end{bmatrix} - \begin{bmatrix} 0 \\ 0 \\ l_m \end{bmatrix}\right) + \begin{bmatrix} 0 \\ 0 \\ l_m \end{bmatrix} \quad (2)$$

When $a_1 = b_1 - 1$, $a_2 = b_2$, and $a_3 = b_3$ are assumed, $\boldsymbol{b} - \boldsymbol{a} = \boldsymbol{v}$. Thus, the gaze direction through the mirrors, $\boldsymbol{b}^* - \boldsymbol{a}^* = \boldsymbol{v}^*$, is calculated using (2):

$$\boldsymbol{v}^* = \begin{bmatrix} -\sin\phi_p \\ \cos\phi_p \cos\phi_t \\ \cos\phi_p \sin\phi_t \end{bmatrix} \quad (3)$$

where $2\alpha = \frac{\pi}{2} + \phi_p$, $2\beta = \frac{\pi}{2} + \phi_t$. In addition, a general pan/tilt camera has a gaze vector $\boldsymbol{v_g}$:

$$\boldsymbol{v_g} = \begin{bmatrix} -\sin\phi_p \cos\phi_t \\ \cos\phi_p \\ \sin\phi_t \end{bmatrix} \quad (4)$$

On the other hand, when $a_1 = b_1$, $b_2 - a_2 = \cos\theta$, and $b_3 - a_3 = \sin\theta$ are assumed, $\boldsymbol{b} - \boldsymbol{a}$ is a vector $\boldsymbol{u} =^T (0, \cos\theta, \sin\theta)$ on the camera image plane. Then, its mapping with respect to the mirrors is as follows:

$$\boldsymbol{u}^* = \begin{bmatrix} \sin\theta\cos\phi_p \\ -\cos\theta\sin\phi_t + \sin\theta\sin\phi_t\cos\phi_t \\ \cos\theta\cos\phi_t + \sin\theta\sin\phi_p\sin\phi_t \end{bmatrix} \quad (5)$$

To compare $\boldsymbol{u}$ and $\boldsymbol{u}^*$, $\boldsymbol{u}^*$ is rotated onto the x-axis using a matrix:

$$\mathbf{R} = \begin{bmatrix} -\sin\phi_p & \cos\phi_p\cos\phi_t & \cos\phi_p\sin\phi_t \\ -\cos\phi_p & -\sin\phi_p\cos\phi_t & -\sin\phi_p\sin\phi_t \\ 0 & -\sin\phi_t & \cos\phi_t \end{bmatrix} \quad (6)$$

Then,

$$\boldsymbol{u}' = \mathbf{R}\boldsymbol{u}^* = \begin{bmatrix} 0 \\ -\sin\theta \\ cos\theta \end{bmatrix} = \begin{bmatrix} 0 \\ \cos(\theta + \frac{\pi}{2}) \\ \sin(\theta + \frac{\pi}{2}) \end{bmatrix} \quad (7)$$

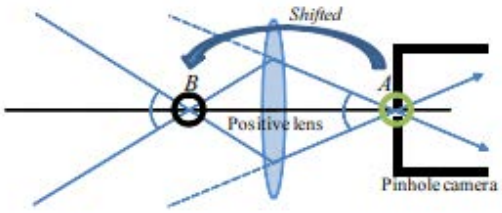
is obtained. That is, the image through the mirrors is inclined at 90 deg, as shown in Fig. 4(b), and the camera should be tilted.

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	" *See* pages 6187-6188. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Okumura 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[h]. varying rate at which the non-ordered steps are performed on the series of images according to the distance.	Okumura II 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. "Abstract—We developed an optical high-speed gaze controller, called the "Saccade Mirror", and used it to realize a high-speed pan/tilt camera with a high-speed image processor. Generally, in a pan/tilt camera, the gaze is controlled mechanically by rotational actuators. However, because pan/tilt cameras will be expected to use high-speed image processing (≥ 1000 fps), sufficiently high-speed performance of the gaze controller, comparable to the high frame rate, cannot be obtained with the usual method. In our system, the camera itself was fixed, and an external Saccade Mirror subsystem was used for optical gaze control. An arbitrary gaze direction within ±30 deg could be achieved in less than 3.5 ms." *See* page 6186. "The purpose of our study was to realize a high-speed pan/tilt camera that has the ability to change its gaze direction extremely quickly, at speeds comparable to the processing speed of a high-speed image processor, while still providing a sufficient angle of view. The term "gaze" used here means the direction in which images are captured by the camera, and "high-speed image processor" means a kind of camera (a vision sensor) that can realize both capturing and processing of more than 1000 images per second. The background of this research follows. It is said that more than 80 % of the sensory information that humans obtain is from the visual organs. For robots as well, visual servo systems have been widely used to grasp changing external environments. Vision sensors with a frame rate of 30 fps, such as CCDs, are mainly used in visual information

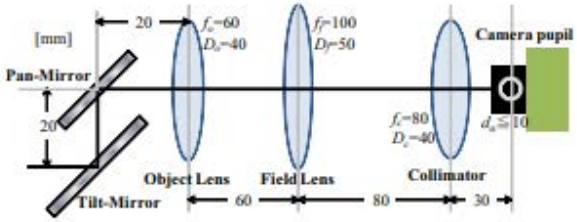
Asserted Claim of the '109 Patent	Exemplary Citations to Okumura II
	processing. However, this approach cannot realize high-speed visual control because the image sampling rate in visual information processing is restricted to at most 30 Hz. In such cases, a high-speed image processor has been demonstrated to be quite useful [1]. On the other hand, in some applications, it is necessary to acquire images over a range wider than the camera's original angle of view. Hence, cameras whose gaze can be controlled, called pan/tilt cameras (or active vision systems), have been developed mainly for the purpose of monitoring, inspection, and so on. In a general pan/tilt camera, the camera is mounted on a two-axis rotational platform including actuators (Fig. 1(a)) [2]. If a high-speed image processor can control its gaze at a speed sufficiently high compared with its frame rate, various advanced applications are expected. Some examples are: • Observation of high-speed dynamic objects without motion blur. • Quasi-extension of the angle of view by combining multiple images taken from different gaze directions in real time. • Displaying multiple images from different gaze directions in real time using only one vision sensor. This kind of system is expected to be valuable in many vision applications, including robot vision, medical services, and broadcasting." *See* page 6186. "However, sufficient high-speed performance cannot be obtained even if the gaze direction of the high-speed image processor is controlled mechanically by rotational actuators. The time required to reach the desired gaze direction is usually more than 20 ms [3], whereas the imaging cycle of the high-speed image processor is less than 1 ms. This is a critical bottleneck to realize a high-speed pan/tilt camera, particularly for a visual servo system. To solve this issue, we developed an external high-speed gaze controller, called the Saccade Mirror. This name is based on the rapid movement of the human eye known as a saccade. Two-axis rotational mirrors, the critical parts of the

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	system, respond in millisecond-order to rapidly control the gaze direction optically (Fig.1(b)).” *See* page 6186. “A. Two-axis Rotational Mirrors for High-speed Gaze Control There have been several studies aimed at realizing a high speed pan/tilt camera even with a conventional structure. However, the required level of performance has not been obtained. For example, Y. Nakabo has developed a 1 ms target tracking system, which is a good example of a pan/tilt camera with a high-speed image processor [3]. In this system, a high-speed image processor called Column Parallel Vision 1 (CPV1) is mounted on a two-axis rotational platform including high-speed actuators. Nevertheless, its response time for switching the gaze direction is more than 20 ms, much longer than the control cycle period of 1 ms. Also, the cutoff frequency of the gaze control in the visual feedback system is approximately 10 Hz, whereas the regulation, or imaging, rate is 1 kHz. For the millisecond-order control that we aim for, the inertia of the rotating parts must be reduced as much as possible.” *See* pages 6186-6187. “This theory can be applied to our Saccade Mirror, enabling both a wide angle of view and high-speed performance to be realized at the same time. That is, if we need gaze control at a sufficiently high speed compared with the frame rate of a high-speed image processor, this combination should give a practical angle of view, or if we need a practical angle of view with a certain vision system, this combination give sufficiently high speed. For example, to obtain a 30 deg angle of view without pupil shift lenses, the inertia of the tilt-mirror is estimated to be more than one-hundred times larger compared with the case where pupil shift lenses are used.” *See* page 6187. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Okumura 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.

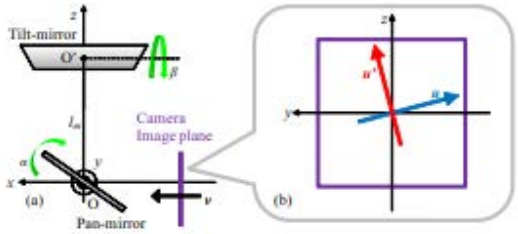
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Claim 2	
2. The method of claim 1, wherein the transformation mapping renders an image appearing to have been taken from a camera positioned at eye-level height and pointing horizontally.	Okumura II expressly and/or inherently discloses and/or renders 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. "B. Pupil Shift Lenses for Achieving Practical Angle of View We solved the issue described above by using positive lenses called "pupil shift lenses" [7]. The basic theory of the function of a pupil shift lens with a pinhole camera model is shown in Fig. 3. A bundle of rays can be refracted by the positive lens. Some of the bundle of rays that would otherwise be concentrated at B are also concentrated at the desired point A using the positive lens. Thinking of A as the pupil of the camera, this vision system including the positive lens has two pupils, the original one A and the shifted one B. This theory can be applied to our Saccade Mirror, enabling both a wide angle of view and high-speed performance to be realized at the same time. That is, if we need gaze control at a sufficiently high speed compared with the frame rate of a high-speed image processor, this combination should give a practical angle of view, or if we need a practical angle of view with a certain vision system, this combination give sufficiently high speed. For example, to obtain a 30 deg angle of view without pupil shift lenses, the inertia of the tilt-mirror is estimated to be more than one-hundred times larger compared with the case where pupil shift lenses are used." *See* page 6187.

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	 Fig. 3. Shift of the pupil using a positive lens. “A. Two-axis Rotational Mirrors for High-speed Gaze Control There have been several studies aimed at realizing a high speed pan/tilt camera even with a conventional structure. However, the required level of performance has not been obtained. For example, Y. Nakabo has developed a 1 ms target tracking system, which is a good example of a pan/tilt camera with a high-speed image processor [3]. In this system, a high-speed image processor called Column Parallel Vision 1 (CPV1) is mounted on a two-axis rotational platform including high-speed actuators. Nevertheless, its response time for switching the gaze direction is more than 20 ms, much longer than the control cycle period of 1 ms. Also, the cutoff frequency of the gaze control in the visual feedback system is approximately 10 Hz, whereas the regulation, or imaging, rate is 1 kHz. For the millisecond-order control that we aim for, the inertia of the rotating parts must be reduced as much as possible. We focused attention on two-axis rotational mirrors for gaze control, as described in the introduction section. In this case, because the only rotating parts are the two mirrors, the inertia of that subsystem can be considerably reduced. However, two-axis rotational mirrors have not been adopted often for pan/tilt cameras. They are mainly used for scanning non-diverging bundles of rays, such as laser beams. For example, J. Taylor et al. and H. Kim et al. both developed depth measurement systems (a kind of laser range finder) using a camera, a laser, and two-axis rotational mirrors [4], [5].

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	If we use rotational mirrors for the pan/tilt camera, one critical issue is that the obtained angle of view is significantly restricted because the mirrors are small and are constructed to rotate on two axes. A model of the system geometry now follows. A pinhole camera model is shown in Fig. 2 [6]. The angle of view θ in Fig. 2 is defined as the angular extent of a given scene in the camera. Rays from the scene are concentrated at the pinhole. The point where the bundle of rays is concentrated is called the pupil. The relationship between θ and S(θ) in Fig. 2 is presented here. S(θ) is the area of a certain image plane a distance d away from the center of the pupil. If θ becomes larger, S(θ) will also obviously become larger. For gaze control with mirrors, if a wide angle of view is required, large mirrors will also be required. Thus, it is not easy to realize both a wide angle of view and high-speed performance at the same time because large mirrors are difficult to drive quickly. This will be even more difficult particularly when using independent two-axis mirrors. We call the mirror near the pupil the "pan-mirror" and the other one the "tilt-mirror." If a certain wide controllable gaze range is needed, the required size of the tilt-mirror will be larger than that of the pan-mirror because the area through which rays pass on the tilt-mirror varies depending on the driven angle of the pan-mirror." *See* page 6187. A. Optical Setup For high-speed gaze control, we used rotational mirrors originally designed for laser scanning (galvanometer mirrors M2 manufactured by GSI Group), and for the pupil shift lenses, we used three achromatic lenses (Edmund Optics). The setup is shown in Fig. 9, and the optical specifications were as follows: • Gazing angle range, ϕ: ±30 deg • Maximum beam aperture: 30 mm

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	• Maximum angle of view, β: 38.6 deg (measured), 40 deg (designed)" *See* page 6189.  Fig. 9. The optical setup of the prototype. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Okumura 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 7	
7[pre]. The method of claim 1, further comprising the steps:	To the extent the preamble is limiting, Okumura II 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) Okumura 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

Asserted Claim of the '109 Patent	Exemplary Citations to Okumura II
	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;	Okumura II expressly and/or inherently discloses and/or renders obvious obtaining a reference image. *See*, *e.g.*, disclosures below. "III. DETAILED OPTICAL THEORY A. Gaze and Visibility Model Here, the gaze direction and appearance of an image through two mirrors are mathematically considered. The two mirrors are mounted as shown in Fig.4.  Fig. 4. (a) Mirror alignment, and (b) appearance of an image through the mirrors. The pan-mirror surface ($z = (\tan\alpha)x$) includes the origin, and its rotational axis is the y-axis. The tilt-mirror surface ($z = (\tan\beta)y + l_m$) includes $\mathbf{O}'(0, 0, l_m)$, and its rotational axis is parallel to the x-axis. The original gaze direction lies in the $+x$-axis direction ($\boldsymbol{v} = ^T (1, 0, 0)$).

Asserted Claim of the ’109 Patent	Exemplary Citations to Okumura II
	A matrix Sp that gives a line-symmetric transformation with respect to the pan-mirror surface and a matrix St that gives a line-symmetric transformation with respect to the tilt-mirror surface are expressed as:

$$\begin{cases} \mathbf{S_p} = \begin{bmatrix} \cos(2\alpha) & 0 & \sin(2\alpha) \\ 0 & 1 & 0 \\ -\sin(2\alpha) & 0 & \cos(2\alpha) \end{bmatrix} \\ \mathbf{S_t} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos(2\alpha) & -\sin(2\alpha) \\ 0 & \sin(2\alpha) & -\cos(2\alpha) \end{bmatrix} \end{cases} \quad (1)$$

Position vectors, $\boldsymbol{a} =^T (a_x, a_y, a_z)$ and $\boldsymbol{b} =^T (b_x, b_y, b_z)$ that satisfy $x < 0$ near the x-axis are considered. $\boldsymbol{a}^*$, the line-symmetric displacement mapping of $\boldsymbol{a}$ with respect to the two mirrors, is calculated as:

$$\boldsymbol{a}^* = \mathbf{S_t}\left(\mathbf{S_p}\begin{bmatrix} a_x \\ a_y \\ a_z \end{bmatrix} - \begin{bmatrix} 0 \\ 0 \\ l_m \end{bmatrix}\right) + \begin{bmatrix} 0 \\ 0 \\ l_m \end{bmatrix} \quad (2)$$

When $a_1 = b_1 - 1$, $a_2 = b_2$, and $a_3 = b_3$ are assumed, $\boldsymbol{b} - \boldsymbol{a} = \boldsymbol{v}$. Thus, the gaze direction through the mirrors, $\boldsymbol{b}^* - \boldsymbol{a}^* = \boldsymbol{v}^*$, is calculated using (2):

$$\boldsymbol{v}^* = \begin{bmatrix} -\sin\phi_p \\ \cos\phi_p \cos\phi_t \\ \cos\phi_p \sin\phi_t \end{bmatrix} \quad (3)$$

where $2\alpha = \frac{\pi}{2} + \phi_p$, $2\beta = \frac{\pi}{2} + \phi_t$. In addition, a general pan/tilt camera has a gaze vector $\boldsymbol{v_g}$:

$$\boldsymbol{v_g} = \begin{bmatrix} -\sin\phi_p \cos\phi_t \\ \cos\phi_p \\ \sin\phi_t \end{bmatrix} \quad (4)$$

On the other hand, when $a_1 = b_1$, $b_2 - a_2 = \cos\theta$, and $b_3 - a_3 = \sin\theta$ are assumed, $\boldsymbol{b} - \boldsymbol{a}$ is a vector $\boldsymbol{u} =^T (0, \cos\theta, \sin\theta)$ on the camera image plane. Then, its mapping with respect to the mirrors is as follows:

$$\boldsymbol{u}^* = \begin{bmatrix} \sin\theta\cos\phi_p \\ -\cos\theta\sin\phi_t + \sin\theta\sin\phi_t\cos\phi_t \\ \cos\theta\cos\phi_t + \sin\theta\sin\phi_p\sin\phi_t \end{bmatrix} \quad (5)$$

To compare $\boldsymbol{u}$ and $\boldsymbol{u}^*$, $\boldsymbol{u}^*$ is rotated onto the x-axis using a matrix:

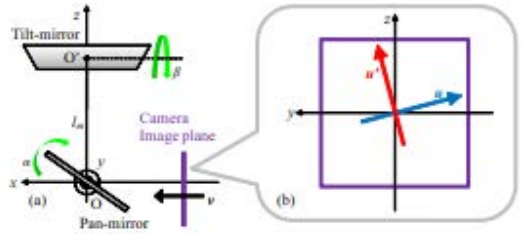
$$\mathbf{R} = \begin{bmatrix} -\sin\phi_p & \cos\phi_p\cos\phi_t & \cos\phi_p\sin\phi_t \\ -\cos\phi_p & -\sin\phi_p\cos\phi_t & -\sin\phi_p\sin\phi_t \\ 0 & -\sin\phi_t & \cos\phi_t \end{bmatrix} \quad (6)$$

Then,

$$\boldsymbol{u}' = \mathbf{R}\boldsymbol{u}^* = \begin{bmatrix} 0 \\ -\sin\theta \\ cos\theta \end{bmatrix} = \begin{bmatrix} 0 \\ \cos(\theta + \frac{\pi}{2}) \\ \sin(\theta + \frac{\pi}{2}) \end{bmatrix} \quad (7)$$

is obtained. That is, the image through the mirrors is inclined at 90 deg, as shown in Fig. 4(b), and the camera should be tilted.

Asserted Claim of the '109 Patent	Exemplary Citations to Okumura II
	" *See* pages 6187-6188. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Okumura 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.
7[b]. performing registration of the digital image with the reference image;	Okumura II expressly and/or inherently discloses and/or renders obvious performing registration of the digital image with the reference image. *See*, *e.g.*, disclosures below. "III. DETAILED OPTICAL THEORY A. Gaze and Visibility Model Here, the gaze direction and appearance of an image through two mirrors are mathematically considered. The two mirrors are mounted as shown in Fig.4.

Asserted Claim of the '109 Patent	Exemplary Citations to Okumura II
	 Fig. 4. (a) Mirror alignment, and (b) appearance of an image through the mirrors. The pan-mirror surface ($z = (\tan\alpha)x$) includes the origin, and its rotational axis is the y-axis. The tilt-mirror surface ($z = (\tan\beta)y + l_m$) includes $\mathbf{O}'(0, 0, l_m)$, and its rotational axis is parallel to the x-axis. The original gaze direction lies in the $+x$-axis direction ($\boldsymbol{v} = ^T (1, 0, 0)$). A matrix Sp that gives a line-symmetric transformation with respect to the pan-mirror surface and a matrix St that gives a line-symmetric transformation with respect to the tilt-mirror surface are expressed as:

$$\begin{cases} \mathbf{S_p} = \begin{bmatrix} \cos(2\alpha) & 0 & \sin(2\alpha) \\ 0 & 1 & 0 \\ -\sin(2\alpha) & 0 & \cos(2\alpha) \end{bmatrix} \\ \mathbf{S_t} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos(2\alpha) & -\sin(2\alpha) \\ 0 & \sin(2\alpha) & -\cos(2\alpha) \end{bmatrix} \end{cases} \quad (1)$$

Position vectors, $\boldsymbol{a} =^T (a_x, a_y, a_z)$ and $\boldsymbol{b} =^T (b_x, b_y, b_z)$ that satisfy $x < 0$ near the x-axis are considered. $\boldsymbol{a}^*$, the line-symmetric displacement mapping of $\boldsymbol{a}$ with respect to the two mirrors, is calculated as:

$$\boldsymbol{a}^* = \mathbf{S_t}\left(\mathbf{S_p}\begin{bmatrix} a_x \\ a_y \\ a_z \end{bmatrix} - \begin{bmatrix} 0 \\ 0 \\ l_m \end{bmatrix}\right) + \begin{bmatrix} 0 \\ 0 \\ l_m \end{bmatrix} \quad (2)$$

When $a_1 = b_1 - 1$, $a_2 = b_2$, and $a_3 = b_3$ are assumed, $\boldsymbol{b} - \boldsymbol{a} = \boldsymbol{v}$. Thus, the gaze direction through the mirrors, $\boldsymbol{b}^* - \boldsymbol{a}^* = \boldsymbol{v}^*$, is calculated using (2):

$$\boldsymbol{v}^* = \begin{bmatrix} -\sin\phi_p \\ \cos\phi_p \cos\phi_t \\ \cos\phi_p \sin\phi_t \end{bmatrix} \quad (3)$$

where $2\alpha = \frac{\pi}{2} + \phi_p$, $2\beta = \frac{\pi}{2} + \phi_t$. In addition, a general pan/tilt camera has a gaze vector $\boldsymbol{v_g}$:

$$\boldsymbol{v_g} = \begin{bmatrix} -\sin\phi_p \cos\phi_t \\ \cos\phi_p \\ \sin\phi_t \end{bmatrix} \quad (4)$$

On the other hand, when $a_1 = b_1$, $b_2 - a_2 = \cos\theta$, and $b_3 - a_3 = \sin\theta$ are assumed, $\boldsymbol{b} - \boldsymbol{a}$ is a vector $\boldsymbol{u} =^T (0, \cos\theta, \sin\theta)$ on the camera image plane. Then, its mapping with respect to the mirrors is as follows:

$$\boldsymbol{u}^* = \begin{bmatrix} \sin\theta\cos\phi_p \\ -\cos\theta\sin\phi_t + \sin\theta\sin\phi_t\cos\phi_t \\ \cos\theta\cos\phi_t + \sin\theta\sin\phi_p\sin\phi_t \end{bmatrix} \quad (5)$$

To compare $\boldsymbol{u}$ and $\boldsymbol{u}^*$, $\boldsymbol{u}^*$ is rotated onto the x-axis using a matrix:

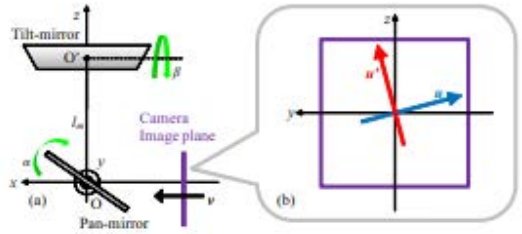
$$\mathbf{R} = \begin{bmatrix} -\sin\phi_p & \cos\phi_p\cos\phi_t & \cos\phi_p\sin\phi_t \\ -\cos\phi_p & -\sin\phi_p\cos\phi_t & -\sin\phi_p\sin\phi_t \\ 0 & -\sin\phi_t & \cos\phi_t \end{bmatrix} \quad (6)$$

Then,

$$\boldsymbol{u}' = \mathbf{R}\boldsymbol{u}^* = \begin{bmatrix} 0 \\ -\sin\theta \\ cos\theta \end{bmatrix} = \begin{bmatrix} 0 \\ \cos(\theta + \frac{\pi}{2}) \\ \sin(\theta + \frac{\pi}{2}) \end{bmatrix} \quad (7)$$

is obtained. That is, the image through the mirrors is inclined at 90 deg, as shown in Fig. 4(b), and the camera should be tilted.

Asserted Claim of the '109 Patent	Exemplary Citations to Okumura II
	" *See* pages 6187-6188. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Okumura 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.
7[c]. using data obtained from the registration to generate the transformation mapping.	Okumura II 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. "III. DETAILED OPTICAL THEORY A. Gaze and Visibility Model Here, the gaze direction and appearance of an image through two mirrors are mathematically considered. The two mirrors are mounted as shown in Fig.4.

Asserted Claim of the '109 Patent	Exemplary Citations to Okumura II
	 Fig. 4. (a) Mirror alignment, and (b) appearance of an image through the mirrors. The pan-mirror surface ($z = (\tan\alpha)x$) includes the origin, and its rotational axis is the y-axis. The tilt-mirror surface ($z = (\tan\beta)y + l_m$) includes $\mathbf{O}'(0, 0, l_m)$, and its rotational axis is parallel to the x-axis. The original gaze direction lies in the $+x$-axis direction ($\boldsymbol{v} = ^T (1, 0, 0)$). A matrix Sp that gives a line-symmetric transformation with respect to the pan-mirror surface and a matrix St that gives a line-symmetric transformation with respect to the tilt-mirror surface are expressed as:

$$\begin{cases} \mathbf{S_p} = \begin{bmatrix} \cos(2\alpha) & 0 & \sin(2\alpha) \\ 0 & 1 & 0 \\ -\sin(2\alpha) & 0 & \cos(2\alpha) \end{bmatrix} \\ \mathbf{S_t} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos(2\alpha) & -\sin(2\alpha) \\ 0 & \sin(2\alpha) & -\cos(2\alpha) \end{bmatrix} \end{cases} \quad (1)$$

Position vectors, $\boldsymbol{a} =^T (a_x, a_y, a_z)$ and $\boldsymbol{b} =^T (b_x, b_y, b_z)$ that satisfy $x < 0$ near the x-axis are considered. $\boldsymbol{a}^*$, the line-symmetric displacement mapping of $\boldsymbol{a}$ with respect to the two mirrors, is calculated as:

$$\boldsymbol{a}^* = \mathbf{S_t}\left(\mathbf{S_p}\begin{bmatrix} a_x \\ a_y \\ a_z \end{bmatrix} - \begin{bmatrix} 0 \\ 0 \\ l_m \end{bmatrix}\right) + \begin{bmatrix} 0 \\ 0 \\ l_m \end{bmatrix} \quad (2)$$

When $a_1 = b_1 - 1$, $a_2 = b_2$, and $a_3 = b_3$ are assumed, $\boldsymbol{b} - \boldsymbol{a} = \boldsymbol{v}$. Thus, the gaze direction through the mirrors, $\boldsymbol{b}^* - \boldsymbol{a}^* = \boldsymbol{v}^*$, is calculated using (2):

$$\boldsymbol{v}^* = \begin{bmatrix} -\sin\phi_p \\ \cos\phi_p \cos\phi_t \\ \cos\phi_p \sin\phi_t \end{bmatrix} \quad (3)$$

where $2\alpha = \frac{\pi}{2} + \phi_p$, $2\beta = \frac{\pi}{2} + \phi_t$. In addition, a general pan/tilt camera has a gaze vector $\boldsymbol{v_g}$:

$$\boldsymbol{v_g} = \begin{bmatrix} -\sin\phi_p \cos\phi_t \\ \cos\phi_p \\ \sin\phi_t \end{bmatrix} \quad (4)$$

On the other hand, when $a_1 = b_1$, $b_2 - a_2 = \cos\theta$, and $b_3 - a_3 = \sin\theta$ are assumed, $\boldsymbol{b} - \boldsymbol{a}$ is a vector $\boldsymbol{u} =^T (0, \cos\theta, \sin\theta)$ on the camera image plane. Then, its mapping with respect to the mirrors is as follows:

$$\boldsymbol{u}^* = \begin{bmatrix} \sin\theta\cos\phi_p \\ -\cos\theta\sin\phi_t + \sin\theta\sin\phi_t\cos\phi_t \\ \cos\theta\cos\phi_t + \sin\theta\sin\phi_p\sin\phi_t \end{bmatrix} \quad (5)$$

To compare $\boldsymbol{u}$ and $\boldsymbol{u}^*$, $\boldsymbol{u}^*$ is rotated onto the x-axis using a matrix:

$$\mathbf{R} = \begin{bmatrix} -\sin\phi_p & \cos\phi_p\cos\phi_t & \cos\phi_p\sin\phi_t \\ -\cos\phi_p & -\sin\phi_p\cos\phi_t & -\sin\phi_p\sin\phi_t \\ 0 & -\sin\phi_t & \cos\phi_t \end{bmatrix} \quad (6)$$

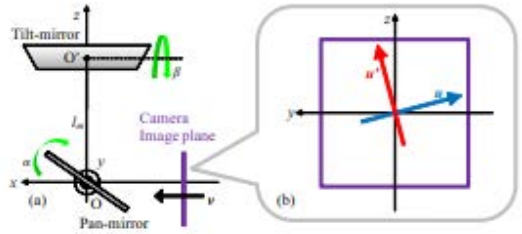
Then,

$$\boldsymbol{u}' = \mathbf{R}\boldsymbol{u}^* = \begin{bmatrix} 0 \\ -\sin\theta \\ cos\theta \end{bmatrix} = \begin{bmatrix} 0 \\ \cos(\theta + \frac{\pi}{2}) \\ \sin(\theta + \frac{\pi}{2}) \end{bmatrix} \quad (7)$$

is obtained. That is, the image through the mirrors is inclined at 90 deg, as shown in Fig. 4(b), and the camera should be tilted.

Asserted Claim of the '109 Patent	Exemplary Citations to Okumura II
	" *See* pages 6187-6188. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Okumura 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 '109 Patent	Exemplary Citations to Okumura II
Claim 8	
8. The method of claim 1, further comprising applying a translation transformation to move the image within display area of the monitor.	Okumura II 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. "III. DETAILED OPTICAL THEORY A. Gaze and Visibility Model Here, the gaze direction and appearance of an image through two mirrors are mathematically considered. The two mirrors are mounted as shown in Fig.4.

Asserted Claim of the '109 Patent	Exemplary Citations to Okumura II
	 Fig. 4. (a) Mirror alignment, and (b) appearance of an image through the mirrors. The pan-mirror surface ($z = (\tan\alpha)x$) includes the origin, and its rotational axis is the y-axis. The tilt-mirror surface ($z = (\tan\beta)y + l_m$) includes $\mathbf{O}'(0, 0, l_m)$, and its rotational axis is parallel to the x-axis. The original gaze direction lies in the $+x$-axis direction ($\boldsymbol{v} = ^T (1, 0, 0)$). A matrix Sp that gives a line-symmetric transformation with respect to the pan-mirror surface and a matrix St that gives a line-symmetric transformation with respect to the tilt-mirror surface are expressed as:

$$\begin{cases} \mathbf{S_p} = \begin{bmatrix} \cos(2\alpha) & 0 & \sin(2\alpha) \\ 0 & 1 & 0 \\ -\sin(2\alpha) & 0 & \cos(2\alpha) \end{bmatrix} \\ \mathbf{S_t} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos(2\alpha) & -\sin(2\alpha) \\ 0 & \sin(2\alpha) & -\cos(2\alpha) \end{bmatrix} \end{cases} \quad (1)$$

Position vectors, $\boldsymbol{a} =^T (a_x, a_y, a_z)$ and $\boldsymbol{b} =^T (b_x, b_y, b_z)$ that satisfy $x < 0$ near the x-axis are considered. $\boldsymbol{a}^*$, the line-symmetric displacement mapping of $\boldsymbol{a}$ with respect to the two mirrors, is calculated as:

$$\boldsymbol{a}^* = \mathbf{S_t}\left(\mathbf{S_p}\begin{bmatrix} a_x \\ a_y \\ a_z \end{bmatrix} - \begin{bmatrix} 0 \\ 0 \\ l_m \end{bmatrix}\right) + \begin{bmatrix} 0 \\ 0 \\ l_m \end{bmatrix} \quad (2)$$

When $a_1 = b_1 - 1$, $a_2 = b_2$, and $a_3 = b_3$ are assumed, $\boldsymbol{b} - \boldsymbol{a} = \boldsymbol{v}$. Thus, the gaze direction through the mirrors, $\boldsymbol{b}^* - \boldsymbol{a}^* = \boldsymbol{v}^*$, is calculated using (2):

$$\boldsymbol{v}^* = \begin{bmatrix} -\sin\phi_p \\ \cos\phi_p \cos\phi_t \\ \cos\phi_p \sin\phi_t \end{bmatrix} \quad (3)$$

where $2\alpha = \frac{\pi}{2} + \phi_p$, $2\beta = \frac{\pi}{2} + \phi_t$. In addition, a general pan/tilt camera has a gaze vector $\boldsymbol{v_g}$:

$$\boldsymbol{v_g} = \begin{bmatrix} -\sin\phi_p \cos\phi_t \\ \cos\phi_p \\ \sin\phi_t \end{bmatrix} \quad (4)$$

On the other hand, when $a_1 = b_1$, $b_2 - a_2 = \cos\theta$, and $b_3 - a_3 = \sin\theta$ are assumed, $\boldsymbol{b} - \boldsymbol{a}$ is a vector $\boldsymbol{u} =^T (0, \cos\theta, \sin\theta)$ on the camera image plane. Then, its mapping with respect to the mirrors is as follows:

$$\boldsymbol{u}^* = \begin{bmatrix} \sin\theta\cos\phi_p \\ -\cos\theta\sin\phi_t + \sin\theta\sin\phi_t\cos\phi_t \\ \cos\theta\cos\phi_t + \sin\theta\sin\phi_p\sin\phi_t \end{bmatrix} \quad (5)$$

To compare $\boldsymbol{u}$ and $\boldsymbol{u}^*$, $\boldsymbol{u}^*$ is rotated onto the x-axis using a matrix:

$$\mathbf{R} = \begin{bmatrix} -\sin\phi_p & \cos\phi_p\cos\phi_t & \cos\phi_p\sin\phi_t \\ -\cos\phi_p & -\sin\phi_p\cos\phi_t & -\sin\phi_p\sin\phi_t \\ 0 & -\sin\phi_t & \cos\phi_t \end{bmatrix} \quad (6)$$

Then,

$$\boldsymbol{u}' = \mathbf{R}\boldsymbol{u}^* = \begin{bmatrix} 0 \\ -\sin\theta \\ cos\theta \end{bmatrix} = \begin{bmatrix} 0 \\ \cos(\theta + \frac{\pi}{2}) \\ \sin(\theta + \frac{\pi}{2}) \end{bmatrix} \quad (7)$$

is obtained. That is, the image through the mirrors is inclined at 90 deg, as shown in Fig. 4(b), and the camera should be tilted.

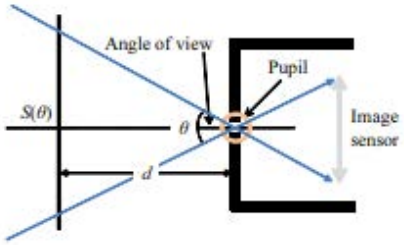
Asserted Claim of the '109 Patent	Exemplary Citations to Okumura II
	" *See* pages 6187-6188. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Okumura II alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect 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.

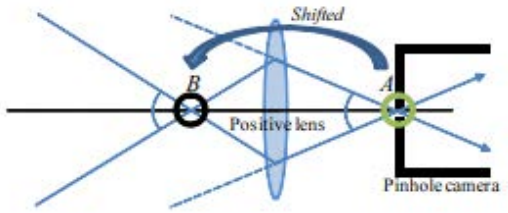
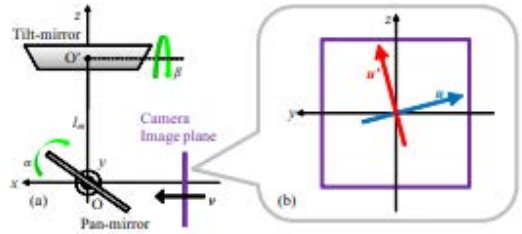
Asserted Claim of the '109 Patent	Exemplary Citations to Okumura II
Claim 9	
9. The method of claim 1, further comprising changing illumination intensity of individual or groups of pixels of the monitor, so as to enhance shading or illumination in the image.	Okumura II expressly and/or inherently discloses 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) Okumura 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 '109 Patent	Exemplary Citations to Okumura II
Claim 11	
11[pre]. The method of claim 1, further comprising:	To the extent the preamble is limiting, Okumura II expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below.

Asserted Claim of the '109 Patent	Exemplary Citations to Okumura II
	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) Okumura 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.
11[a]. determining distance to a user appearing in the image; and,	Okumura II 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*: "A. Two-axis Rotational Mirrors for High-speed Gaze Control There have been several studies aimed at realizing a high1speed pan/tilt camera even with a conventional structure. However, the required level of performance has not been obtained. For example, Y. Nakabo has developed a 1 ms target tracking system, which is a good example of a pan/tilt camera with a high-speed image processor [3]. In this system, a high-speed image processor called Column Parallel Vision 1 (CPV1) is mounted on a two-axis rotational platform including high-speed actuators. Nevertheless, its response time for switching the gaze direction is more than 20 ms, much longer than the control cycle period of 1 ms. Also, the cutoff frequency of the gaze control in the visual feedback system is approximately 10 Hz, whereas the regulation, or imaging, rate is 1 kHz. For the millisecond-order control that we aim for, the inertia of the rotating parts must be reduced as much as possible. We focused attention on two-axis rotational mirrors for gaze control, as described in the introduction section. In this case, because the only rotating parts are the two mirrors, the inertia of that subsystem can be considerably reduced. However, two-axis rotational mirrors have not been adopted often for pan/tilt cameras. They are mainly used for scanning non-diverging bundles of rays, such as laser beams. For example, J. Taylor et

Asserted Claim of the '109 Patent	Exemplary Citations to Okumura II
	al. and H. Kim et al. both developed depth measurement systems (a kind of laser range finder) using a camera, a laser, and two-axis rotational mirrors [4], [5]. If we use rotational mirrors for the pan/tilt camera, one critical issue is that the obtained angle of view is significantly restricted because the mirrors are small and are constructed to rotate on two axes. A model of the system geometry now follows. A pinhole camera model is shown in Fig. 2 [6]. The angle of view θ in Fig. 2 is defined as the angular extent of a given scene in the camera. Rays from the scene are concentrated at the pinhole. The point where the bundle of rays is concentrated is called the pupil. The relationship between θ and S(θ) in Fig. 2 is presented here. S(θ) is the area of a certain image plane a distance d away from the center of the pupil. If θ becomes larger, S(θ) will also obviously become larger. For gaze control with mirrors, if a wide angle of view is required, large mirrors will also be required. Thus, it is not easy to realize both a wide angle of view and high-speed performance at the same time because large mirrors are difficult to drive quickly. This will be even more difficult particularly when using independent two-axis mirrors. We call the mirror near the pupil the "pan-mirror" and the other one the "tilt-mirror." If a certain wide controllable gaze range is needed, the required size of the tilt-mirror will be larger than that of the pan-mirror because the area through which rays pass on the tilt-mirror varies depending on the driven angle of the pan-mirror." *See* page 6187.

Asserted Claim of the ’109 Patent	Exemplary Citations to Okumura II
	 Fig. 2. Angle of view in the model of a pinhole camera. “B. Pupil Shift Lenses for Achieving Practical Angle of View We solved the issue described above by using positive lenses called “pupil shift lenses” [7]. The basic theory of the function of a pupil shift lens with a pinhole camera model is shown in Fig. 3. A bundle of rays can be refracted by the positive lens. Some of the bundle of rays that would otherwise be concentrated at B are also concentrated at the desired point A using the positive lens. Thinking of A as the pupil of the camera, this vision system including the positive lens has two pupils, the original one A and the shifted one B. This theory can be applied to our Saccade Mirror, enabling both a wide angle of view and high-speed performance to be realized at the same time. That is, if we need gaze control at a sufficiently high speed compared with the frame rate of a high-speed image processor, this combination should give a practical angle of view, or if we need a practical angle of view with a certain vision system, this combination give sufficiently high speed. For example, to obtain a 30 deg angle of view without pupil shift lenses, the inertia of the tilt-mirror is estimated to be more than one-hundred times larger compared with the case where pupil shift lenses are used.” *See* page 6187.

Asserted Claim of the ’109 Patent	Exemplary Citations to Okumura II
	 Fig. 3. Shift of the pupil using a positive lens. “III. DETAILED OPTICAL THEORY A. Gaze and Visibility Model Here, the gaze direction and appearance of an image through two mirrors are mathematically considered. The two mirrors are mounted as shown in Fig.4.  Fig. 4. (a) Mirror alignment, and (b) appearance of an image through the mirrors. The pan-mirror surface ($z = (\tan\alpha)x$) includes the origin, and its rotational axis is the y-axis. The tilt-mirror surface ($z = (\tan\beta)y + l_m$) includes $\mathbf{O}'(0, 0, l_m)$, and its rotational axis is parallel to the x-axis. The original gaze direction lies in the $+x$-axis direction ($\boldsymbol{v} = ^T (1, 0, 0)$).

Asserted Claim of the ’109 Patent	Exemplary Citations to Okumura II
	A matrix Sp that gives a line-symmetric transformation with respect to the pan-mirror surface and a matrix St that gives a line-symmetric transformation with respect to the tilt-mirror surface are expressed as:

$$\begin{cases} \mathbf{S_p} = \begin{bmatrix} \cos(2\alpha) & 0 & \sin(2\alpha) \\ 0 & 1 & 0 \\ -\sin(2\alpha) & 0 & \cos(2\alpha) \end{bmatrix} \\ \mathbf{S_t} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos(2\alpha) & -\sin(2\alpha) \\ 0 & \sin(2\alpha) & -\cos(2\alpha) \end{bmatrix} \end{cases} \quad (1)$$

Position vectors, $\boldsymbol{a} =^T (a_x, a_y, a_z)$ and $\boldsymbol{b} =^T (b_x, b_y, b_z)$ that satisfy $x < 0$ near the x-axis are considered. $\boldsymbol{a}^*$, the line-symmetric displacement mapping of $\boldsymbol{a}$ with respect to the two mirrors, is calculated as:

$$\boldsymbol{a}^* = \mathbf{S_t}\left(\mathbf{S_p}\begin{bmatrix} a_x \\ a_y \\ a_z \end{bmatrix} - \begin{bmatrix} 0 \\ 0 \\ l_m \end{bmatrix}\right) + \begin{bmatrix} 0 \\ 0 \\ l_m \end{bmatrix} \quad (2)$$

When $a_1 = b_1 - 1$, $a_2 = b_2$, and $a_3 = b_3$ are assumed, $\boldsymbol{b} - \boldsymbol{a} = \boldsymbol{v}$. Thus, the gaze direction through the mirrors, $\boldsymbol{b}^* - \boldsymbol{a}^* = \boldsymbol{v}^*$, is calculated using (2):

$$\boldsymbol{v}^* = \begin{bmatrix} -\sin\phi_p \\ \cos\phi_p \cos\phi_t \\ \cos\phi_p \sin\phi_t \end{bmatrix} \quad (3)$$

where $2\alpha = \frac{\pi}{2} + \phi_p$, $2\beta = \frac{\pi}{2} + \phi_t$. In addition, a general pan/tilt camera has a gaze vector $\boldsymbol{v_g}$:

$$\boldsymbol{v_g} = \begin{bmatrix} -\sin\phi_p \cos\phi_t \\ \cos\phi_p \\ \sin\phi_t \end{bmatrix} \quad (4)$$

On the other hand, when $a_1 = b_1$, $b_2 - a_2 = \cos\theta$, and $b_3 - a_3 = \sin\theta$ are assumed, $\boldsymbol{b} - \boldsymbol{a}$ is a vector $\boldsymbol{u} =^T (0, \cos\theta, \sin\theta)$ on the camera image plane. Then, its mapping with respect to the mirrors is as follows:

$$\boldsymbol{u}^* = \begin{bmatrix} \sin\theta\cos\phi_p \\ -\cos\theta\sin\phi_t + \sin\theta\sin\phi_t\cos\phi_t \\ \cos\theta\cos\phi_t + \sin\theta\sin\phi_p\sin\phi_t \end{bmatrix} \quad (5)$$

To compare $\boldsymbol{u}$ and $\boldsymbol{u}^*$, $\boldsymbol{u}^*$ is rotated onto the x-axis using a matrix:

$$\mathbf{R} = \begin{bmatrix} -\sin\phi_p & \cos\phi_p\cos\phi_t & \cos\phi_p\sin\phi_t \\ -\cos\phi_p & -\sin\phi_p\cos\phi_t & -\sin\phi_p\sin\phi_t \\ 0 & -\sin\phi_t & \cos\phi_t \end{bmatrix} \quad (6)$$

Then,

$$\boldsymbol{u}' = \mathbf{R}\boldsymbol{u}^* = \begin{bmatrix} 0 \\ -\sin\theta \\ cos\theta \end{bmatrix} = \begin{bmatrix} 0 \\ \cos(\theta + \frac{\pi}{2}) \\ \sin(\theta + \frac{\pi}{2}) \end{bmatrix} \quad (7)$$

is obtained. That is, the image through the mirrors is inclined at 90 deg, as shown in Fig. 4(b), and the camera should be tilted.

Asserted Claim of the '109 Patent	Exemplary Citations to Okumura II
	" *See* pages 6187-6188. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Okumura 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.
11[b]. varying resolution of the image according to the distance.	Okumura II expressly and/or inherently discloses and/or renders obvious varying resolution of the image according to the distance. *See*, *e.g.*, disclosures below. "D. Observation of Moving Ball Our millisecond-order pan/tilt camera should be useful for observing or evaluating high-speed dynamic phenomena with high resolution and no motion blur. If only a high-speed camera is used, the entire range of the dynamic motion must be let into the visual field of the camera using a wide-angle lens. Thus, the resolution of the desired area becomes relatively low. Moreover, motion blur also appears because the target moves at high speed. We focused on applications in the field of sports. Balls in baseball, football or tennis are difficult to observe continuously because the velocity vectors of the balls fluctuate extremely rapidly during games. The ability to acquire dynamic images of the fast-moving balls would make significant contributions to broadcasting techniques, practice for players, product development for sports goods manufacturers, and so on. Therefore, as an exploratory experiment, we observed a dynamic rubber ball using our millisecond-order pan/tilt camera. The target suddenly came into the visual field, bounced against a table, and was finally hit by a racket. The image sequences are shown in Fig. 13. To keep the images of the target ball stationary, they are corrected so that the center of mass in each image is placed at the

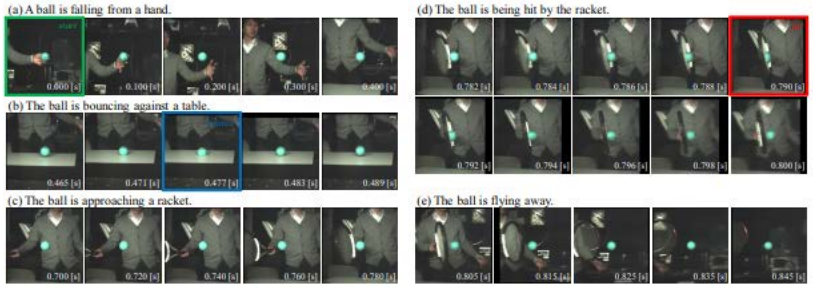
Asserted Claim of the ’109 Patent	Exemplary Citations to Okumura II
	center. Although the instant where the ball bounces or is hit (change of the velocity vector) is conventionally difficult to capture, clearly observable image sequences could be successfully obtained with our system. The ball’s estimated trajectory is also shown in Fig. 14.” *See* pages 6190-6191.  Fig. 13. Image sequences of a dynamic rubber ball: The ball is (a) falling from a hand, (b) bouncing against a table, (c) approaching a racket, (d) being hit by the racket, and (e) flying away. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Okumura 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.

Exhibit A-20: Invalidity of U.S. Patent No. 8,982,109 in view of Virtual Mirror System ("Straka II")

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.

The Virtual Mirror System ("Straka II") expressly and/or inherently discloses and/or renders obvious the Asserted Claims of U.S. Patent No. 8,982,109 (the "'109 Patent"), as set forth in the chart below. 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.

Straka II anticipates the Asserted Claims of the '109 Patent. To the extent it is found Straka 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 Straka II does not anticipate the Asserted Claims, Straka II 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.

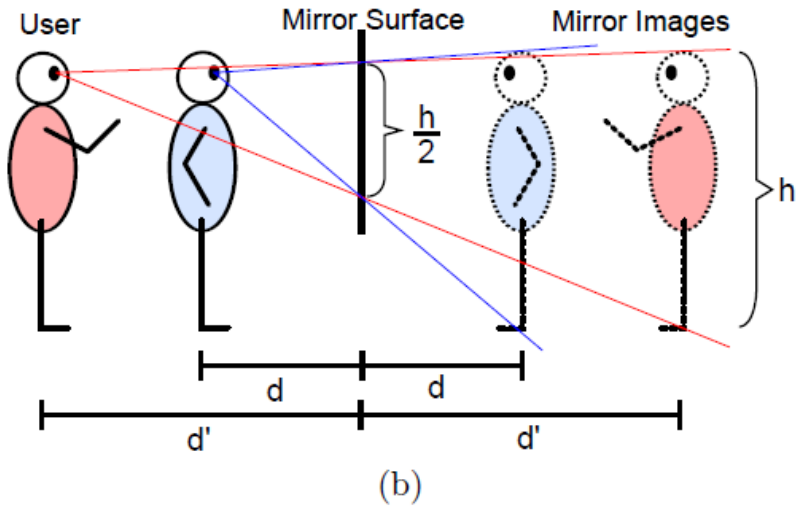
Asserted Claim of the '109 Patent	Exemplary Citations to Straka II
Claim 1	
1[pre]. A method for operating a system having a monitor, a camera, and a processor, so as to display a mirror-mimicking image on the monitor, by performing non-ordered steps comprising:	To the extent the preamble is limiting, Straka II expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. "Our virtual mirror system requires three components: multiple cameras to capture images of the user, a computer to process the data and a monitor to show the mirror image." *See* Straka II at p. 3. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Straka 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[a]. obtaining a digital image from a camera;	Straka II expressly and/or inherently discloses and/or renders obvious obtaining a digital image from a camera. *See*, *e.g.*, disclosures below. "Our contribution is a novel virtual mirror system which combines a multicamera capture system with real-time free-viewpoint video. We equip a room with several cameras (see Sect. 3) and use a virtual camera to render an artificial mirror image which we display on a large monitor." *See* Straka II at p. 2. "In contrast, free viewpoint video systems are able to render arbitrary views of an object by using images from multiple fixed cameras." *See* Straka at p. 2. "Our virtual mirror system requires three components: multiple cameras to capture images of the user, a computer to process the data and a monitor to show the mirror image." *See* Straka II at p. 3. "The cameras deliver 640 × 480 pixel images at 15 frames per second." *See* Straka II at p. 4.

Asserted Claim of the '109 Patent	Exemplary Citations to Straka II
	"In the first stage, we acquire a live stream of multiple synchronized camera images." *See* Straka II at p. 4. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Straka 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[b]. flipping the image about a vertical axis so as to reverse right and left sides of the image;	Straka II 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. "We present a Virtual Mirror system which is able to simulate a physically correct full-body mirror on a monitor." *See* Straka II at Abstract. "A virtual mirror is an Augmented Reality (AR) system which renders an image of the user from a virtual viewpoint and creates the illusion of a mirror image." *See* Straka II at p. 1. "Free viewpoint video systems on the other hand are able to render an arbitrary view of a person by combining images from multiple fixed cameras [3,9,18]. This allows for the accurate simulation of optical effects, including rendering of a reflection image." *See* Straka II at p. 1. "We equip a room with several cameras (see Sect. 3) and use a virtual camera to render an artificial mirror image which we display on a large monitor." *See* Straka II at p. 2. "The last component of the camera matrix $\tilde{P}$ is the intrinsic matrix $\tilde{K}$ which mirrors and projects the scene onto the monitor's surface:

Asserted Claim of the '109 Patent	Exemplary Citations to Straka II
	$\widetilde{K} = \begin{bmatrix} -f & 0 & p_x \\ 0 & -f & p_y \\ 0 & 0 & 1 \end{bmatrix}$ with $f = 2 \cdot d$." *See* Straka II at p. 7. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Straka 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[c]. applying a transformation mapping to the image to modify the image such that it appears to mimic a reflection of a mirror;	Straka II 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 mirror plane π, which is the surface of the monitor in our system, can be expressed using a homogeneous notation which satisfies $\pi^T X = 0$ for every 3D point X that lies on the plane. The first three components of π correspond to the plane normal $\mathrm{n} = \left[\pi^{(1)}, \pi^{(2)}, \pi^{(3)}\right]^T \qquad \|\mathrm{n}\| = 1$ of the mirror while the fourth component $\pi^{(4)}$ describes the distance of the plane from the origin as determined in the configuration step. The orthogonal distance *d* between c and the mirror surface can be calculated as follows: $d = \pi^T \begin{bmatrix} \mathrm{c} \\ 1 \end{bmatrix}$. "The 3 × 4 camera matrix $\widetilde{\mathrm{P}} = \widetilde{\mathrm{K}}\left[\widetilde{\mathrm{R}}|\widetilde{\mathrm{t}}\right]$ producing an optically correct mirror image from the user's view on the monitor can be calculated from the position of eyes c, the distance *d* and the normal n of the mirror plane (see Fig. 4a). The rotation $\widetilde{\mathrm{R}}_{[3\times3]}$ of the virtual

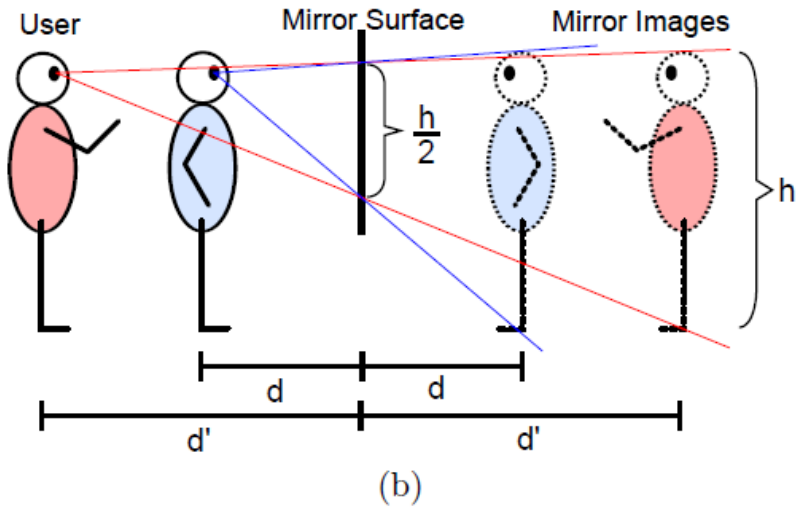
Asserted Claim of the '109 Patent	Exemplary Citations to Straka II
	camera is defined so that the camera looks along the normal **n** of the mirror surface with an up-vector (up = $[0,\ 0,\ 1]^T$): $\widetilde{\mathrm{R}} = \begin{bmatrix} \mathrm{r}_x{}^T \\ (\mathrm{r}_x \times \mathrm{n})^T \\ \mathrm{n}^T \end{bmatrix}$ with $\mathrm{r}_x = \mathrm{n} \times \mathrm{up}$. "Note that the gazing direction of the user does not affect the mirror image and therefore does not need to be considered. The position $\tilde{\mathrm{c}}$ of the virtual camera is simply a mirrored version of the position of the eyes c which yields the translation vector $\tilde{\mathrm{t}}$ for the virtual projection matrix $\widetilde{\mathrm{P}}$: $\tilde{\mathrm{t}} = \widetilde{\mathrm{R}} \cdot \tilde{\mathrm{c}}$ with $\tilde{\mathrm{c}} = \mathrm{c} - 2 \cdot d \cdot \mathrm{n}$. "The last component of the camera matrix $\tilde{P}$ is the intrinsic matrix $\widetilde{K}$ which mirrors and projects the scene onto the monitor's surface: $\widetilde{K} = \begin{bmatrix} -f & 0 & p_x \\ 0 & -f & p_y \\ 0 & 0 & 1 \end{bmatrix}$ with $f = 2 \cdot d$. "The focal length *f* of the camera is equal to the distance between the virtual camera and the user, which is twice the user-mirror distance *d*. This can be explained by the observation that the size of oneself's image on the mirror surface is constant and independent from *d* and the focal length of the eyes (see Fig. 1b). In the general case, the mirror image will be an off-center projection with the principal point offsets p_x and p_y shifted depending on the eye position **c**, the size of the monitor and its resolution in pixels as well as the position of the application window on the monitor." *See* Straka II at p. 7. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Straka 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

Asserted Claim of the '109 Patent	Exemplary Citations to Straka II
	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;	Straka II 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. "Illustration of the mirror effect: When the user has a distance *d* from the mirror, the mirror image appears at the same distance behind the mirror. The height of the mirror image on the mirror surface always is half the height *h* of the user and does not depend on the distance *d*." *See* Straka II at p. 3." "A virtual mirror needs to simulate the properties of a real mirror as accurate as possible. When standing in front of a mirror at a distance *d*, the mirror image of oneself appears exactly at the same distance but behind the mirror. However, even though this distance can change, the size of the user in the mirror image when projected on the mirror surface stays constant at half the height of the *h* user." *See* Straka II at p. 3.

Asserted Claim of the '109 Patent	Exemplary Citations to Straka II
	 (b) *See* Straka II at Fig. 1(b). This limitation would have been obvious to a person of ordinary skill in the art based on (1) Straka 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[e]. displaying the image on the monitor after performing the flipping, transformation mapping, and resizing;	Straka II 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.

Asserted Claim of the '109 Patent	Exemplary Citations to Straka II
	"A 47 inch Full-HD television mounted in portrait mode has a height of 104cm and therefore can display the full-body mirror image of users up to 2 meters in height, which includes 99 percent of all people according to [15]." *See* Straka II at pp. 3-4. "In this section we evaluate our virtual mirror system in terms of visual quality, robustness and run-time. Figure 5a shows an example of an user interacting with the system. As soon as the user steps in front of the monitor, a virtual mirror image such as in Fig. 5b is shown on the screen. We obtain an appealing artificial mirror image at a resolution of 540×960 pixels, from any virtual camera position such as in Fig. 5c which shows a user looking at his own back." *See* Straka II at pp. 5-6.  (a) (b) (c) *See* Straka II. at Figs. 5(a)-(c). This limitation would have been obvious to a person of ordinary skill in the art based on (1) Straka 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 '109 Patent	Exemplary Citations to Straka II
1[f]. wherein the non-ordered steps are performed on a series of images of a live video feed from the camera;	Straka II 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. "A real-time 3D reconstruction and rendering pipeline enables us to create a virtual mirror image at 15 frames per second on a single computer." *See* Straka II at Abstract. "Our contribution is a novel virtual mirror system which combines a multi-camera capture system with real-time free-viewpoint video." *See* Straka II at p. 2. "In Sect. 5 we show that we are able to achieve real-time processing of the camera images using only a single computer." *See* Straka II at p. 2. "A balanced use of graphics hardware and CPU processing allows us to achieve real-time execution for the whole system. We are able to render an output mirror image at 15 frames per second and display it to the user less than 100ms after camera image acquisition." *See* Straka II at p. 9. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Straka 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[g]. determining distance to a user appearing in the live video feed; and	Straka II 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. "Illustration of the mirror effect: When the user has a distance *d* from the mirror, the mirror image appears at the same distance behind the mirror. The height of the mirror image on the mirror surface always is half the height *h* of the user and does not depend on the distance *d*." *See* Straka II at p. 3."

Asserted Claim of the '109 Patent	Exemplary Citations to Straka II
	"A virtual mirror needs to simulate the properties of a real mirror as accurate as possible. When standing in front of a mirror at a distance *d*, the mirror image of oneself appears exactly at the same distance but behind the mirror. However, even though this distance can change, the size of the user in the mirror image when projected on the mirror surface stays constant at half the height of the *h* user." *See* Straka II at p. 3. "The orthogonal distance *d* between c and the mirror surface can be calculated as follows: $d = \pi^T \begin{bmatrix} c \\ 1 \end{bmatrix}$." *See* Straka II at 7.  *See* Straka II at Fig. 1(b). This limitation would have been obvious to a person of ordinary skill in the art based on (1) Straka II alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the

Asserted Claim of the '109 Patent	Exemplary Citations to Straka 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.
1[h]. varying rate at which the non-ordered steps are performed on the series of images according to the distance.	Straka II 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. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Straka 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 '109 Patent	Exemplary Citations to Straka II
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.	Straka II 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. "One common property of existing virtual mirror systems is that they consist of a single camera with a fixed position where the horizontally flipped video stream is shown to the user on a monitor. However, such systems generally do not allow one to simulate a correct mirror because video devices are only able to capture a projected image and not the reflection of the user from his viewpoint. Free viewpoint video systems on the other hand are able to render an arbitrary view of a person by combining images from multiple fixed cameras [3,9,18]. This allows for the accurate simulation of optical effects including rendering of a reflection image." *See* Straka II at p. 1.

Asserted Claim of the '109 Patent	Exemplary Citations to Straka II
	"In contrast, free viewpoint video systems are able to render arbitrary views of an object by using images from multiple fixed cameras." *See* Straka II at p. 2. "Visual-hull based rendering [1,9] requires only depth information obtained through processing of camera images with background segmentation (silhouette) in order to synthesize a new viewpoint." *See* Straka at p. 3  *See* Straka II at Fig. 5(a) (showing an eye-level height, horizontally point-of-view despite the cameras (circled in red) being above the user's head).

Asserted Claim of the '109 Patent	Exemplary Citations to Straka II
	This limitation would have been obvious to a person of ordinary skill in the art based on (1) Straka 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 '109 Patent	Exemplary Citations to Straka II
Claim 7	
7[pre]. The method of claim 1, further comprising the steps:	To the extent the preamble is limiting, Straka II expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. *See* Claims 1[pre]-1[h]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Straka 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.
7[a]. obtaining a reference image;	Straka II expressly and/or inherently discloses and/or renders obvious obtaining a reference image. *See*, *e.g.*, disclosures below. "In the first stage, we acquire a live stream of multiple synchronized camera images. Each image is then undistorted using radial distortion parameters determined during camera calibration. A subsequent silhouette extraction step segments the user from the background in all images." *See* Straka II at p. 4. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Straka II alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the

Asserted Claim of the '109 Patent	Exemplary Citations to Straka 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.
7[b]. performing registration of the digital image with the reference image;	Straka II expressly and/or inherently discloses and/or renders obvious performing registration of the digital image with the reference image. *See*, *e.g.*, disclosures below. "In the first stage, we acquire a live stream of multiple synchronized camera images. Each image is then undistorted using radial distortion parameters determined during camera calibration. A subsequent silhouette extraction step segments the user from the background in all images. We employ a luminance insensitive background subtraction method in order to cope with shadows caused by the user. Silhouette data is used to generate a low-resolution voxel model and extract a skeleton which we use to implement marker-less user interaction. In the mirror simulation mode of our system, a virtual camera is controlled by the 3D position of the user's head which we determine in voxel space. An alternative mode of operation allows the user to rotate the camera around him- or herself by hand gestures. Finally, we use an image based visual hull (IBVH) technique to render the image of the user using the virtual camera. The remainder of this section describes important components of our system in more detail." *See* Straka II at pp. 4-5. "In our system, we use a 3D model to determine the position of the head and hands of the user. We use a fast space carving approach on the GPU [13] to obtain a discrete voxel grid V with a resolution of $k3$ voxels ($k = 64$). Once the voxel model has been obtained, we need to perform a hierarchical segmentation into head, body and limbs. In the recent years it has become popular to build a so-called Reeb graph [19] to represent the topology of arbitrary multidimensional structures. A Reeb graph is generated by extracting level sets from such structures and keeping track of critical points where a level set becomes disconnected. When applied to the human body, an optimal Reeb graph has a tree structure with branches for head, arms and legs. "In this work, we utilize a fast and robust method called *Voxel Scooping* [12] for extracting the Reeb graph of the human body. While the algorithm was originally

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	intended for tracing centerlines of neurons in medical data, we show that it can be easily applied to volumetric body scans such as obtained from our shape-from-silhouette approach. Starting with the node at a seeding point, each node in the graph spherically expands in voxel space with a locally adaptive radius (hence the name scooping). Based on this expansion, a new node is created and the process is repeated until there are no more voxels left to scoop. When the expanded voxels of a single node no longer form a connected component, a branching node is created and each branch is processed individually. In the final Reeb graph there will be artifacts in the form of short branches (see Fig. 3c). A final pruning step removes branches that only consist of two or less nodes in order to obtain a clean graph with only six arcs corresponding to head, body and limbs (as in Fig. 3d). We propose to use the top of the head as the seeding point for voxel scooping, which will always produce a tree structure similar to the human skeleton as in Fig. 3b. The position of the head is determined when the user steps into the system and is further tracked in voxel space." *See* Straka II at pp. 5-6. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Straka 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.
7[c]. using data obtained from the registration to generate the transformation mapping.	Straka II 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 the first stage, we acquire a live stream of multiple synchronized camera images. Each image is then undistorted using radial distortion parameters determined during camera calibration. A subsequent silhouette extraction step segments the user from the background in all images. We employ a luminance insensitive background subtraction method in order to cope with shadows caused by the user. Silhouette data is used to generate a low-resolution voxel model and extract a skeleton which we use to implement marker-less user interaction. In the mirror simulation mode of our system, a virtual

Asserted Claim of the '109 Patent	Exemplary Citations to Straka II
	camera is controlled by the 3D position of the user's head which we determine in voxel space. An alternative mode of operation allows the user to rotate the camera around him- or herself by hand gestures. Finally, we use an image based visual hull (IBVH) technique to render the image of the user using the virtual camera. The remainder of this section describes important components of our system in more detail." *See* Straka II at pp. 4-5. "In our system, we use a 3D model to determine the position of the head and hands of the user. We use a fast space carving approach on the GPU [13] to obtain a discrete voxel grid V with a resolution of $k3$ voxels ($k = 64$). Once the voxel model has been obtained, we need to perform a hierarchical segmentation into head, body and limbs. In the recent years it has become popular to build a so-called Reeb graph [19] to represent the topology of arbitrary multidimensional structures. A Reeb graph is generated by extracting level sets from such structures and keeping track of critical points where a level set becomes disconnected. When applied to the human body, an optimal Reeb graph has a tree structure with branches for head, arms and legs. "In this work, we utilize a fast and robust method called *Voxel Scooping* [12] for extracting the Reeb graph of the human body. While the algorithm was originally intended for tracing centerlines of neurons in medical data, we show that it can be easily applied to volumetric body scans such as obtained from our shape-from-silhouette approach. Starting with the node at a seeding point, each node in the graph spherically expands in voxel space with a locally adaptive radius (hence the name scooping). Based on this expansion, a new node is created and the process is repeated until there are no more voxels left to scoop. When the expanded voxels of a single node no longer form a connected component, a branching node is created and each branch is processed individually. In the final Reeb graph there will be artifacts in the form of short branches (see Fig. 3c). A final pruning step removes branches that only consist of two or less nodes in order to obtain a clean graph with only six arcs corresponding to head, body and limbs (as in Fig. 3d). We propose to use the top of the head as the seeding point for voxel scooping, which will always produce a tree structure similar to the human skeleton

Asserted Claim of the '109 Patent	Exemplary Citations to Straka II
	as in Fig. 3b. The position of the head is determined when the user steps into the system and is further tracked in voxel space." *See* Straka II at pp. 5-6. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Straka 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.

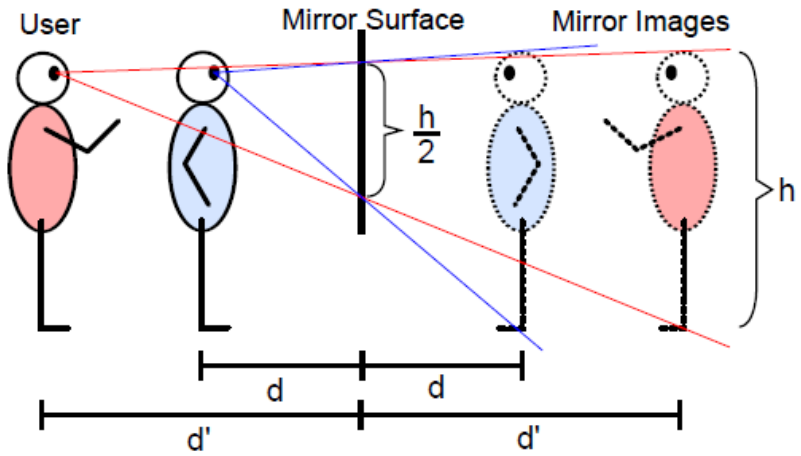
Asserted Claim of the '109 Patent	Exemplary Citations to Straka II
Claim 8	
8. The method of claim 1, further comprising applying a translation transformation to move the image within display area of the monitor.	Straka II expressly and/or inherently discloses and/or renders obvious applying a translation transformation to move the image within display area of the monitor. *See*, *e.g.*, disclosures below. "The last component of the camera matrix $\tilde{P}$ is the intrinsic matrix $\tilde{K}$ which mirrors and projects the scene onto the monitor's surface: $\tilde{K} = \begin{bmatrix} -f & 0 & p_x \\ 0 & -f & p_y \\ 0 & 0 & 1 \end{bmatrix}$ with $f = 2 \cdot d$. "The focal length *f* of the camera is equal to the distance between the virtual camera and the user, which is twice the user-mirror distance *d*. This can be explained by the observation that the size of oneself's image on the mirror surface is constant and independent from *d* and the focal length of the eyes (see Fig. 1b). In the general case, the mirror image will be an off-center projection with the principal point offsets p_x and p_y

Asserted Claim of the '109 Patent	Exemplary Citations to Straka II
	shifted depending on the eye position **c**, the size of the monitor and its resolution in pixels as well as the position of the application window on the monitor." *See* Straka II at p. 7. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Straka 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 '109 Patent	Exemplary Citations to Straka II
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.	Straka II 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 limitation would have been obvious to a person of ordinary skill in the art based on (1) Straka 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 '109 Patent	Exemplary Citations to Straka II
Claim 11	
11[pre]. The method of claim 1, further comprising:	To the extent the preamble is limiting, Straka II expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below.

Asserted Claim of the '109 Patent	Exemplary Citations to Straka II
	See Claims 1[pre]-1[h]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Straka 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.
11[a]. determining distance to a user appearing in the image; and,	Straka II 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*: "Illustration of the mirror effect: When the user has a distance *d* from the mirror, the mirror image appears at the same distance behind the mirror. The height of the mirror image on the mirror surface always is half the height *h* of the user and does not depend on the distance *d*." *See* Straka II at p. 3." "A virtual mirror needs to simulate the properties of a real mirror as accurate as possible. When standing in front of a mirror at a distance *d*, the mirror image of oneself appears exactly at the same distance but behind the mirror. However, even though this distance can change, the size of the user in the mirror image when projected on the mirror surface stays constant at half the height of the *h* user." *See* Straka II at p. 3. "The orthogonal distance *d* between c and the mirror surface can be calculated as follows: $d = \pi^T \begin{bmatrix} c \\ 1 \end{bmatrix}$." *See* Straka II at 7.

Asserted Claim of the '109 Patent	Exemplary Citations to Straka II
	 (b) *See* Straka II at Fig. 1(b). This limitation would have been obvious to a person of ordinary skill in the art based on (1) Straka 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.
11[b]. varying resolution of the image according to the distance.	Straka II expressly and/or inherently discloses and/or renders obvious varying resolution of the image according to the distance. *See*, *e.g.*, disclosures below. "The last component of the camera matrix $\tilde{P}$ is the intrinsic matrix $\tilde{K}$ which mirrors and projects the scene onto the monitor's surface:

Asserted Claim of the '109 Patent	Exemplary Citations to Straka II
	$\widetilde{K} = \begin{bmatrix} -f & 0 & p_x \\ 0 & -f & p_y \\ 0 & 0 & 1 \end{bmatrix}$ with $f = 2 \cdot d$. "The focal length *f* of the camera is equal to the distance between the virtual camera and the user, which is twice the user-mirror distance *d*. This can be explained by the observation that the size of oneself's image on the mirror surface is constant and independent from *d* and the focal length of the eyes (see Fig. 1b). In the general case, the mirror image will be an off-center projection with the principal point offsets p_x and p_y shifted depending on the eye position **c**, the size of the monitor and its resolution in pixels as well as the position of the application window on the monitor." *See* Straka II at p. 7. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Straka 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.

Exhibit A-21: Invalidity of U.S. Patent No. 8,982,109 in view of U.S. Patent Pub. No. 2011/0246329 ("Geisner")

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.

Geisner was originally filed April 1, 2010 and issued on October 6, 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).

Geisner anticipates the Asserted Claims of the '109 Patent. To the extent it is found Geisner 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 Geisner does not anticipate the Asserted Claims, Geisner 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.

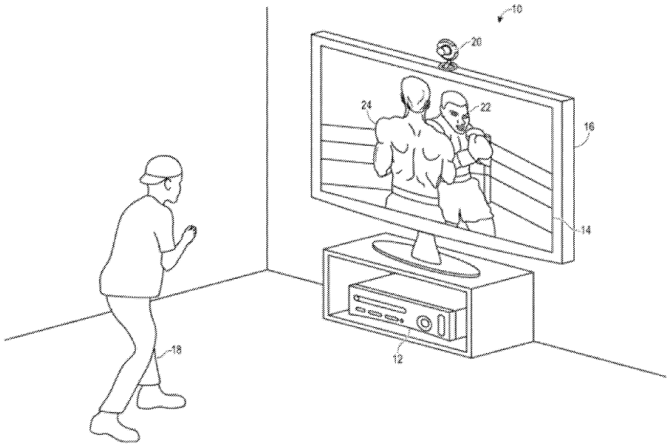
In these contentions, Defendants have relied in part on Plaintiff's Infringement Contentions. In those contentions, Plaintiff appears to pursue overly broad claim constructions in an effort to assert infringement where none exists, and to accuse products that do not infringe the claims. Defendants' assertion 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.

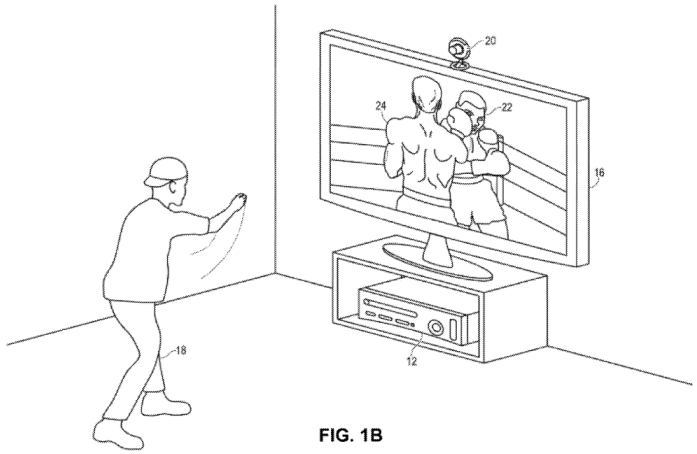
Defendants have endeavored to provide as much detail as possible in these contentions and, in doing so, have exceeded the level of detail required. The inclusion of specific details in some areas is not a concession that such details are required or that the omission of similar details in other areas 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 Geisner
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, Geisner expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. "An on-screen shopping application which reacts to a human target user's motions to provide a shopping experience to the user is provided. A tracking system is used to track user motions and execute a shopping application. An on-screen representation of a human target user, representative of the likeness of the user or another individual, is presented on a display device. Movements of the human target user are tracked and displayed on the display device. An on-screen interface allows the user to interact with virtual articles that represent real-world articles available to the user. User movements which are recognized as article manipulation or transaction control gestures are translated into commands for the shopping application. In one aspect, the application comprises a computer implemented method wherein a scene including a human target user is captured using a capture device which is part of the tracking system. A representation of the scene and the human target is rendered on a display device. An interface is presented allowing the human target to select and position one or more of a plurality of virtual articles representing real articles available for purchase in the representation on the display device. User movements are tracked in the scene and the movements applied to the representation of the human target. Movements are applied to at least one of the virtual articles in the representation when the motions of the human target in the scene indicate an article manipulation gesture. User movements are applied to a purchasing interface when the motions of the human target in the scene indicate an transaction manipulation gesture." *See* paras. [0003]-[0004]. "Technology is provided wherein a computing system runs an on-screen shopping application which reacts to a human target user's motions to provide a shopping experience to the user. A tracking system is used to track user motions and execute a shopping application. An on-screen representation of a human target user, representative of the likeness of the user or another individual, is presented on a display device.

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	Movements of the human target user are tracked and displayed on the display device. An on-screen interface allows the user to interact with virtual articles that represent real-world articles available to the user. User movements which are recognized as article manipulation or transaction control gestures are translated into commands for the shopping application. In one embodiment, the shopping solution provided herein utilizes a system 10 which tracks user movements and presents an on-screen representation of a user (and/or other users), and allows interaction by one or more movements of the human target, or tracked, user." *See* paras. [0024]-[0025]. "FIGS. 1A and 1B illustrate an example embodiment of a system 10 which can be used with the present technology. One use of the exemplary tracking system 10 is where a user 18 plays a game. In FIG. 1 the example is the user playing a boxing game. In an example embodiment, the system 10 may be used to recognize, analyze, and/or track a human target such as the user 18 or other objects within range of tracking system 10. As shown in FIG. 1, tracking system 10 may include a computing system 12. The computing system 12 may be a computer, a gaming system or console, or the like. According to an example embodiment, the computing system 12 may include hardware components and/or software components such that computing system 12 may be used to execute applications such as gaming applications, non-gaming applications, or the like. In one embodiment, computing system 12 may include a processor such as a standardized processor, a specialized processor, a microprocessor, or the like that may execute instructions stored on a processor readable storage device for performing the processes described herein. As shown in FIG. 1A, tracking system 10 may further include a capture device 20. The capture device 20 may be, for example, a camera that may be used to visually monitor one or more users, such as the user 18, such that gestures and/or movements performed by the one or more users may be captured, analyzed, and tracked to perform one or more

Asserted Claim of the '109 Patent	Exemplary Citations to Geisner
	controls or actions within the application and/or animate an avatar or on-screen character, as will be described in more detail below. According to one embodiment, the tracking system 10 may be connected to an audio/visual device 16 such as a television, a monitor, a high-definition television (HDTV), or the like that may provide game or application visuals and/or audio to a user such as the user 18. For example, the computing system 12 may include a video adapter such as a graphics card and/or an audio adapter such as a sound card that may provide audio/visual signals associated with the game application, non-game application, or the like. The audio/visual device 16 may receive the audio/visual signals from the computing system 12 and may then output the game or application visuals and/or audio associated with the audio/visual signals to the user 18. According to one embodiment, the audio/visual device 16 may be connected to the computing system 12 via, for example, an S-Video cable, a coaxial cable, an HDMI cable, a DVI cable, a VGA cable, component video cable, or the like. As shown in FIGS. 1A and 1B, the tracking system 10 may be used to recognize, analyze, and/or track a human target such as the user 18. For example, the user 18 may be tracked using the capture device 20 such that the gestures and/or movements of user 18 may be captured to animate an avatar or on-screen character and/or may be interpreted as controls that may be used to affect the application being executed by computer environment 12. Thus, according to one embodiment, the user 18 may move his or her body to control the application and/or animate the avatar or on-screen character. Similarly, tracking system 10 may be used to recognize, analyze, and/or track persons who are watching user 18 play the game so that movement by those persons watching user 18 play the game will control movement avatars in the audience at the boxing game displayed on audio/visual device 16. In the example depicted in FIGS. 1A and 1B, the application executing on the computing system 10 may be a boxing game that the user 18 is playing. For example, the computing system 12 may use the audio/visual device 16 to provide a visual representation of a boxing opponent 22 to the user 18. The computing system 12 may also use the

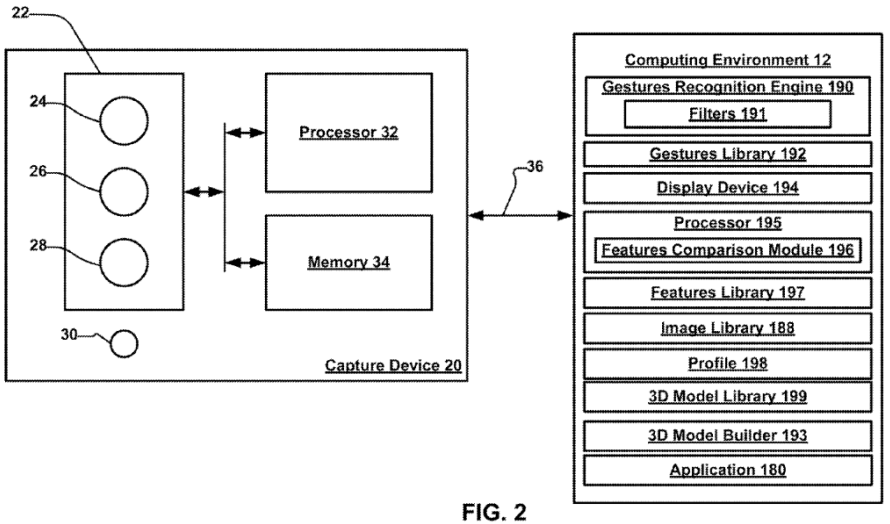
Asserted Claim of the '109 Patent	Exemplary Citations to Geisner
	audio/visual device 16 to provide a visual representation of a user avatar 24 that the user 18 may control with his or her movements. For example, as shown in FIG. 1B, the user 18 may throw a punch in physical space to cause the user avatar 24 to throw a punch in game space. Thus, according to an example embodiment, the computer system 12 and the capture device 20 recognize and analyze the punch of the user 18 in physical space such that the punch may be interpreted as a game control of the user avatar 24 in game space and/or the motion of the punch may be used to animate the user avatar 24 in game space." *See* paras. [0026]-[0031].  FIG. 1

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	 FIG. 1B “FIG. 2 illustrates an example embodiment of a capture device 20 that may be used for target recognition, analysis, and tracking in a scene, where the target can be a user or an object. According to an example embodiment, the capture device 20 may be configured to capture video with depth information including a depth image that may include depth values via any suitable technique including, for example, time-of-flight, structured light, stereo image, or the like. According to one embodiment, the capture device 20 may organize the calculated depth information into “Z layers,” or layers that may be perpendicular to a Z axis extending from the depth camera along its line of sight. As shown in FIG. 2, the capture device 20 may include an image camera component 22. According to an example embodiment, the image camera component 22 may be a depth camera that may capture the depth image of a scene. The depth image may include a two-dimensional (2-D) pixel area of the captured scene where each pixel in the 2-D pixel

Asserted Claim of the '109 Patent	Exemplary Citations to Geisner
	area may represent a depth value such as a length or distance in, for example, centimeters, millimeters, or the like of an object in the captured scene from the camera. As shown in FIG. 2, according to an example embodiment, the image camera component 22 may include an IR light component 24, a three-dimensional (3-D) camera 26, and an RGB camera 28 that may be used to capture the depth image of a scene. Each of these components is focused on a scene. For example, in time-of-flight analysis, the IR light component 24 of the capture device 20 may emit an infrared light onto the scene and may then use sensors (not shown) to detect the backscattered light from the surface of one or more targets and objects in the scene using, for example, the 3-D camera 26 and/or the RGB camera 28. In some embodiments, pulsed infrared light may be used such that the time between an outgoing light pulse and a corresponding incoming light pulse may be measured and used to determine a physical distance from the capture device 20 to a particular location on the targets or objects in the scene. Additionally, in other example embodiments, the phase of the outgoing light wave may be compared to the phase of the incoming light wave to determine a phase shift. The phase shift may then be used to determine a physical distance from the capture device 20 to a particular location on the targets or objects. According to another example embodiment, time-of-flight analysis may be used to indirectly determine a physical distance from the capture device 20 to a particular location on the targets or objects by analyzing the intensity of the reflected beam of light over time via various techniques including, for example, shuttered light pulse imaging. In another example embodiment, the capture device 20 may use a structured light to capture depth information. In such an analysis, patterned light (i.e., light displayed as a known pattern such as grid pattern or a stripe pattern) may be projected onto the scene via, for example, the IR light component 24. Upon striking the surface of one or more targets or objects in the scene, the pattern may become deformed in response. Such a deformation of the pattern may be captured by, for example, the 3-D camera 26 and/or

Asserted Claim of the '109 Patent	Exemplary Citations to Geisner
	the RGB camera 28 and may then be analyzed to determine a physical distance from the capture device 20 to a particular location on the targets or objects. According to another embodiment, the capture device 20 may include two or more physically separated cameras that may view a scene from different angles, to obtain visual stereo data that may be resolved to generate depth information. In another example embodiment, the capture device 20 may use point cloud data and target digitization techniques to detect features of the user." *See* paras. [0034]-[0040]. "In an example embodiment, the capture device 20 may further include a processor 32 that may be in operative communication with the image camera component 22. The processor 32 may include a standardized processor, a specialized processor, a microprocessor, or the like that may execute instructions that may include instructions for receiving the depth image, determining whether a suitable target may be included in the depth image, converting the suitable target into a skeletal representation or model of the target, or any other suitable instruction. The capture device 20 may further include a memory component 34 that may store the instructions that may be executed by the processor 32, images or frames of images captured by the 3-d camera 26 or RGB camera 28, or any other suitable information, images, or the like. According to an example embodiment, the memory component 34 may include random access memory (RAM), read only memory (ROM), cache, Flash memory, a hard disk, or any other suitable storage component. As shown in FIG. 2, in one embodiment, the memory component 34 may be a separate component in communication with the image capture component 22 and the processor 32. According to another embodiment, the memory component 34 may be integrated into the processor 32 and/or the image capture component 22. As shown in FIG. 2, the capture device 20 may be in communication with the computing environment 12 via a communication link 36. The communication link 36 may be a wired connection including, for example, a USB connection, a Firewire connection, an

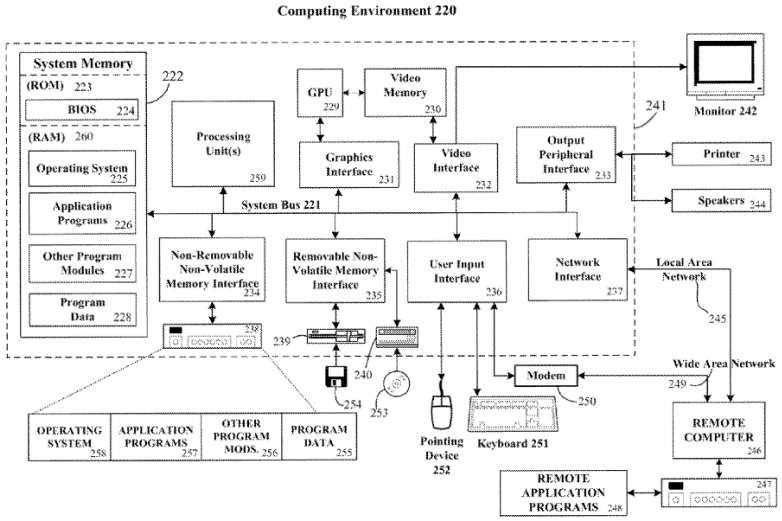
Asserted Claim of the '109 Patent	Exemplary Citations to Geisner
	Ethernet cable connection, or the like and/or a wireless connection such as a wireless 802.11b, g, a, or n connection. According to one embodiment, the computing environment 12 may provide a clock to the capture device 20 that may be used to determine when to capture, for example, a scene via the communication link 36. Additionally, the capture device 20 may provide the depth information and images captured by, for example, the 3-D camera 26 and/or the RGB camera 28, and a skeletal model that may be generated by the capture device 20 to the computing environment 12 via the communication link 36. The computing environment 12 may then use the skeletal model, depth information, and captured images to, for example, control an application such as a game or word processor. For example, as shown, in FIG. 2, the computing environment 12 may include a gestures library 192. Computing environment 12 may include a gesture recognition engine 190 including gesture filters 191, a gestures library 192, a display device 194, a processor 195 including a feature comparison model 196, a features library 197, an image library 188, user profile information 198, a 3-D model library 198, a 3-D model builder 193 and one or more applications 180. In the present example, application 180 is an interactive shopping application. Processor 195 can execute instructions for receiving data of a scene, wherein the data includes data representative of the target in a physical space. The instructions comprise instructions for detecting at least one target feature from the data, and comparing the at least one detected target feature to visual representation feature options from the features library 195. The visual representation feature options may comprise selectable options configured for application to the visual representation. Further instructions provide for selecting a visual representation feature from the visual representation feature options, applying the visual representation feature to the visual representation of the target, and rendering the visual representation. The visual representation may be auto-generated from the comparison of the at least one detected feature to the visual representation

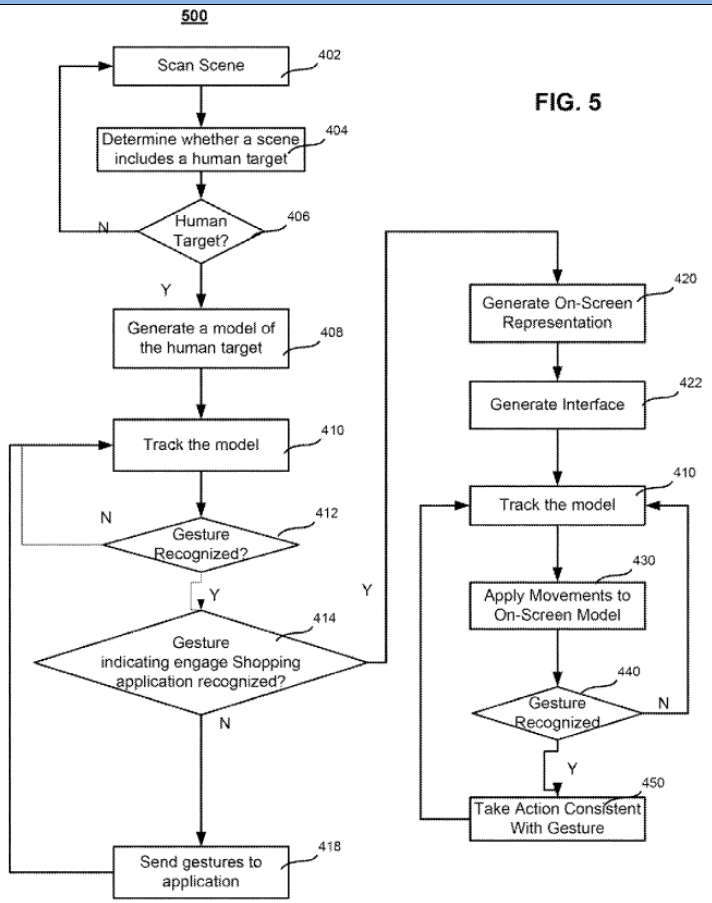
Asserted Claim of the '109 Patent	Exemplary Citations to Geisner
	feature options such that the selection of the visual representation feature is performed without manual selection by a user." *See* paras. [0042]-[0047].  FIG. 2 "The selection of the visual representation feature may comprise selecting the visual representation feature that is similar to the detected target feature. The visual representation feature may be at least one of a facial feature, a body part, a color, a size, a height, a width, a shape, an accessory, or a clothing item. The instructions may provide for generating a subset of visual representation feature options, from the visual representation feature options, for the visual representation feature, and providing the generated subset of feature options for user selection of the visual representation feature to apply to the visual representation. The generated subset of visual representation feature options may comprise multiple visual representation feature options that are similar to the detected target feature. The instructions may provide for receiving a user selection of a visual representation feature from the generated subset of feature options, wherein selecting the visual representation feature from the visual representation feature options comprises selecting the visual representation feature that corresponds to the user

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	selection. The visual representation, having the visual representation feature, may be rendered in real time. Furthermore, the instructions may provide for monitoring the target and detecting a change in the detected target feature, and updating the visual representation of the target by updating the visual representation feature applied to the visual representation, in real time, based on the change in the detected target feature." *See* para. [0048]. "The computing environment 12 may include a processor 195 that can process the depth image to determine what targets are in a scene, such as a user 18 or an object in the room. This can be done, for instance, by grouping together of pixels of the depth image that share a similar distance value. The image may also be parsed to produce a skeletal representation of the user, where features, such as joints and tissues that run between joints are identified. There exist skeletal mapping techniques to capture a person with a depth camera and from that determine various spots on that user's skeleton, joints of the hand, wrists, elbows, knees, nose, ankles, shoulders, and where the pelvis meets the spine. Other techniques include transforming the image into a body model representation of the person and transforming the image into a mesh model representation of the person. In an embodiment, the processing is performed on the capture device 20, and the raw image data of depth and color (where the capture device 20 comprises a 3-D camera 26) values are transmitted to the computing environment 12 via link 36. In another embodiment, the processing is performed by a processor 32 coupled to the camera 402 and then the parsed image data is sent to the computing environment 12. In still another embodiment, both the raw image data and the parsed image data are sent to the computing environment 12. The computing environment 12 may receive the parsed image data but it may still receive the raw data for executing the current process or application. For instance, if an image of the scene is transmitted across a computer network to another user, the computing environment 12 may transmit the raw data for processing by another computing environment. The processor may have a features comparison module 196. The features comparison module 196 may compare the detected features of a target to the options in the features

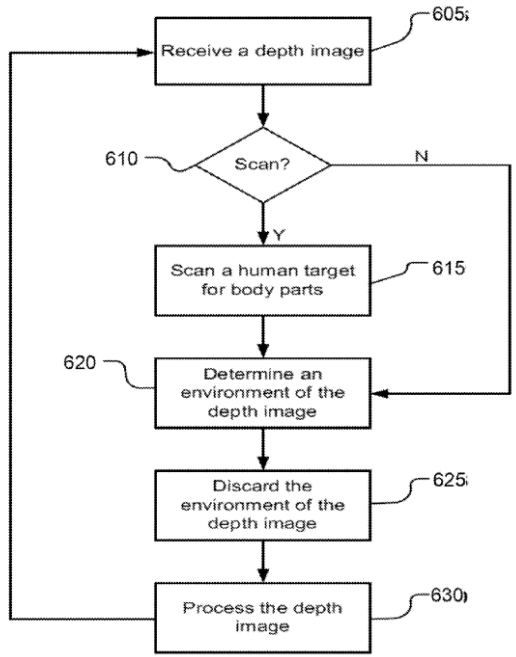
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	library 197. The features library 197 may provide visual representation feature options, such as color options, facial feature options, body type options, size options, etc, and the options may vary for human and non-human targets. The library may be a catalog, a database, memory, or the like, that stores the features for the visual representation. The library may an organized or unorganized collection of features options. The system or user may add features to the catalog. For example, an application may have a pre-packaged set of feature options or the system may have a default number of available features. Additional feature options may be added to or updated in the features library 197. For example, the user may purchase additional feature options in a virtual marketplace, a user may gift feature options to another user, or the system may generate feature options by taking a snapshot of the user's detected features." *See* paras. [0054]-[0056]. "The computing environment 12 can model and display a representation of a human target user, or a representation of another individual for whom a 3D model is stored, such as in the form of an avatar or a pointer on a display, such as in a display device 193. Display device 193 may include a computer monitor, a television screen, or any suitable display device. For example, a camera-controlled computer system may capture user image data and display user feedback on a television screen that maps to the user's gestures. The user feedback may be displayed as an avatar or other on screen representation of the user, on the screen such as shown in FIGS. 1A and 1B. The avatar's motion can be controlled directly by mapping the avatar's movement to those of the user's movements. The user's gestures may be interpreted control certain aspects of the application. According to an example embodiment, the target may be a human target in any position such as standing or sitting, a human target with an object, two or more human targets, one or more appendages of one or more human targets or the like that may be scanned, tracked, modeled and/or evaluated to generate a virtual screen, compare the user to one or more stored profiles and/or to store profile information 198 about the target in a computing environment such as computing environment 12. The profile information 198 may be in the form of user profiles, personal profiles, application profiles, system

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	profiles, or any other suitable method for storing data for later access. The profile information 198 may be accessible via an application or be available system-wide, for example. The profile information 198 may include lookup tables for loading specific user profile information. The virtual screen may interact with an application that may be executed by the computing environment 12 described above with respect to FIGS. 1A-1B.” *See* paras. [0072]-[0073]. “The system will use the RGB images and depth images to track a user's movements. For example, the system will track a skeleton of a person using a depth images. There are many methods that can be used to track the skeleton of a person using depth images. One suitable example of tracking a skeleton using depth images is provided in U.S. patent application Ser. No. 12/603,437, “Pose Tracking Pipeline,” filed on Oct. 21, 2009. (hereinafter referred to as the '437 application), incorporated herein by reference in its entirety. The process of the '437 application includes acquiring a depth image, down sampling the data, removing and/or smoothing high variance noisy data, identifying and removing the background, and assigning each of the foreground pixels to different parts of the body. Based on those steps, the system will fit a model with the data and create a skeleton. The skeleton will include a set of joints and connections between the joints. In one embodiment, in order for a user's motion to be used to control an application the user must first be enrolled or bound to the application. In one embodiment, each user will be asked to identify himself or herself by standing in front of the system so that depth images and/or visual images can be obtained from multiple angles for that user. For example, the user may be asked to stand in front of the camera, turn around, and make various poses while depth images and visual images are obtained. After the system obtains enough depth and/or visual images, the system will create a set of identifying data from the images that uniquely identifies the user. The system will create a unique identification and associate that unique identification with on-screen representation (e.g., avatar) or other object in the game/application. After a user is enrolled in (or bound to) the application, the system will track the motion of that user while the user is actively engaged with the application (e.g., playing the game or using the application). However, in the past, other people in the room who are not actively engaged with the application,

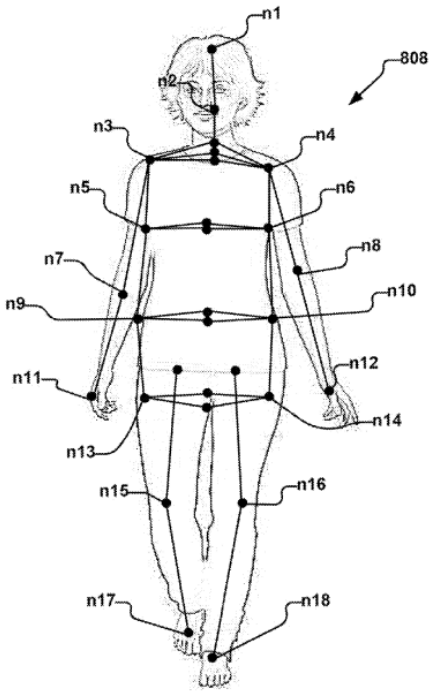
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	(e.g., not bound to application, bound to application but not playing current game, or bound to application but currently not having a turn to play) do not have a way to interact with the application." *See* paras. [0102]-[0103].  FIG. 4 "FIG. 5 is a flow chart illustrating a general method to provide an independent motion tracking based shopping application in accordance with the present technology. In FIG. 5, a scene is scanned at 402 in accordance with the discussion herein using the capture system illustrated in FIG. 2 and the process described below at FIG. 6. At step 404, the system time determines whether the scene includes a human target. Selection of a human target within a scene is discussed below with respect to FIG. 7. At step 406, scanning is continuous until a human target is found. Once a human target is detected at 406, a model of the human target is generated at 408. A model of the target is illustrated in FIG. 8. At step 410, the model is continuously tracked." *See* paras. [0104]-[0105].

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	 FIG. 5 "If the shopping application is engaged at 414, an on-screen representation of the human target is generated at 420. At 422, a shopping interface is generated on the display 16. The shopping interface may comprise any variety of interface designed to allow the user to manipulate a series of virtual articles presented in the interface through movements captured by the system 10. The virtual articles presented represent real-world articles

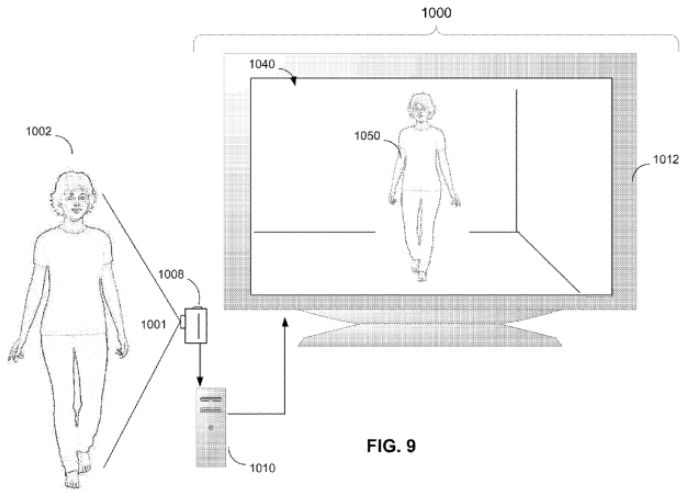
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	that a user may acquire through vendors, or which the user may already own and which the user wishes to have presented in the on-screen representation. For example, a user may wish to shop for a new item to match to a user's existing inventory of items. Representations of both items may be presented. The model of the human target is continuously tracked at 410 and movements of the human target model are applied to the on-screen model at 430. This is discussed below with respect to FIGS. 6 and 11, and performed in accordance with the teachings of U.S. application Ser. Nos. 12/475,308, 12/696,282, 12/641,788, and 12/575,388. If a user performs a gesture and the gesture is recognized at 440, action consistent with the gesture within the shopping application is applied at 450. As discussed below, shopping applications gestures can comprise two general types of gestures: an article manipulation gesture or a transaction manipulation gesture. An article manipulation gesture may comprise, for example, any of a number of shopping consistent actions consistent with the interface presented to the user. If the user is presented a selection of virtual articles comprising clotting and an on-screen representation of themselves, article manipulation actions may comprise actions such as selecting clothes, putting on clothes, taking off clothes, adjusting clothes, changing backgrounds, changing accessories, moving room elements within a scene, placing items within a scene, placing the on-screen representation with a variety of backgrounds in particular clothing, and the like. A transaction gesture may comprise a gesture used to facilitate a transaction such as movement of an article into a shopping cart, removing an article from a shopping cart, entry of financial information and the like." *See* paras. [0109]-[0111]. "FIG. 7 depicts a flow diagram of an example method for processing depth information in accordance with steps 404 and 406 of FIG. 6 including, for example, segmenting a human target from an environment in depth image that may be captured by a capture device. In an example embodiment, the example method 600 may take the form of program code (i.e., instructions) that may be executed by, for example, the capture device 20 and/or the computing environment 12 of system 1010. The method of determining whether a human is in the scene is disclosed in U.S. patent application Ser.

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	No. 12/475,094 entitled "Environment And/Or Target Segmentation", filed 29 May 2009 and hereby fully incorporated herein by reference." *See* para. [0114].  FIG. 7 "For example, according to an example embodiment, a model such as a skeletal model, a mesh human model, or the like of a user such as the user 18 described with respect to FIG. 8.

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	The visual appearance of an on-screen character may then be changed in response to changes to the model being tracked. For example, a user such as the user 18 described above with respect to FIGS. 1A and 1B playing an electronic game on a gaming console may be tracked by the gaming console as described herein. In particular, a body model such as a skeletal model may be used to model the target game player, and the body model may be used to render an on-screen player avatar. As the game player straightens one arm, the gaming console may track this motion, then in response to the tracked motion, adjust the body model accordingly. The gaming console may also apply one or more constraints to movements of the body model. Upon making such adjustments and applying such constraints, the gaming console may display the adjusted player avatar. FIG. 8 illustrates an example embodiment of a skeletal model 808 representing a scanned human target used to track a user, such as user 18 or 1002. The model is shown relative to the user 1002. According to an example embodiment, the skeletal model 808 may include one or more data structures that may represent the human target 18 or 1002 as a three-dimensional model. Each body part may be characterized as a mathematical vector defining joints and bones of the skeletal model 808. As shown in FIG. 8, the skeletal model 808 may include one or more joints n1-n18. According to an example embodiment, each of the joints n1-n18 may enable one or more body parts defined there between to move relative to one or more other body parts. For example, a model representing a human target may include a plurality of rigid and/or deformable body parts that may be defined by one or more structural members such as "bones" with the joints n1-n18 located at the intersection of adjacent bones. The joints n1-n18 may enable various body parts associated with the bones and joints n1-n18 to move independently of each other. For example, the bone defined between the joints n7 and n11, shown in FIG. 9, corresponds to a forearm that may be moved independent of, for example, the bone defined between joints n15 and n17 that corresponds to a calf. **Each of the joints represents a place in the skeleton where the skeleton can pivot in the x, y, z directions or a place of interest on the body. Other methods for tracking can also be used. Suitable tracking technology is disclosed the teachings of U.S. patent

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	application Ser. Nos. 12/475,308, 12/696,282, 12/641,788, and 12/575,388, cited above.” *See* paras. [0121]-[0125].  FIG. 8 “FIGS. 9 and 10 illustrate the creation of an on screen representation 1050 of a user 1002. The techniques for generating an on-screen representation are disclosed in U.S. patent application Ser. No. 12/511,850, entitled Auto Generating a Visual Representation, filed 29 Jul. 2009, fully incorporated herein by reference. The on-screen representation may be auto-generated by the system to provide a visual representation of

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	a target that has features resembling the detected features of the target. Alternately, the system may provide a subset of selectable features from which the user may choose. The system may select the features based on the detected features of the target and apply the selections to the visual representation of the target. Thus, auto-generation techniques may remove a large amount of the effort from a user. For example, the system can make selections, on behalf of the user, and apply them to the user's visual representation. As shown in FIG. 9, the system renders a visual representation 1050 on a display 1000 that corresponds to the user 1002 in the physical space 1001. In this example, the system auto-generated the on-screen representation 1050 by detecting features of the user 1002, comparing the detected features to a library of feature options, or imaging information in an imaging library, selecting the feature options that resemble the detected features of the user 1002, and automatically applying them to the user's on-screen representation 1050. The auto-generation of the on-screen representation removes work from the user 1002 and creates an experience for the user 1002 as they are transported into the game or application experience. By tracking the model generated at step 408, system 20 can display the on-screen representation in real time and update the feature selections applied to the on-screen representation in real time. The system may track the user in the physical space over time and apply modifications or update the features applied to the on-screen representation, also in real time. For example, the system may track a user and identify that the user has removed a sweatshirt. The system may identify the user's body movements and recognize a change in the user's clothing type and color. The system may use any of the user's identified characteristics to assist in the feature selection process and/or updated the features selected from the features library and applied to the visual representation. Image data and/or depth information may be used in to identify target features. Such target features for a human target may include, for example, height and/or arm length and may be obtained based on, for example, a body scan, a skeletal model, the extent of a user 1002 on a pixel area or any other suitable process or data. Using for example, the depth values in a plurality of observed pixels that are associated with a human target and

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	the extent of one or more aspects of the human target such as the height, the width of the head, or the width of the shoulders, or the like, the size of the human target may be determined. The camera 1008 may process the image data and use it to determine the shape, colors, and size of various parts of the user, including the user's hair, clothing, etc. The detected features may be compared to a catalog of feature options for application to a visual representation, such as the visual representation feature options in the features library 197.” *See* paras. [0129]-[0132].  FIG. 9

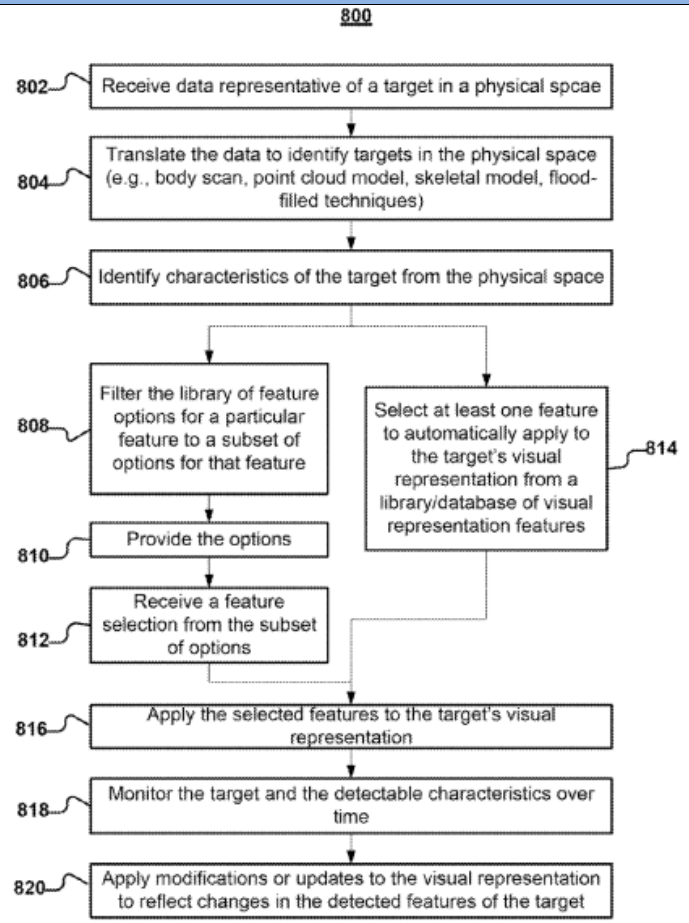
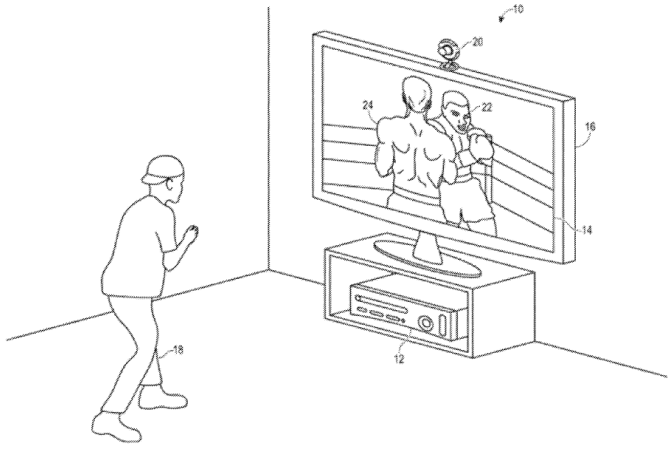
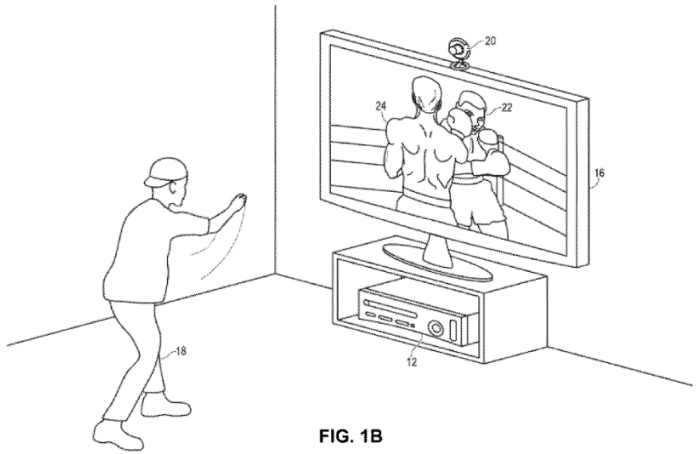
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FIG. 10

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	This limitation would have been obvious to a person of ordinary skill in the art based on (1) Geisner 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;	Geisner expressly and/or inherently discloses and/or renders obvious obtaining a digital image from a camera. *See*, *e.g.*, disclosures below. "In one aspect, the application comprises a computer implemented method wherein a scene including a human target user is captured using a capture device which is part of the tracking system. A representation of the scene and the human target is rendered on a display device. An interface is presented allowing the human target to select and position one or more of a plurality of virtual articles representing real articles available for purchase in the representation on the display device. User movements are tracked in the scene and the movements applied to the representation of the human target. Movements are applied to at least one of the virtual articles in the representation when the motions of the human target in the scene indicate an article manipulation gesture. User movements are applied to a purchasing interface when the motions of the human target in the scene indicate an transaction manipulation gesture." *See* para. [0004]. "As shown in FIG. 1A, tracking system 10 may further include a capture device 20. The capture device 20 may be, for example, a camera that may be used to visually monitor one or more users, such as the user 18, such that gestures and/or movements performed by the one or more users may be captured, analyzed, and tracked to perform one or more controls or actions within the application and/or animate an avatar or on-screen character, as will be described in more detail below. According to one embodiment, the tracking system 10 may be connected to an audio/visual device 16 such as a television, a monitor, a high-definition television (HDTV), or the like that may provide game or application visuals and/or audio to a user such as the user 18. For example, the computing system 12 may include a video adapter

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	such as a graphics card and/or an audio adapter such as a sound card that may provide audio/visual signals associated with the game application, non-game application, or the like. The audio/visual device 16 may receive the audio/visual signals from the computing system 12 and may then output the game or application visuals and/or audio associated with the audio/visual signals to the user 18. According to one embodiment, the audio/visual device 16 may be connected to the computing system 12 via, for example, an S-Video cable, a coaxial cable, an HDMI cable, a DVI cable, a VGA cable, component video cable, or the like. As shown in FIGS. 1A and 1B, the tracking system 10 may be used to recognize, analyze, and/or track a human target such as the user 18. For example, the user 18 may be tracked using the capture device 20 such that the gestures and/or movements of user 18 may be captured to animate an avatar or on-screen character and/or may be interpreted as controls that may be used to affect the application being executed by computer environment 12. Thus, according to one embodiment, the user 18 may move his or her body to control the application and/or animate the avatar or on-screen character. Similarly, tracking system 10 may be used to recognize, analyze, and/or track persons who are watching user 18 play the game so that movement by those persons watching user 18 play the game will control movement avatars in the audience at the boxing game displayed on audio/visual device 16. In the example depicted in FIGS. 1A and 1B, the application executing on the computing system 10 may be a boxing game that the user 18 is playing. For example, the computing system 12 may use the audio/visual device 16 to provide a visual representation of a boxing opponent 22 to the user 18. The computing system 12 may also use the audio/visual device 16 to provide a visual representation of a user avatar 24 that the user 18 may control with his or her movements. For example, as shown in FIG. 1B, the user 18 may throw a punch in physical space to cause the user avatar 24 to throw a punch in game space. Thus, according to an example embodiment, the computer system 12 and the capture device 20 recognize and analyze the punch of the user 18 in physical space such that the punch may be interpreted as a game control of the user avatar 24 in game

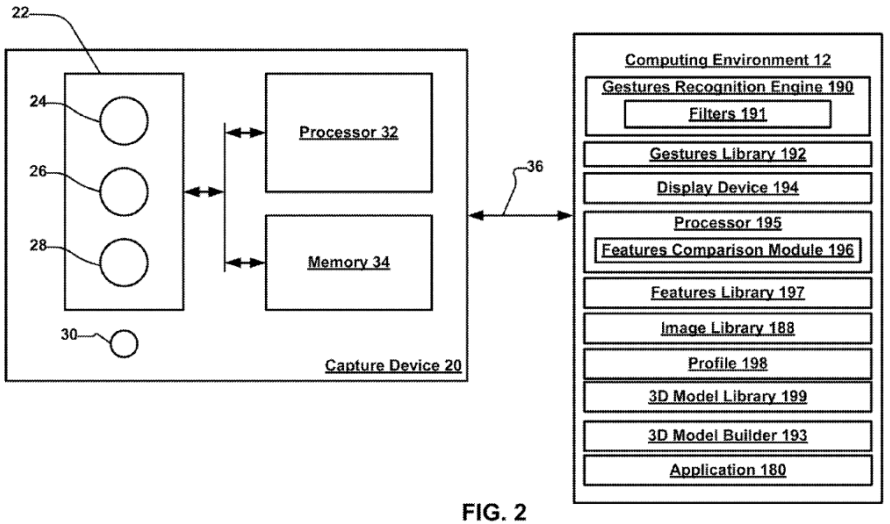
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	space and/or the motion of the punch may be used to animate the user avatar 24 in game space." *See* paras. [0028]-[0031].  FIG. 1

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	 FIG. 1B “FIG. 2 illustrates an example embodiment of a capture device 20 that may be used for target recognition, analysis, and tracking in a scene, where the target can be a user or an object. According to an example embodiment, the capture device 20 may be configured to capture video with depth information including a depth image that may include depth values via any suitable technique including, for example, time-of-flight, structured light, stereo image, or the like. According to one embodiment, the capture device 20 may organize the calculated depth information into “Z layers,” or layers that may be perpendicular to a Z axis extending from the depth camera along its line of sight. As shown in FIG. 2, the capture device 20 may include an image camera component 22. According to an example embodiment, the image camera component 22 may be a depth camera that may capture the depth image of a scene. The depth image may include a two-dimensional (2-D) pixel area of the captured scene where each pixel in the 2-D pixel area may represent a depth value such as a length or distance in, for example, centimeters, millimeters, or the like of an object in the captured scene from the camera.

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	As shown in FIG. 2, according to an example embodiment, the image camera component 22 may include an IR light component 24, a three-dimensional (3-D) camera 26, and an RGB camera 28 that may be used to capture the depth image of a scene. Each of these components is focused on a scene. For example, in time-of-flight analysis, the IR light component 24 of the capture device 20 may emit an infrared light onto the scene and may then use sensors (not shown) to detect the backscattered light from the surface of one or more targets and objects in the scene using, for example, the 3-D camera 26 and/or the RGB camera 28. In some embodiments, pulsed infrared light may be used such that the time between an outgoing light pulse and a corresponding incoming light pulse may be measured and used to determine a physical distance from the capture device 20 to a particular location on the targets or objects in the scene. Additionally, in other example embodiments, the phase of the outgoing light wave may be compared to the phase of the incoming light wave to determine a phase shift. The phase shift may then be used to determine a physical distance from the capture device 20 to a particular location on the targets or objects. According to another example embodiment, time-of-flight analysis may be used to indirectly determine a physical distance from the capture device 20 to a particular location on the targets or objects by analyzing the intensity of the reflected beam of light over time via various techniques including, for example, shuttered light pulse imaging. In another example embodiment, the capture device 20 may use a structured light to capture depth information. In such an analysis, patterned light (i.e., light displayed as a known pattern such as grid pattern or a stripe pattern) may be projected onto the scene via, for example, the IR light component 24. Upon striking the surface of one or more targets or objects in the scene, the pattern may become deformed in response. Such a deformation of the pattern may be captured by, for example, the 3-D camera 26 and/or the RGB camera 28 and may then be analyzed to determine a physical distance from the capture device 20 to a particular location on the targets or objects.

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	According to another embodiment, the capture device 20 may include two or more physically separated cameras that may view a scene from different angles, to obtain visual stereo data that may be resolved to generate depth information. In another example embodiment, the capture device 20 may use point cloud data and target digitization techniques to detect features of the user." *See* paras. [0034]-[0040]. "In an example embodiment, the capture device 20 may further include a processor 32 that may be in operative communication with the image camera component 22. The processor 32 may include a standardized processor, a specialized processor, a microprocessor, or the like that may execute instructions that may include instructions for receiving the depth image, determining whether a suitable target may be included in the depth image, converting the suitable target into a skeletal representation or model of the target, or any other suitable instruction. The capture device 20 may further include a memory component 34 that may store the instructions that may be executed by the processor 32, images or frames of images captured by the 3-d camera 26 or RGB camera 28, or any other suitable information, images, or the like. According to an example embodiment, the memory component 34 may include random access memory (RAM), read only memory (ROM), cache, Flash memory, a hard disk, or any other suitable storage component. As shown in FIG. 2, in one embodiment, the memory component 34 may be a separate component in communication with the image capture component 22 and the processor 32. According to another embodiment, the memory component 34 may be integrated into the processor 32 and/or the image capture component 22. As shown in FIG. 2, the capture device 20 may be in communication with the computing environment 12 via a communication link 36. The communication link 36 may be a wired connection including, for example, a USB connection, a Firewire connection, an Ethernet cable connection, or the like and/or a wireless connection such as a wireless 802.11b, g, a, or n connection. According to one embodiment, the computing

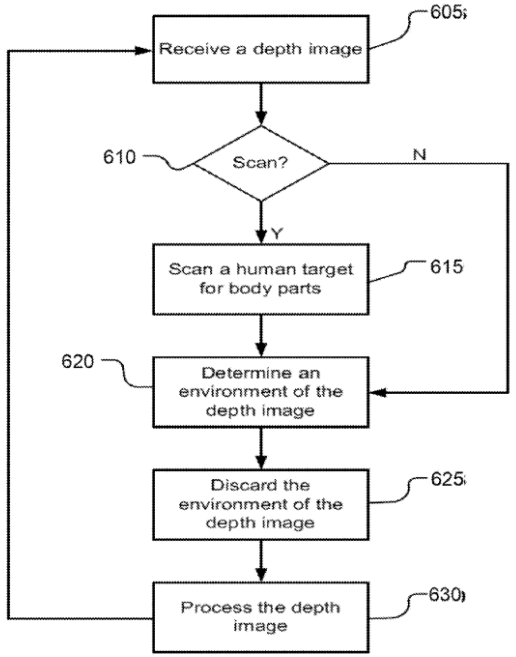
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	environment 12 may provide a clock to the capture device 20 that may be used to determine when to capture, for example, a scene via the communication link 36. Additionally, the capture device 20 may provide the depth information and images captured by, for example, the 3-D camera 26 and/or the RGB camera 28, and a skeletal model that may be generated by the capture device 20 to the computing environment 12 via the communication link 36. The computing environment 12 may then use the skeletal model, depth information, and captured images to, for example, control an application such as a game or word processor. For example, as shown, in FIG. 2, the computing environment 12 may include a gestures library 192. Computing environment 12 may include a gesture recognition engine 190 including gesture filters 191, a gestures library 192, a display device 194, a processor 195 including a feature comparison model 196, a features library 197, an image library 188, user profile information 198, a 3-D model library 198, a 3-D model builder 193 and one or more applications 180. In the present example, application 180 is an interactive shopping application. Processor 195 can execute instructions for receiving data of a scene, wherein the data includes data representative of the target in a physical space. The instructions comprise instructions for detecting at least one target feature from the data, and comparing the at least one detected target feature to visual representation feature options from the features library 195. The visual representation feature options may comprise selectable options configured for application to the visual representation. Further instructions provide for selecting a visual representation feature from the visual representation feature options, applying the visual representation feature to the visual representation of the target, and rendering the visual representation. The visual representation may be auto-generated from the comparison of the at least one detected feature to the visual representation feature options such that the selection of the visual representation feature is performed without manual selection by a user." *See* paras. [0042]-[0047].

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	 FIG. 2 “The data captured by the cameras 26, 28 and device 20 in the form of the skeletal model and movements associated with it may be compared to the gesture filters 191 in the gestures library 192 to identify when a user (as represented by the skeletal model) has performed one or more gestures. Thus, inputs to a filter such as filter 191 may comprise things such as joint data about a user's joint position, like angles formed by the bones that meet at the joint, RGB color data from the scene, and the rate of change of an aspect of the user. As mentioned, parameters may be set for the gesture. Outputs from a filter 191 may comprise things such as the confidence that a given gesture is being made, the speed at which a gesture motion is made, and a time at which the gesture occurs. The computing environment 12 may include a processor 195 that can process the depth image to determine what targets are in a scene, such as a user 18 or an object in the room. This can be done, for instance, by grouping together of pixels of the depth image that share a similar distance value. The image may also be parsed to produce a skeletal representation of the user, where features, such as joints and tissues that run between joints are identified. There exist skeletal mapping techniques to capture a person with a

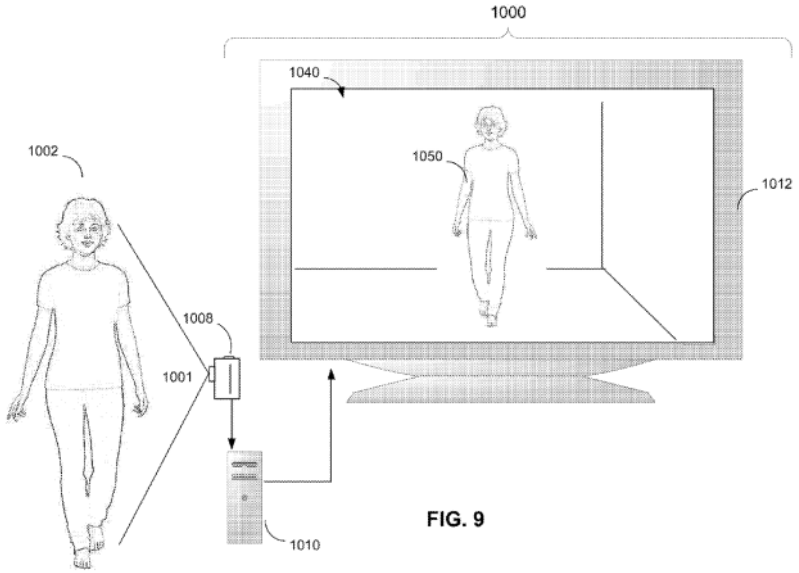
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	depth camera and from that determine various spots on that user's skeleton, joints of the hand, wrists, elbows, knees, nose, ankles, shoulders, and where the pelvis meets the spine. Other techniques include transforming the image into a body model representation of the person and transforming the image into a mesh model representation of the person. In an embodiment, the processing is performed on the capture device 20, and the raw image data of depth and color (where the capture device 20 comprises a 3-D camera 26) values are transmitted to the computing environment 12 via link 36. In another embodiment, the processing is performed by a processor 32 coupled to the camera 402 and then the parsed image data is sent to the computing environment 12. In still another embodiment, both the raw image data and the parsed image data are sent to the computing environment 12. The computing environment 12 may receive the parsed image data but it may still receive the raw data for executing the current process or application. For instance, if an image of the scene is transmitted across a computer network to another user, the computing environment 12 may transmit the raw data for processing by another computing environment. The processor may have a features comparison module 196. The features comparison module 196 may compare the detected features of a target to the options in the features library 197. The features library 197 may provide visual representation feature options, such as color options, facial feature options, body type options, size options, etc, and the options may vary for human and non-human targets. The library may be a catalog, a database, memory, or the like, that stores the features for the visual representation. The library may an organized or unorganized collection of features options. The system or user may add features to the catalog. For example, an application may have a pre-packaged set of feature options or the system may have a default number of available features. Additional feature options may be added to or updated in the features library 197. For example, the user may purchase additional feature options in a virtual marketplace, a user may gift feature options to another user, or the system may generate feature options by taking a snapshot of the user's detected features.

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	The image library 188 may be a collection of images retrieved by the capture device 20 including particular features of users who interact with the capture device. Images may be used to render on-screen scenes in accordance with the discussion below. The image library 188 may also store images scanned by the capture device of articles in the scene." *See* paras. [0053]-[0057]. "The computing environment 12 can model and display a representation of a human target user, or a representation of another individual for whom a 3D model is stored, such as in the form of an avatar or a pointer on a display, such as in a display device 193. Display device 193 may include a computer monitor, a television screen, or any suitable display device. For example, a camera-controlled computer system may capture user image data and display user feedback on a television screen that maps to the user's gestures. The user feedback may be displayed as an avatar or other on screen representation of the user, on the screen such as shown in FIGS. 1A and 1B. The avatar's motion can be controlled directly by mapping the avatar's movement to those of the user's movements. The user's gestures may be interpreted control certain aspects of the application." *See* para. [0072]. "In one embodiment, in order for a user's motion to be used to control an application the user must first be enrolled or bound to the application. In one embodiment, each user will be asked to identify himself or herself by standing in front of the system so that depth images and/or visual images can be obtained from multiple angles for that user. For example, the user may be asked to stand in front of the camera, turn around, and make various poses while depth images and visual images are obtained. After the system obtains enough depth and/or visual images, the system will create a set of identifying data from the images that uniquely identifies the user. The system will create a unique identification and associate that unique identification with on-screen representation (e.g., avatar) or other object in the game/application. After a user is enrolled in (or bound to) the application, the system will track the motion of that user while the user is actively engaged with the application (e.g., playing the game or using the application). However, in the past, other people in the room who are not actively engaged with the application, (e.g., not bound to application, bound to application but not playing current game, or

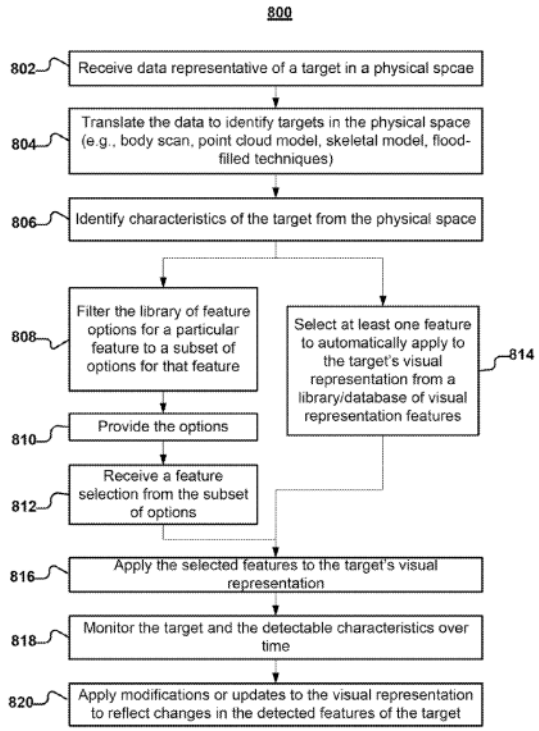
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	bound to application but currently not having a turn to play) do not have a way to interact with the application." *See* para. [0103]. "FIG. 7 depicts a flow diagram of an example method for processing depth information in accordance with steps 404 and 406 of FIG. 6 including, for example, segmenting a human target from an environment in depth image that may be captured by a capture device. In an example embodiment, the example method 600 may take the form of program code (i.e., instructions) that may be executed by, for example, the capture device 20 and/or the computing environment 12 of system 1010. The method of determining whether a human is in the scene is disclosed in U.S. patent application Ser. No. 12/475,094 entitled "Environment And/Or Target Segmentation", filed 29 May 2009 and hereby fully incorporated herein by reference. According to one embodiment, at 605, a depth image may be received. The capture device 20 may capture or observe a scene that may include one or more targets or objects. In an example embodiment, the capture device 20 may be a depth camera configured to obtain a depth image of the scene using any suitable technique such as time-of-flight analysis, structured light analysis, stereo vision analysis, or the like. The depth image may be a plurality of observed pixels where each observed pixel has an observed depth value. The depth image may include a two-dimensional (2-D) pixel area of the captured scene where each pixel in the 2-D pixel area may have a depth value such as a length or distance in, for example, centimeters, millimeters, or the like of an object in the captured scene from the capture device. The depth image may include one or more human targets corresponding to, one or more users and one or more non-human targets such as a wall, a table, a monitor, a couch, a ceiling or the like in the captured scene. At 615, a human target in a depth image may be scanned for one or more body parts. In one embodiment, system 10 may determine whether a human target in the depth image may have been previously scanned, at 610, before the human target may be scanned at 615. For example, the capture device may capture a scene in frames. Each frame may include a depth image. The depth image of each frame may be analyzed to determine whether the depth image may include a human

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	target as described above. The depth image of each frame may further be analyzed to determine whether the human target may have been previously scanned for one or more body parts. For example, at 610, system 10 may determine whether a human target in the depth image received, at 605, corresponds to a human target previously scanned at 615. In one embodiment, at 610, if the human target may not correspond to a human target previously scanned, the human target may then be scanned at 615." *See* paras. [0114]-[0116].  FIG. 7

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	"As shown in FIG. 8, the skeletal model 808 may include one or more joints n1-n18. According to an example embodiment, each of the joints n1-n18 may enable one or more body parts defined there between to move relative to one or more other body parts. For example, a model representing a human target may include a plurality of rigid and/or deformable body parts that may be defined by one or more structural members such as "bones" with the joints n1-n18 located at the intersection of adjacent bones. The joints n1-n18 may enable various body parts associated with the bones and joints n1-n18 to move independently of each other. For example, the bone defined between the joints n7 and n11, shown in FIG. 9, corresponds to a forearm that may be moved independent of, for example, the bone defined between joints n15 and n17 that corresponds to a calf. **Each of the joints represents a place in the skeleton where the skeleton can pivot in the x, y, z directions or a place of interest on the body. Other methods for tracking can also be used. Suitable tracking technology is disclosed the teachings of U.S. patent application Ser. Nos. 12/475,308, 12/696,282, 12/641,788, and 12/575,388, cited above. FIG. 9 illustrates a user 1002 and an on-screen representation of the user 1050 provided by system 20. Through moving her body, a user 1002 may create gestures. A gesture comprises a motion or pose by a user that may be captured as image data and parsed for meaning. A user's gestures may be used for input in a general computing context. For instance, various motions of the hands or other body parts may correspond to common system wide tasks such as navigate up or down in a hierarchical list, open a file, close a file, and save a file. For instance, a user may hold his hand with the fingers pointing up and the palm facing the capture device 20. He may then close his fingers towards the palm to make a fist, and this could be a gesture that indicates that the focused window in a window-based user-interface computing environment should be closed. Gestures may also be used in a video-game-specific context, depending on the game. For instance, with a driving game, various motions of the hands and feet may correspond to steering a vehicle in a direction, shifting gears, accelerating, and braking. Thus, a gesture may indicate a wide variety of motions that map to a displayed user representation, and in a

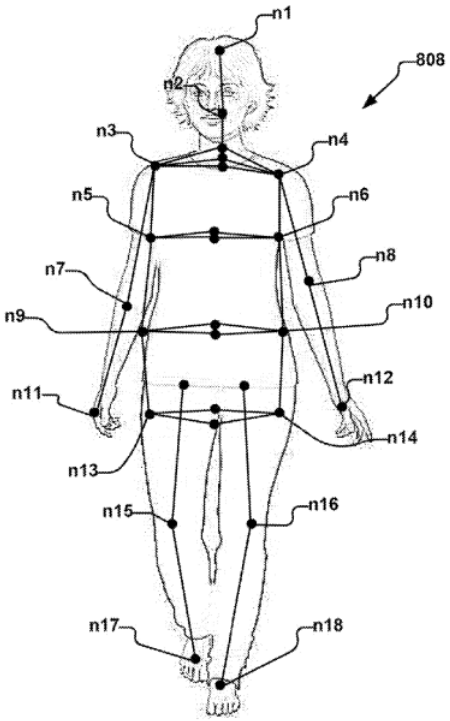
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	wide variety of applications, such as video games, text editors, word processing, data management, etc." *See* paras. [0124]-[0127].  FIG. 9 "FIGS. 9 and 10 illustrate the creation of an on screen representation 1050 of a user 1002. The techniques for generating an on-screen representation are disclosed in U.S. patent application Ser. No. 12/511,850, entitled Auto Generating a Visual Representation, filed 29 Jul. 2009, fully incorporated herein by reference. The on-screen representation may be auto-generated by the system to provide a visual representation of a target that has features resembling the detected features of the target. Alternately, the system may provide a subset of selectable features from which the user may choose. The system may select the features based on the detected features of the target and apply the selections to the visual representation of the target. Thus, auto-generation techniques

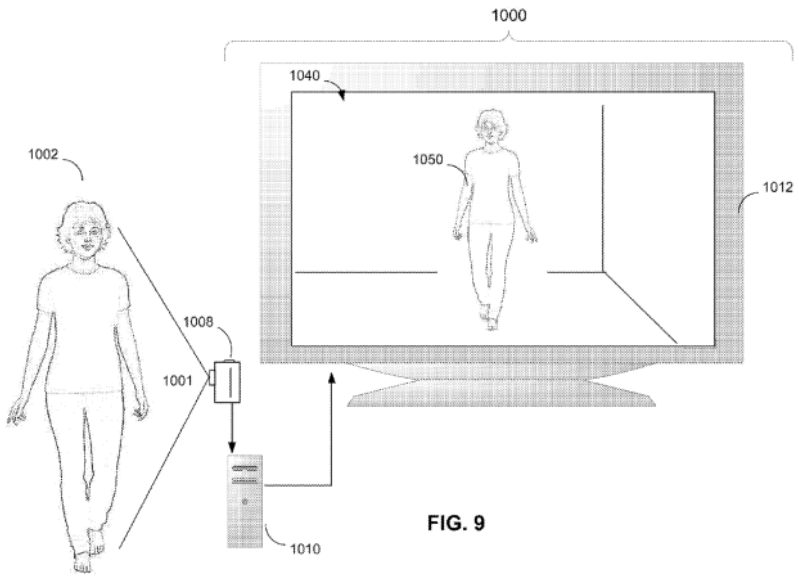
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	may remove a large amount of the effort from a user. For example, the system can make selections, on behalf of the user, and apply them to the user's visual representation. As shown in FIG. 9, the system renders a visual representation 1050 on a display 1000 that corresponds to the user 1002 in the physical space 1001. In this example, the system auto-generated the on-screen representation 1050 by detecting features of the user 1002, comparing the detected features to a library of feature options, or imaging information in an imaging library, selecting the feature options that resemble the detected features of the user 1002, and automatically applying them to the user's on-screen representation 1050. The auto-generation of the on-screen representation removes work from the user 1002 and creates an experience for the user 1002 as they are transported into the game or application experience. By tracking the model generated at step 408, system 20 can display the on-screen representation in real time and update the feature selections applied to the on-screen representation in real time. The system may track the user in the physical space over time and apply modifications or update the features applied to the on-screen representation, also in real time. For example, the system may track a user and identify that the user has removed a sweatshirt. The system may identify the user's body movements and recognize a change in the user's clothing type and color. The system may use any of the user's identified characteristics to assist in the feature selection process and/or updated the features selected from the features library and applied to the visual representation. Image data and/or depth information may be used in to identify target features. Such target features for a human target may include, for example, height and/or arm length and may be obtained based on, for example, a body scan, a skeletal model, the extent of a user 1002 on a pixel area or any other suitable process or data. Using for example, the depth values in a plurality of observed pixels that are associated with a human target and the extent of one or more aspects of the human target such as the height, the width of the head, or the width of the shoulders, or the like, the size of the human target may be determined. The camera 1008 may process the image data and use it to determine the shape, colors, and size of various parts of the user, including the user's hair, clothing,

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	etc. The detected features may be compared to a catalog of feature options for application to a visual representation, such as the visual representation feature options in the features library 197." *See* paras. [0129]-[0132].  FIG. 10 "As described above, at 802 a capture device can capture data of a scene, such as the depth image of the scene and scan targets in the scene. At 804, the system may determine whether one or more targets in the scene corresponds to a human target such as a user. For example, to determine whether a target or object in the scene corresponds to a human target, each of the targets may be flood filled and compared to a pattern of a human body

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	model. Each target or object that matches the human body model may then be scanned to generate a skeletal model associated therewith. For example, a target identified as a human may be scanned to generate a skeletal model associated therewith. The skeletal model may then be provided to the computing environment for tracking the skeletal model and rendering a visual representation associated with the skeletal model. At 804, the system may translate the captured data to identify the features of the targets in the physical space by using any suitable technique, such as a body scan, point cloud models, skeletal models, flood-filled techniques, or the like." *See* para. [0139]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Geisner 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;	Geisner 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. "As shown in FIG. 8, the skeletal model 808 may include one or more joints n1-n18. According to an example embodiment, each of the joints n1-n18 may enable one or more body parts defined there between to move relative to one or more other body parts. For example, a model representing a human target may include a plurality of rigid and/or deformable body parts that may be defined by one or more structural members such as "bones" with the joints n1-n18 located at the intersection of adjacent bones. The joints n1-n18 may enable various body parts associated with the bones and joints n1-n18 to move independently of each other. For example, the bone defined between the joints n7 and n11, shown in FIG. 9, corresponds to a forearm that may be moved independent of, for example, the bone defined between joints n15 and n17 that corresponds to a calf. **Each of the joints represents a place in the skeleton where the skeleton can pivot in the x, y, z directions or a place of interest on the body. Other methods for tracking can

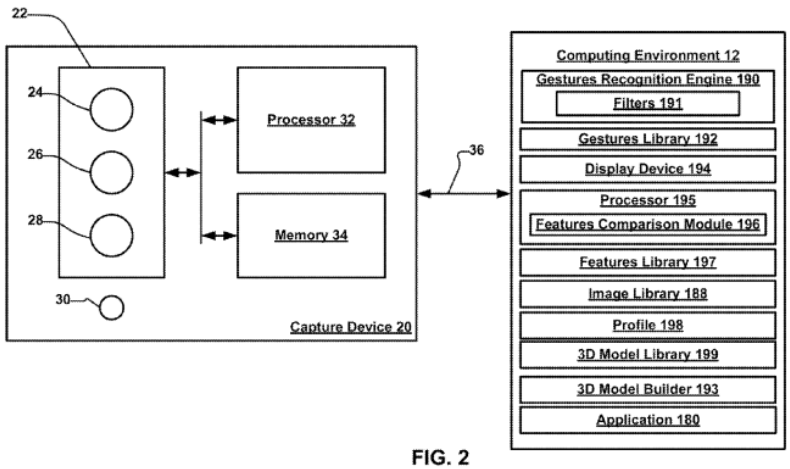
Asserted Claim of the '109 Patent	Exemplary Citations to Geisner
	also be used. Suitable tracking technology is disclosed the teachings of U.S. patent application Ser. Nos. 12/475,308, 12/696,282, 12/641,788, and 12/575,388, cited above. FIG. 9 illustrates a user 1002 and an on-screen representation of the user 1050 provided by system 20. Through moving her body, a user 1002 may create gestures. A gesture comprises a motion or pose by a user that may be captured as image data and parsed for meaning. A user's gestures may be used for input in a general computing context. For instance, various motions of the hands or other body parts may correspond to common system wide tasks such as navigate up or down in a hierarchical list, open a file, close a file, and save a file. For instance, a user may hold his hand with the fingers pointing up and the palm facing the capture device 20. He may then close his fingers towards the palm to make a fist, and this could be a gesture that indicates that the focused window in a window-based user-interface computing environment should be closed. Gestures may also be used in a video-game-specific context, depending on the game. For instance, with a driving game, various motions of the hands and feet may correspond to steering a vehicle in a direction, shifting gears, accelerating, and braking. Thus, a gesture may indicate a wide variety of motions that map to a displayed user representation, and in a wide variety of applications, such as video games, text editors, word processing, data management, etc." *See* paras. [0124]-[0127].

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	 FIG. 8

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	 FIG. 9 This limitation would have been obvious to a person of ordinary skill in the art based on (1) Geisner 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;	Geisner 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.

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	"According to another embodiment, the capture device 20 may include two or more physically separated cameras that may view a scene from different angles, to obtain visual stereo data that may be resolved to generate depth information." *See* para. [0039]. "Processor 195 can execute instructions for receiving data of a scene, wherein the data includes data representative of the target in a physical space. The instructions comprise instructions for detecting at least one target feature from the data, and comparing the at least one detected target feature to visual representation feature options from the features library 195. The visual representation feature options may comprise selectable options configured for application to the visual representation. Further instructions provide for selecting a visual representation feature from the visual representation feature options, applying the visual representation feature to the visual representation of the target, and rendering the visual representation. The visual representation may be auto-generated from the comparison of the at least one detected feature to the visual representation feature options such that the selection of the visual representation feature is performed without manual selection by a user. The selection of the visual representation feature may comprise selecting the visual representation feature that is similar to the detected target feature. The visual representation feature may be at least one of a facial feature, a body part, a color, a size, a height, a width, a shape, an accessory, or a clothing item. The instructions may provide for generating a subset of visual representation feature options, from the visual representation feature options, for the visual representation feature, and providing the generated subset of feature options for user selection of the visual representation feature to apply to the visual representation. The generated subset of visual representation feature options may comprise multiple visual representation feature options that are similar to the detected target feature. The instructions may provide for receiving a user selection of a visual representation feature from the generated subset of feature options, wherein selecting the visual representation feature from the visual representation feature options comprises selecting the visual representation feature that corresponds to the user selection. The visual representation, having the visual representation feature, may be rendered in real time. Furthermore, the instructions may provide for monitoring the

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	target and detecting a change in the detected target feature, and updating the visual representation of the target by updating the visual representation feature applied to the visual representation, in real time, based on the change in the detected target feature. As shown, in FIG. 2, the computing environment 12 may include a gestures library 192 and a gestures recognition engine 190. The gestures recognition engine 190 may include a collection of gesture filters 191. A filter may comprise code and associated data that can recognize gestures or otherwise process depth, RGB, or skeletal data. Each filter 191 may comprise information defining a gesture along with parameters, or metadata, for that gesture. For instance, a throw, which comprises motion of one of the hands from behind the rear of the body to past the front of the body, may be implemented as a gesture filter 191 comprising information representing the movement of one of the hands of the user from behind the rear of the body to past the front of the body, as that movement would be captured by a depth camera. Parameters may then be set for that gesture. Where the gesture is a throw, a parameter may be a threshold velocity that the hand has to reach, a distance the hand must travel (either absolute, or relative to the size of the user as a whole), and a confidence rating by the recognizer engine that the gesture occurred. These parameters for the gesture may vary between applications, between contexts of a single application, or within one context of one application over time." *See* paras. [0047]-[0049].

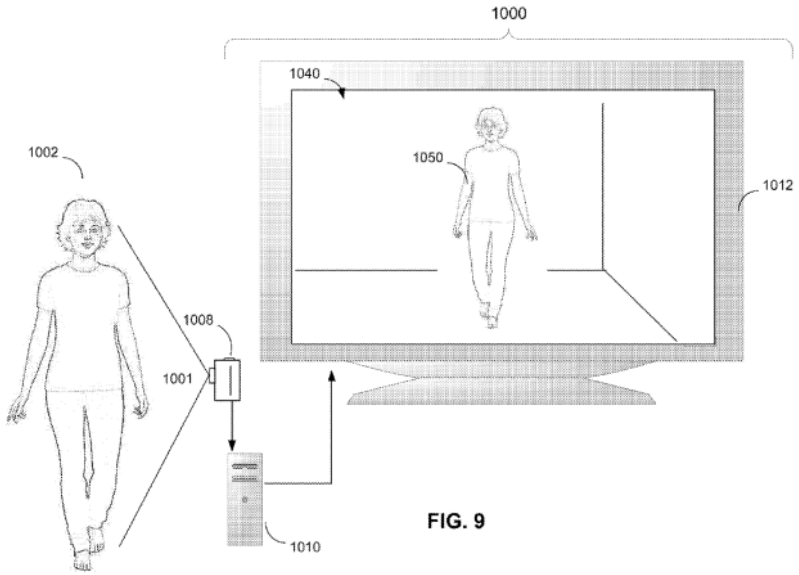
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	 FIG. 2 “In an example embodiment, a gesture may be recognized as a trigger for the entry into a modification mode, where a user can modify the visual representation auto-generated by the system. For example, a gesture filter 191 may comprise information for recognizing a modification trigger gesture. If the modification trigger gesture is recognized, the application may go into a modification mode. The modification trigger gesture may vary between applications, between systems, between users, or the like. For example, the same gesture in a tennis gaming application may not be the same modification trigger gesture in a bowling game application. Consider an example modification trigger gesture that comprises a user motioning the user's right hand, presented in front of the user's body, with the pointer finger pointing upward and moving in a circular motion. The parameters set for the modification trigger gesture may be used to identify that the user's hand is in front of the user's body, the user's pointer finger is pointed in an upward motion, and identifying that the pointer finger is moving in a circular motion. Certain gestures may be identified as a request to enter into a modification mode, where if an application is currently executing, the modification mode interrupts the current state

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	of the application and enters into a modification mode. The modification mode may cause the application to pause, where the application can be resumed at the pause point when the user leaves the modification mode. Alternately, the modification mode may not result in a pause to the application, and the application may continue to execute while the user makes modifications. The data captured by the cameras 26, 28 and device 20 in the form of the skeletal model and movements associated with it may be compared to the gesture filters 191 in the gestures library 192 to identify when a user (as represented by the skeletal model) has performed one or more gestures. Thus, inputs to a filter such as filter 191 may comprise things such as joint data about a user's joint position, like angles formed by the bones that meet at the joint, RGB color data from the scene, and the rate of change of an aspect of the user. As mentioned, parameters may be set for the gesture. Outputs from a filter 191 may comprise things such as the confidence that a given gesture is being made, the speed at which a gesture motion is made, and a time at which the gesture occurs. The computing environment 12 may include a processor 195 that can process the depth image to determine what targets are in a scene, such as a user 18 or an object in the room. This can be done, for instance, by grouping together of pixels of the depth image that share a similar distance value. The image may also be parsed to produce a skeletal representation of the user, where features, such as joints and tissues that run between joints are identified. There exist skeletal mapping techniques to capture a person with a depth camera and from that determine various spots on that user's skeleton, joints of the hand, wrists, elbows, knees, nose, ankles, shoulders, and where the pelvis meets the spine. Other techniques include transforming the image into a body model representation of the person and transforming the image into a mesh model representation of the person." *See* paras. [0051]-[0054]. "In another example, the target is a human user and the system detects the user's features, such as eye color, size, and shape, hair color, type, and length, etc. The system may compare the detected features to a catalog of feature options and apply selected features to the visual representation. As described above, the system may combine features and

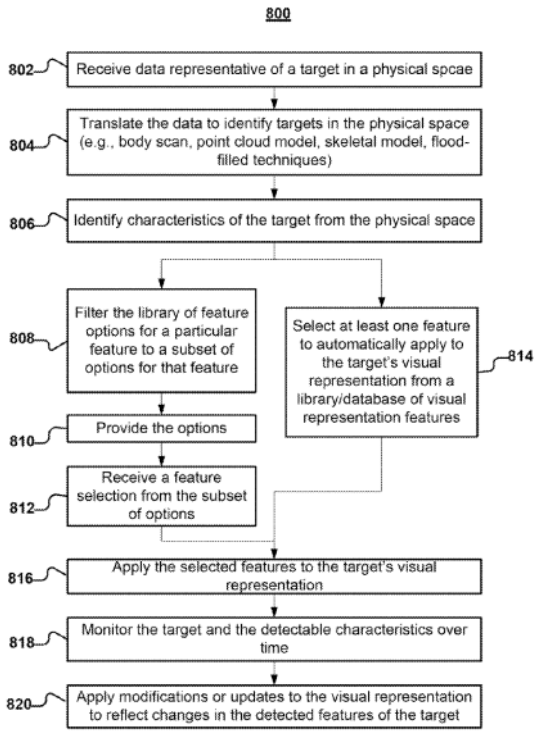
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	alter those features. For example, the features may be altered by applying a color, positioning, or scaling to the target. The features may be altered by the selection of additional features from the features library 197, such as a color, or by using image data from a snapshot of the target. For example, an application may provide a generic set of solid color pants, t-shirts, and shoe types in the features library 197. The system may select from the generic clothing features but alter the selected clothing features by applying colors to the clothing to reflect the colors of the target's clothing detected by the system." *See* para. [0062]. "The computing environment 12 may use the gestures library 192 to interpret movements of the skeletal model and to control an application based on the movements. Filters may be modular or interchangeable so that a first filter may be replaced with a second filter that has the same number and types of inputs and outputs as the first filter without altering any other aspect of the recognizer engine architecture. For instance, there may be a first filter for driving that takes as input skeletal data and outputs a confidence that the gesture associated with the filter is occurring and an angle of steering. Where one wishes to substitute this first driving filter with a second driving filter—perhaps because the second driving filter is more efficient and requires fewer processing resources—one may do so by simply replacing the first filter with the second filter so long as the second filter has those same inputs and outputs—one input of skeletal data type, and two outputs of confidence type and angle type. A filter need not have a parameter. For instance, a "user height" filter that returns the user's height may not allow for any parameters that may be tuned. An alternate "user height" filter may have tunable parameters—such as to whether to account for a user's footwear, hairstyle, headwear and posture in determining the user's height. Inputs to a filter may comprise things such as joint data about a user's joint position, like angles formed by the bones that meet at the joint, RGB color data from the scene, and the rate of change of an aspect of the user. Outputs from a filter may comprise things

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	such as the confidence that a given gesture is being made, the speed at which a gesture motion is made, and a time at which a gesture motion is made." *See* paras. [0066]-[0068]. "In one embodiment, in order for a user's motion to be used to control an application the user must first be enrolled or bound to the application. In one embodiment, each user will be asked to identify himself or herself by standing in front of the system so that depth images and/or visual images can be obtained from multiple angles for that user. For example, the user may be asked to stand in front of the camera, turn around, and make various poses while depth images and visual images are obtained. After the system obtains enough depth and/or visual images, the system will create a set of identifying data from the images that uniquely identifies the user. The system will create a unique identification and associate that unique identification with on-screen representation (e.g., avatar) or other object in the game/application. After a user is enrolled in (or bound to) the application, the system will track the motion of that user while the user is actively engaged with the application (e.g., playing the game or using the application). However, in the past, other people in the room who are not actively engaged with the application, (e.g., not bound to application, bound to application but not playing current game, or bound to application but currently not having a turn to play) do not have a way to interact with the application." *See* para. [0103]. "If a user performs a gesture and the gesture is recognized at 440, action consistent with the gesture within the shopping application is applied at 450. As discussed below, shopping applications gestures can comprise two general types of gestures: an article manipulation gesture or a transaction manipulation gesture. An article manipulation gesture may comprise, for example, any of a number of shopping consistent actions consistent with the interface presented to the user. If the user is presented a selection of virtual articles comprising clotting and an on-screen representation of themselves, article manipulation actions may comprise actions such as selecting clothes, putting on clothes, taking off clothes, adjusting clothes, changing backgrounds, changing accessories, moving room elements within a scene, placing items within a scene, placing the on-screen representation with a variety of backgrounds in particular clothing, and the like. A transaction gesture may comprise a gesture used to facilitate a transaction such as

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	movement of an article into a shopping cart, removing an article from a shopping cart, entry of financial information and the like." *See* para. [0111]. "As shown in FIG. 8, the skeletal model 808 may include one or more joints n1-n18. According to an example embodiment, each of the joints n1-n18 may enable one or more body parts defined there between to move relative to one or more other body parts. For example, a model representing a human target may include a plurality of rigid and/or deformable body parts that may be defined by one or more structural members such as "bones" with the joints n1-n18 located at the intersection of adjacent bones. The joints n1-n18 may enable various body parts associated with the bones and joints n1-n18 to move independently of each other. For example, the bone defined between the joints n7 and n11, shown in FIG. 9, corresponds to a forearm that may be moved independent of, for example, the bone defined between joints n15 and n17 that corresponds to a calf. **Each of the joints represents a place in the skeleton where the skeleton can pivot in the x, y, z directions or a place of interest on the body. Other methods for tracking can also be used. Suitable tracking technology is disclosed the teachings of U.S. patent application Ser. Nos. 12/475,308, 12/696,282, 12/641,788, and 12/575,388, cited above. FIG. 9 illustrates a user 1002 and an on-screen representation of the user 1050 provided by system 20. Through moving her body, a user 1002 may create gestures. A gesture comprises a motion or pose by a user that may be captured as image data and parsed for meaning. A user's gestures may be used for input in a general computing context. For instance, various motions of the hands or other body parts may correspond to common system wide tasks such as navigate up or down in a hierarchical list, open a file, close a file, and save a file. For instance, a user may hold his hand with the fingers pointing up and the palm facing the capture device 20. He may then close his fingers towards the palm to make a fist, and this could be a gesture that indicates that the focused window in a window-based user-interface computing environment should be closed. Gestures may also be used in a video-game-specific context, depending on the game. For instance, with

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	a driving game, various motions of the hands and feet may correspond to steering a vehicle in a direction, shifting gears, accelerating, and braking. Thus, a gesture may indicate a wide variety of motions that map to a displayed user representation, and in a wide variety of applications, such as video games, text editors, word processing, data management, etc." *See* paras. [0124]-[0127].  FIG. 9 "FIGS. 9 and 10 illustrate the creation of an on screen representation 1050 of a user 1002. The techniques for generating an on-screen representation are disclosed in U.S. patent application Ser. No. 12/511,850, entitled Auto Generating a Visual Representation, filed 29 Jul. 2009, fully incorporated herein by reference. The on-screen representation may be auto-generated by the system to provide a visual representation of a target that has features resembling the detected features of the target. Alternately, the

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	system may provide a subset of selectable features from which the user may choose. The system may select the features based on the detected features of the target and apply the selections to the visual representation of the target. Thus, auto-generation techniques may remove a large amount of the effort from a user. For example, the system can make selections, on behalf of the user, and apply them to the user's visual representation. As shown in FIG. 9, the system renders a visual representation 1050 on a display 1000 that corresponds to the user 1002 in the physical space 1001. In this example, the system auto-generated the on-screen representation 1050 by detecting features of the user 1002, comparing the detected features to a library of feature options, or imaging information in an imaging library, selecting the feature options that resemble the detected features of the user 1002, and automatically applying them to the user's on-screen representation 1050. The auto-generation of the on-screen representation removes work from the user 1002 and creates an experience for the user 1002 as they are transported into the game or application experience. By tracking the model generated at step 408, system 20 can display the on-screen representation in real time and update the feature selections applied to the on-screen representation in real time. The system may track the user in the physical space over time and apply modifications or update the features applied to the on-screen representation, also in real time. For example, the system may track a user and identify that the user has removed a sweatshirt. The system may identify the user's body movements and recognize a change in the user's clothing type and color. The system may use any of the user's identified characteristics to assist in the feature selection process and/or updated the features selected from the features library and applied to the visual representation. Image data and/or depth information may be used in to identify target features. Such target features for a human target may include, for example, height and/or arm length and may be obtained based on, for example, a body scan, a skeletal model, the extent of a user 1002 on a pixel area or any other suitable process or data. Using for example, the depth values in a plurality of observed pixels that are associated with a human target and the extent of one or more aspects of the human target such as the height, the width of the

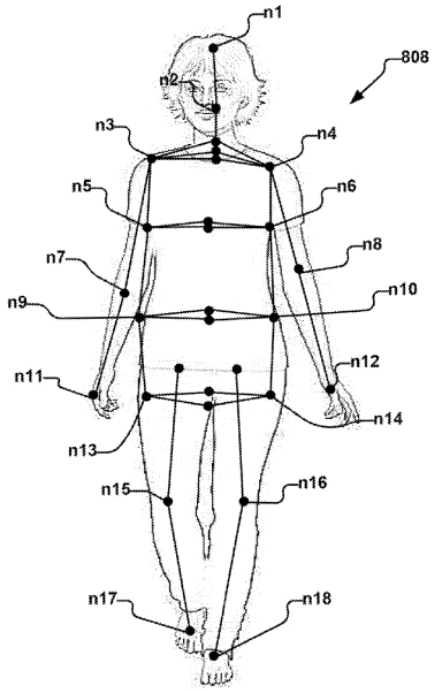
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	head, or the width of the shoulders, or the like, the size of the human target may be determined. The camera 1008 may process the image data and use it to determine the shape, colors, and size of various parts of the user, including the user's hair, clothing, etc. The detected features may be compared to a catalog of feature options for application to a visual representation, such as the visual representation feature options in the features library 197." *See* paras. [0129]-[0132].  FIG. 10 "In another example embodiment, the system can identify characteristics of the user and use the identified characteristics to select features for the visual representation, the

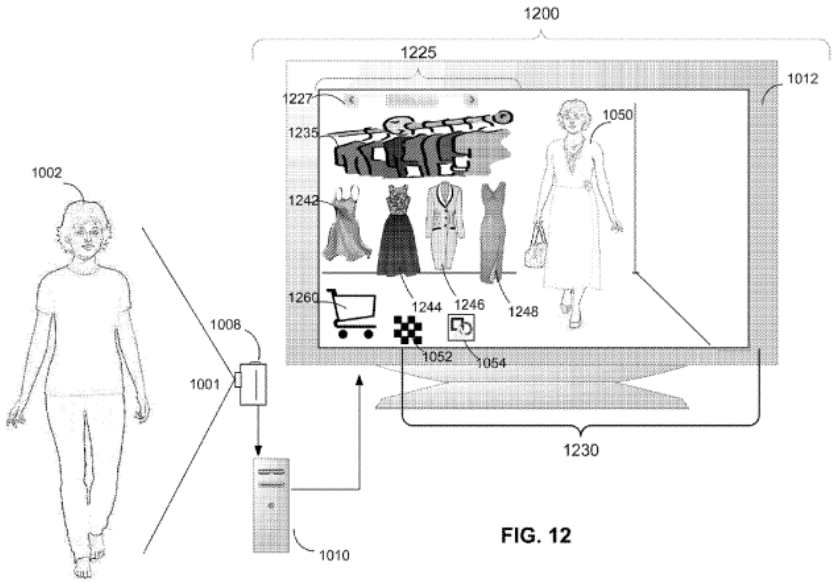
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	system may use target digitization techniques. The techniques comprise identifying surfaces, textures, and object dimensions from unorganized point clouds derived from a capture device, such as a depth sensing device. Employing target digitization may comprise surface extraction, identifying points in a point cloud, labeling surface normals, computing object properties, tracking changes in object properties over time, and increasing confidence in the object boundaries and identity as additional frames are captured. For example, a point cloud of data points related to objects in a physical space may be received or observed. The point cloud may then be analyzed to determine whether the point cloud includes an object. A collection of point clouds may be identified as an object and fused together to represent a single object. A surface of the point clouds may be extracted from the object identified. Any known technique or technique disclosed herein that provides the ability to scan a known/unknown object, scan a human, and scan background aspects in a scene (e.g., floors, walls) may be used to detect features of a target in the physical space. The scan data for each, which may include a combination of depth and RGB data, may be used to create a three-dimensional model of the object. The RGB data is applied to the corresponding area of the model. Temporal tracking, from frame to frame, can increase confidence and adapt the object data in real-time. Thus, the object properties and tracking of changes in the object properties over time may be used to reliably track objects that change in position and orientation from frame to frame in real time. The capture device captures data at interactive rates, increasing the fidelity of the data and allowing the disclosed techniques to process the raw depth data, digitize the objects in the scene, extract the surface and texture of the object, and perform any of these techniques in real-time such that the display can provide a real-time depiction of the scene." *See* paras. [0133]-[0134]. "Step 1126 illustrates a small set of possible gestures representing an action which may occur in an shopping application 180. These actions may include, for example, an action to: select article, apply article to on-screen image, remove article from avatar, add article to scene, remove article from scene, un-select article, apply background, remove article from rack, place article on rack, adjust article properties, and move object into scene.

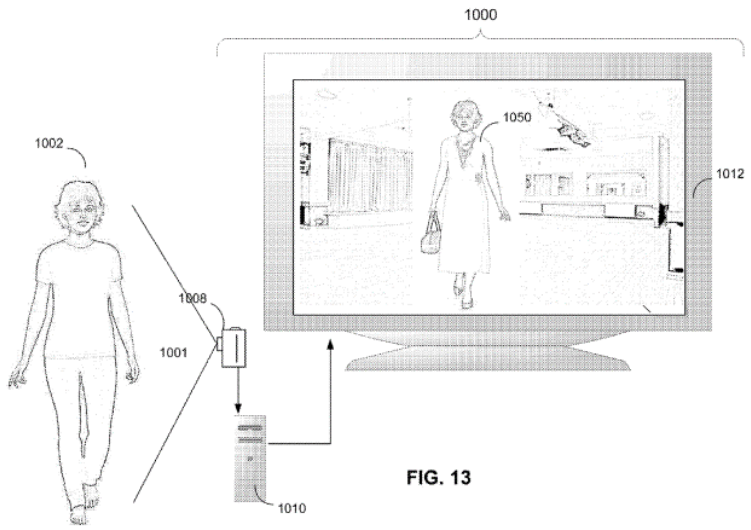
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	The aforementioned gestures should not be construed as limiting but are exemplary of the type of gestures a user may need in a shopping application when manipulating an article. Selecting an article may comprise a gesture indicating that that the user intends to select an article in the interface. An interface for the application may be presented in a display, as shown below at FIG. 12. Selection can be of an article in a rendered scene or in the interface selection portion of the scene. Such a gesture may comprise, for example, a motion to grab a virtual garment by moving to position the on-screen representation of the user's hand over the garment and closing one's hand. A gesture applying an article to an on-screen image may comprise moving a selected garment from a rack of hanging virtual clothes, and placing the garment on top of the on-screen representation. Conversely, a gesture may comprise removing an article. A gesture may indicate the user wishes to adjust the clothing. For example, the user may wish to raise the user's collar, roll up the user's pants, roll up the user's sleeves, or the like. Any of these types of gestures may result in the adjustment of the clothing in the interface at 1128. Alternatively, the user may wish to place themselves in a different physical background at 1128. A gesture such as selecting a background tile from the interface and applying the background tile into the user's screen will result in applying or removing a background at 1128. Any other of a number of types of actions at 1126 may result in a corresponding action 1128 within the interface." *See* paras. [0153]-[0154]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Geisner 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;	Geisner 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.

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	"In another example, the target is a human user and the system detects the user's features, such as eye color, size, and shape, hair color, type, and length, etc. The system may compare the detected features to a catalog of feature options and apply selected features to the visual representation. As described above, the system may combine features and alter those features. For example, the features may be altered by applying a color, positioning, or scaling to the target. The features may be altered by the selection of additional features from the features library 197, such as a color, or by using image data from a snapshot of the target. For example, an application may provide a generic set of solid color pants, t-shirts, and shoe types in the features library 197. The system may select from the generic clothing features but alter the selected clothing features by applying colors to the clothing to reflect the colors of the target's clothing detected by the system." *See* para. [0062]. "Another interface element may include user sizing controls. Sizing controls may be applied to articles (such as clothing) or to the representation of the tracked human model of the user. For example, a user may wish to determine how her appearance may change with a gain or loss of weight. Sizing controls may also allow selection of different sizes of articles, allowing a user to determine if a small or medium size article fits the on-screen representation better." *See* para. [0161]. "For example, according to an example embodiment, a model such as a skeletal model, a mesh human model, or the like of a user such as the user 18 described with respect to FIG. 8. The visual appearance of an on-screen character may then be changed in response to changes to the model being tracked. For example, a user such as the user 18 described above with respect to FIGS. 1A and 1B playing an electronic game on a gaming console may be tracked by the gaming console as described herein. In particular, a body model such as a skeletal model may be used to model the target game player, and the body model may be used to render an on-screen player avatar. As the game player straightens one arm, the gaming console may track this motion, then in response to the tracked motion, adjust the body model accordingly. The gaming console may also apply one or

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	more constraints to movements of the body model. Upon making such adjustments and applying such constraints, the gaming console may display the adjusted player avatar. FIG. 8 illustrates an example embodiment of a skeletal model 808 representing a scanned human target used to track a user, such as user 18 or 1002. The model is shown relative to the user 1002. According to an example embodiment, the skeletal model 808 may include one or more data structures that may represent the human target 18 or 1002 as a three-dimensional model. Each body part may be characterized as a mathematical vector defining joints and bones of the skeletal model 808. As shown in FIG. 8, the skeletal model 808 may include one or more joints n1-n18. According to an example embodiment, each of the joints n1-n18 may enable one or more body parts defined there between to move relative to one or more other body parts. For example, a model representing a human target may include a plurality of rigid and/or deformable body parts that may be defined by one or more structural members such as "bones" with the joints n1-n18 located at the intersection of adjacent bones. The joints n1-n18 may enable various body parts associated with the bones and joints n1-n18 to move independently of each other. For example, the bone defined between the joints n7 and n11, shown in FIG. 9, corresponds to a forearm that may be moved independent of, for example, the bone defined between joints n15 and n17 that corresponds to a calf. **Each of the joints represents a place in the skeleton where the skeleton can pivot in the x, y, z directions or a place of interest on the body. Other methods for tracking can also be used. Suitable tracking technology is disclosed the teachings of U.S. patent application Ser. Nos. 12/475,308, 12/696,282, 12/641,788, and 12/575,388, cited above." *See* paras. [0121]-[0125].

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	 FIG. 8

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	 FIG. 12

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	 FIG. 13 This limitation would have been obvious to a person of ordinary skill in the art based on (1) Geisner 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;	Geisner 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 on-screen shopping application which reacts to a human target user's motions to provide a shopping experience to the user is provided. A tracking system is used to track user motions and execute a shopping application. An on-screen representation of a human target user, representative of the likeness of the user or another individual, is

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	presented on a display device. Movements of the human target user are tracked and displayed on the display device. An on-screen interface allows the user to interact with virtual articles that represent real-world articles available to the user. User movements which are recognized as article manipulation or transaction control gestures are translated into commands for the shopping application. In one aspect, the application comprises a computer implemented method wherein a scene including a human target user is captured using a capture device which is part of the tracking system. A representation of the scene and the human target is rendered on a display device. An interface is presented allowing the human target to select and position one or more of a plurality of virtual articles representing real articles available for purchase in the representation on the display device. User movements are tracked in the scene and the movements applied to the representation of the human target. Movements are applied to at least one of the virtual articles in the representation when the motions of the human target in the scene indicate an article manipulation gesture. User movements are applied to a purchasing interface when the motions of the human target in the scene indicate an transaction manipulation gesture." *See* paras. [0003]-[0004]. "Technology is provided wherein a computing system runs an on-screen shopping application which reacts to a human target user's motions to provide a shopping experience to the user. A tracking system is used to track user motions and execute a shopping application. An on-screen representation of a human target user, representative of the likeness of the user or another individual, is presented on a display device. Movements of the human target user are tracked and displayed on the display device. An on-screen interface allows the user to interact with virtual articles that represent real-world articles available to the user. User movements which are recognized as article manipulation or transaction control gestures are translated into commands for the shopping application." *See* para. [0024]. "Hence, for a garment, in one embodiment, a 3-D model includes a mesh of information use to determine how to apply the garment to a human model. Body deformation provides resizing of the cloth or garment model. Physics-based models have been

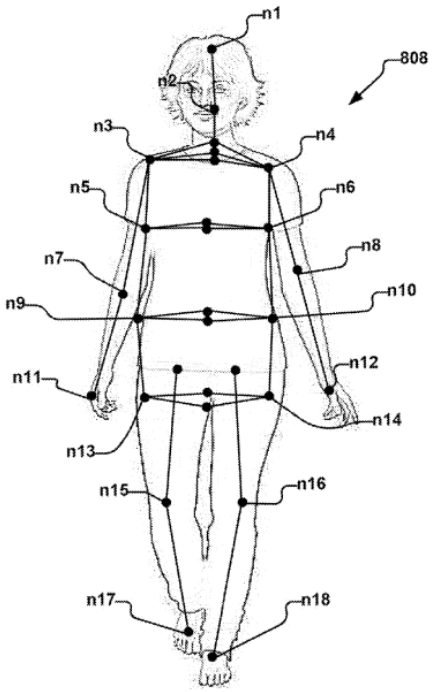
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	developed that are able to simulate the dynamics of cloth independent of its use whether it's clothing or other situations such as furniture or tablecloths. Such models integrate complex clothing detection and simulate physical behavior of the garments. Any of these modeling techniques may be utilized to generate a three-dimensional article model for use in the application. One popular way of modeling the mechanics of clothes are spring-mass particle systems. They are composed of 3-D punctual masses, connected to their neighbors by springs. The mechanical behaviors of clothes are simulated by competing forces applied on each mass given their position and velocity. There are different ways to complete the numerical integration. Garments interact with objects in their environment either with the body that wears them or with other garment pieces. Dealing with collisions involves two types of problems, collision detection and collision response. A shopping application 180 will use this information stored in the 3-D model to find the geometrical contacts between the objects and integrate the resulting reaction and friction effects in a mechanical simulation presented on the display 194. In another example, the target is a human user and the system detects the user's features, such as eye color, size, and shape, hair color, type, and length, etc. The system may compare the detected features to a catalog of feature options and apply selected features to the visual representation. As described above, the system may combine features and alter those features. For example, the features may be altered by applying a color, positioning, or scaling to the target. The features may be altered by the selection of additional features from the features library 197, such as a color, or by using image data from a snapshot of the target. For example, an application may provide a generic set of solid color pants, t-shirts, and shoe types in the features library 197. The system may select from the generic clothing features but alter the selected clothing features by applying colors to the clothing to reflect the colors of the target's clothing detected by the system. The 3-D model library storing features and models of elements used in an on-screen interface by a user. The 3-D model library may include physical models of articles formed in conjunction with the disclosure in U.S. patent application No (virtual object manipulation). Additional meta-data may be associated with each model to provide, for

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	example, information on how the article interacts with other articles. For example, a 3-D model of a lamp may record the type light the lamp provides and the coverage of the light." *See* paras. [0061]-[0063]. "The computing environment 12 can model and display a representation of a human target user, or a representation of another individual for whom a 3D model is stored, such as in the form of an avatar or a pointer on a display, such as in a display device 193. Display device 193 may include a computer monitor, a television screen, or any suitable display device. For example, a camera-controlled computer system may capture user image data and display user feedback on a television screen that maps to the user's gestures. The user feedback may be displayed as an avatar or other on screen representation of the user, on the screen such as shown in FIGS. 1A and 1B. The avatar's motion can be controlled directly by mapping the avatar's movement to those of the user's movements. The user's gestures may be interpreted control certain aspects of the application. According to an example embodiment, the target may be a human target in any position such as standing or sitting, a human target with an object, two or more human targets, one or more appendages of one or more human targets or the like that may be scanned, tracked, modeled and/or evaluated to generate a virtual screen, compare the user to one or more stored profiles and/or to store profile information 198 about the target in a computing environment such as computing environment 12. The profile information 198 may be in the form of user profiles, personal profiles, application profiles, system profiles, or any other suitable method for storing data for later access. The profile information 198 may be accessible via an application or be available system-wide, for example. The profile information 198 may include lookup tables for loading specific user profile information. The virtual screen may interact with an application that may be executed by the computing environment 12 described above with respect to FIGS. 1A-1B. The system may render a visual representation of a human target, such as a user, by auto-generating the visual representation based on information stored in the user's profile.

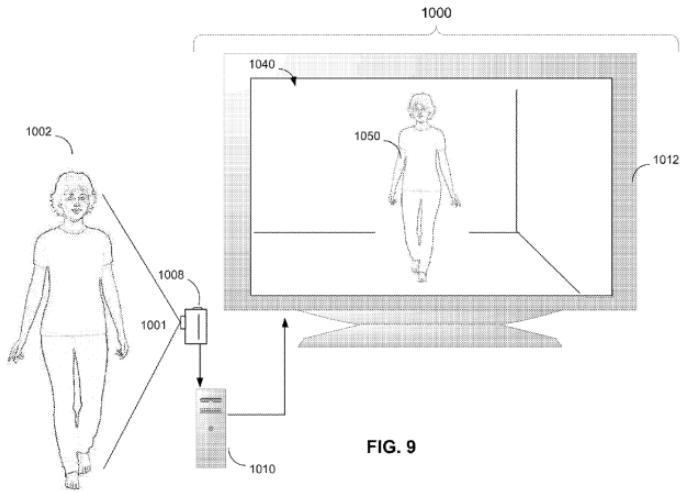
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	According to example embodiments, lookup tables may include user specific profile information. In one embodiment, the computing environment such as computing environment 12 may include stored profile data 198 about one or more users in lookup tables. The stored profile data 198 may include, among other things the targets scanned or estimated body size, skeletal models, body models, voice samples or passwords, the target's gender, the targets age, previous gestures, target limitations and standard usage by the target of the system, such as, for example a tendency to sit, left or right handedness, or a tendency to stand very near the capture device. This information may be used to determine if there is a match between a target in a capture scene and one or more user profiles 198, which, in one embodiment, may allow the system to adapt the virtual screen to the user, or to adapt other elements of the computing or gaming experience according to the profile 198. Previously selected features for the target's visual representation may be stored in a profile. For example, a user-specific profile may store the features selected and applied to auto-generate the user's visual representation. A location-specific profile may store features selected and applied to auto-generate and display a virtual scene that resembles the physical space. For example, virtual objects that correspond to objects in the physical space, such as furniture in the room, may be generated by selecting from options in the features library 197. Colors may be detected and available colors may be selected from the features library 197. Upon recognition or initialization by the system, the location-specific profile may be loaded, displaying the furniture and colors that correspond to the location." *See* paras. [0072]-[0075]. "Furthermore, as used herein, a computing environment 12 may refer to a single computing device or to a computing system. The computing environment may include non-computing components. The computing environment may include a display device, such as display device 194 shown in FIG. 2. A display device may be an entity separate but coupled to the computing environment or the display device may be the computing device that processes and displays, for example. Thus, a computing system, computing

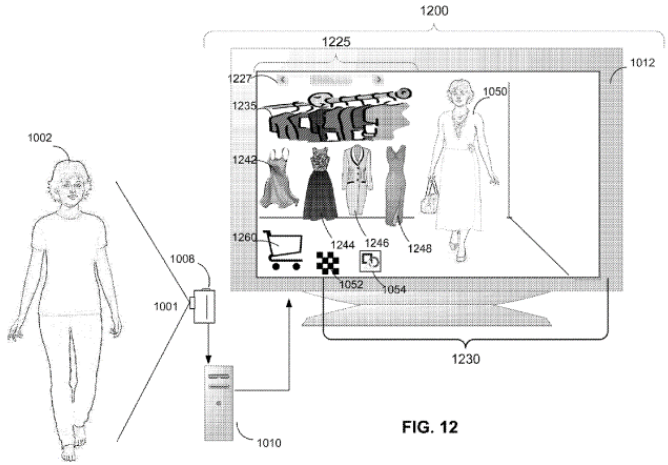
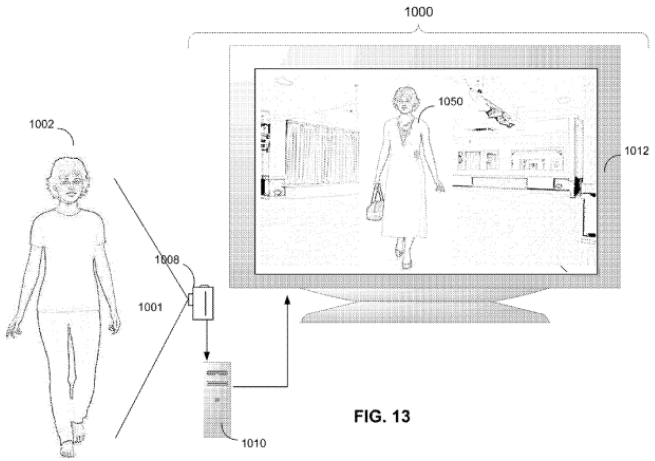
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	device, computing environment, computer, processor, or other computing component may be used interchangeably. FIG. 3 illustrates an example embodiment of a computing system that may be the computing system 12 shown in FIGS. 1A-2 used to track motion and/or animate (or otherwise update) an avatar or other on-screen object displayed by an application. The computing system such as the computing system 12 described above with respect to FIGS. 1A-2 may be a multimedia console 100, such as a gaming console. As shown in FIG. 3, the multimedia console 100 has a central processing unit (CPU) 101 having a level 1 cache 102, a level 2 cache 104, and a flash ROM (Read Only Memory) 106. The level 1 cache 102 and a level 2 cache 104 temporarily store data and hence reduce the number of memory access cycles, thereby improving processing speed and throughput. The CPU 101 may be provided having more than one core, and thus, additional level 1 and level 2 caches 102 and 104. The flash ROM 106 may store executable code that is loaded during an initial phase of a boot process when the multimedia console 100 is powered on. A graphics processing unit (GPU) 108 and a video encoder/video codec (coder/decoder) 114 form a video processing pipeline for high speed and high resolution graphics processing. Data is carried from the graphics processing unit 108 to the video encoder/video codec 114 via a bus. The video processing pipeline outputs data to an A/V (audio/video) port 140 for transmission to a television or other display. A memory controller 110 is connected to the GPU 108 to facilitate processor access to various types of memory 112, such as, but not limited to, a RAM (Random Access Memory)." *See* paras. [0079]-[0081]. "For example, according to an example embodiment, a model such as a skeletal model, a mesh human model, or the like of a user such as the user 18 described with respect to FIG. 8. The visual appearance of an on-screen character may then be changed in response to changes to the model being tracked. For example, a user such as the user 18 described

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	above with respect to FIGS. 1A and 1B playing an electronic game on a gaming console may be tracked by the gaming console as described herein. In particular, a body model such as a skeletal model may be used to model the target game player, and the body model may be used to render an on-screen player avatar. As the game player straightens one arm, the gaming console may track this motion, then in response to the tracked motion, adjust the body model accordingly. The gaming console may also apply one or more constraints to movements of the body model. Upon making such adjustments and applying such constraints, the gaming console may display the adjusted player avatar. FIG. 8 illustrates an example embodiment of a skeletal model 808 representing a scanned human target used to track a user, such as user 18 or 1002. The model is shown relative to the user 1002. According to an example embodiment, the skeletal model 808 may include one or more data structures that may represent the human target 18 or 1002 as a three-dimensional model. Each body part may be characterized as a mathematical vector defining joints and bones of the skeletal model 808. As shown in FIG. 8, the skeletal model 808 may include one or more joints n1-n18. According to an example embodiment, each of the joints n1-n18 may enable one or more body parts defined there between to move relative to one or more other body parts. For example, a model representing a human target may include a plurality of rigid and/or deformable body parts that may be defined by one or more structural members such as "bones" with the joints n1-n18 located at the intersection of adjacent bones. The joints n1-n18 may enable various body parts associated with the bones and joints n1-n18 to move independently of each other. For example, the bone defined between the joints n7 and n11, shown in FIG. 9, corresponds to a forearm that may be moved independent of, for example, the bone defined between joints n15 and n17 that corresponds to a calf. **Each of the joints represents a place in the skeleton where the skeleton can pivot in the x, y, z directions or a place of interest on the body. Other methods for tracking can also be used. Suitable tracking technology is disclosed the teachings of U.S. patent

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	application Ser. Nos. 12/475,308, 12/696,282, 12/641,788, and 12/575,388, cited above." *See* paras. [0121]-[0125].  FIG. 8 "FIGS. 9 and 10 illustrate the creation of an on screen representation 1050 of a user 1002. The techniques for generating an on-screen representation are disclosed in U.S. patent application Ser. No. 12/511,850, entitled Auto Generating a Visual Representation, filed 29 Jul. 2009, fully incorporated herein by reference. The on-screen representation may be auto-generated by the system to provide a visual representation of

Asserted Claim of the '109 Patent	Exemplary Citations to Geisner
	a target that has features resembling the detected features of the target. Alternately, the system may provide a subset of selectable features from which the user may choose. The system may select the features based on the detected features of the target and apply the selections to the visual representation of the target. Thus, auto-generation techniques may remove a large amount of the effort from a user. For example, the system can make selections, on behalf of the user, and apply them to the user's visual representation. As shown in FIG. 9, the system renders a visual representation 1050 on a display 1000 that corresponds to the user 1002 in the physical space 1001. In this example, the system auto-generated the on-screen representation 1050 by detecting features of the user 1002, comparing the detected features to a library of feature options, or imaging information in an imaging library, selecting the feature options that resemble the detected features of the user 1002, and automatically applying them to the user's on-screen representation 1050. The auto-generation of the on-screen representation removes work from the user 1002 and creates an experience for the user 1002 as they are transported into the game or application experience. By tracking the model generated at step 408, system 20 can display the on-screen representation in real time and update the feature selections applied to the on-screen representation in real time. The system may track the user in the physical space over time and apply modifications or update the features applied to the on-screen representation, also in real time. For example, the system may track a user and identify that the user has removed a sweatshirt. The system may identify the user's body movements and recognize a change in the user's clothing type and color. The system may use any of the user's identified characteristics to assist in the feature selection process and/or updated the features selected from the features library and applied to the visual representation. Image data and/or depth information may be used in to identify target features. Such target features for a human target may include, for example, height and/or arm length and may be obtained based on, for example, a body scan, a skeletal model, the extent of a user 1002 on a pixel area or any other suitable process or data. Using for example, the depth values in a plurality of observed pixels that are associated with a human target and

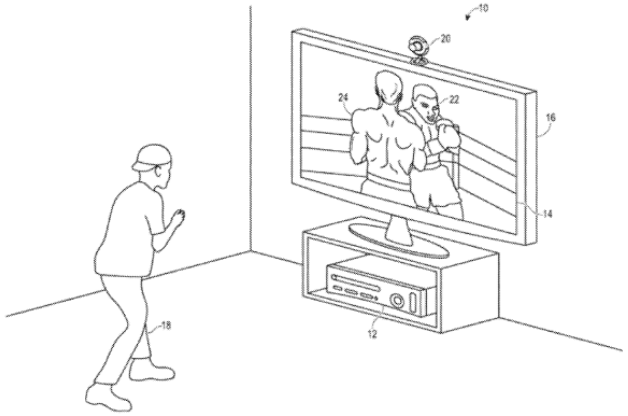
Asserted Claim of the ’109 Patent	Exemplary Citations to Geisner
	the extent of one or more aspects of the human target such as the height, the width of the head, or the width of the shoulders, or the like, the size of the human target may be determined. The camera 1008 may process the image data and use it to determine the shape, colors, and size of various parts of the user, including the user's hair, clothing, etc. The detected features may be compared to a catalog of feature options for application to a visual representation, such as the visual representation feature options in the features library 197.” *See* paras. [0129]-[0132].  FIG. 9

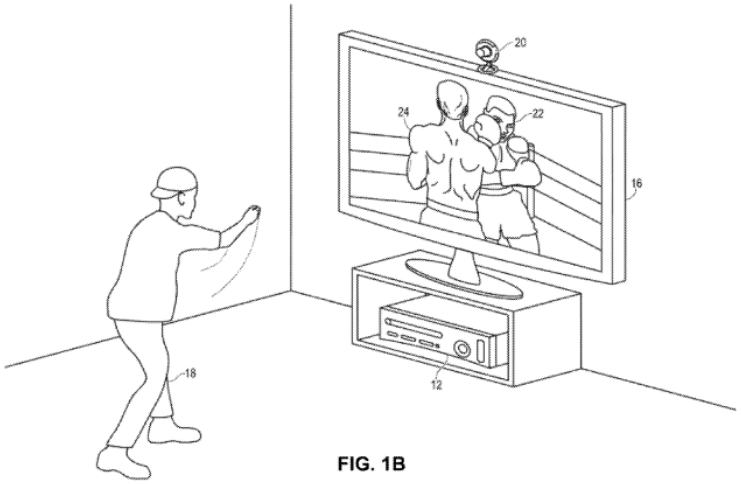
Asserted Claim of the ’109 Patent	Exemplary Citations to Geisner
	 FIG. 12  FIG. 13

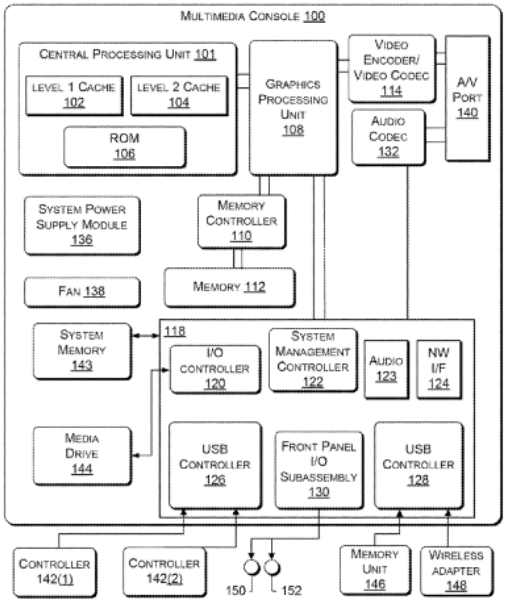
Asserted Claim of the '109 Patent	Exemplary Citations to Geisner
	This limitation would have been obvious to a person of ordinary skill in the art based on (1) Geisner alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as detailed 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;	Geisner 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. "FIG. 2 illustrates an example embodiment of a capture device 20 that may be used for target recognition, analysis, and tracking in a scene, where the target can be a user or an object. According to an example embodiment, the capture device 20 may be configured to capture video with depth information including a depth image that may include depth values via any suitable technique including, for example, time-of-flight, structured light, stereo image, or the like. According to one embodiment, the capture device 20 may organize the calculated depth information into "Z layers," or layers that may be perpendicular to a Z axis extending from the depth camera along its line of sight." *See* para. [0034]. "The capture device 20 may further include a memory component 34 that may store the instructions that may be executed by the processor 32, images or frames of images captured by the 3-d camera 26 or RGB camera 28, or any other suitable information, images, or the like. According to an example embodiment, the memory component 34 may include random access memory (RAM), read only memory (ROM), cache, Flash memory, a hard disk, or any other suitable storage component. As shown in FIG. 2, in one embodiment, the memory component 34 may be a separate component in communication with the image capture component 22 and the processor 32. According to another embodiment, the memory component 34 may be integrated into the processor 32 and/or the image capture component 22.

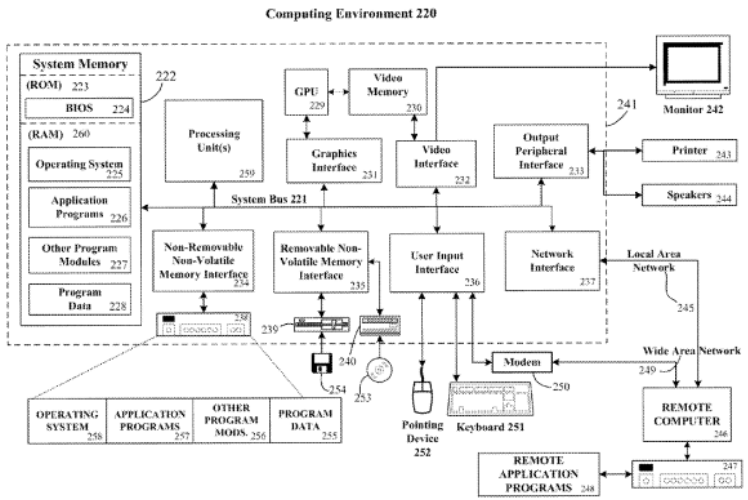
Asserted Claim of the '109 Patent	Exemplary Citations to Geisner
	As shown in FIG. 2, the capture device 20 may be in communication with the computing environment 12 via a communication link 36. The communication link 36 may be a wired connection including, for example, a USB connection, a Firewire connection, an Ethernet cable connection, or the like and/or a wireless connection such as a wireless 802.11b, g, a, or n connection. According to one embodiment, the computing environment 12 may provide a clock to the capture device 20 that may be used to determine when to capture, for example, a scene via the communication link 36. Additionally, the capture device 20 may provide the depth information and images captured by, for example, the 3-D camera 26 and/or the RGB camera 28, and a skeletal model that may be generated by the capture device 20 to the computing environment 12 via the communication link 36. The computing environment 12 may then use the skeletal model, depth information, and captured images to, for example, control an application such as a game or word processor. For example, as shown, in FIG. 2, the computing environment 12 may include a gestures library 192." *See* paras. [0043]-[0045]. "A graphics processing unit (GPU) 108 and a video encoder/video codec (coder/decoder) 114 form a video processing pipeline for high speed and high resolution graphics processing. Data is carried from the graphics processing unit 108 to the video encoder/video codec 114 via a bus. The video processing pipeline outputs data to an A/V (audio/video) port 140 for transmission to a television or other display. A memory controller 110 is connected to the GPU 108 to facilitate processor access to various types of memory 112, such as, but not limited to, a RAM (Random Access Memory)." *See* para. [0081]. "The depth image may include one or more human targets corresponding to, one or more users and one or more non-human targets such as a wall, a table, a monitor, a couch, a ceiling or the like in the captured scene. At 615, a human target in a depth image may be scanned for one or more body parts. In one embodiment, system 10 may determine whether a human target in the depth image may have been previously scanned, at 610, before the human target may be scanned at 615. For example, the capture device may capture a scene in frames. Each frame may include a depth image. The depth image of

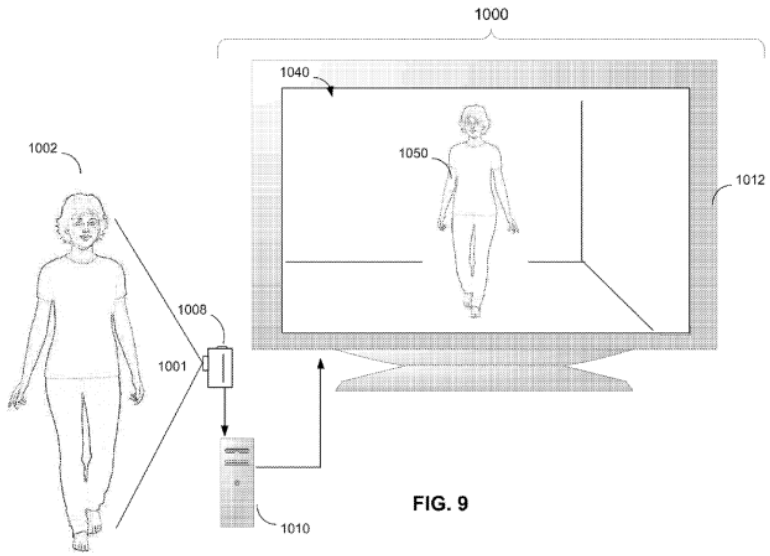
Asserted Claim of the '109 Patent	Exemplary Citations to Geisner
	each frame may be analyzed to determine whether the depth image may include a human target as described above. The depth image of each frame may further be analyzed to determine whether the human target may have been previously scanned for one or more body parts. For example, at 610, system 10 may determine whether a human target in the depth image received, at 605, corresponds to a human target previously scanned at 615. In one embodiment, at 610, if the human target may not correspond to a human target previously scanned, the human target may then be scanned at 615." *See* para. [0116]. "By tracking the model generated at step 408, system 20 can display the on-screen representation in real time and update the feature selections applied to the on-screen representation in real time. The system may track the user in the physical space over time and apply modifications or update the features applied to the on-screen representation, also in real time. For example, the system may track a user and identify that the user has removed a sweatshirt. The system may identify the user's body movements and recognize a change in the user's clothing type and color. The system may use any of the user's identified characteristics to assist in the feature selection process and/or updated the features selected from the features library and applied to the visual representation." *See* para. [0131]. "Any known technique or technique disclosed herein that provides the ability to scan a known/unknown object, scan a human, and scan background aspects in a scene (e.g., floors, walls) may be used to detect features of a target in the physical space. The scan data for each, which may include a combination of depth and RGB data, may be used to create a three-dimensional model of the object. The RGB data is applied to the corresponding area of the model. Temporal tracking, from frame to frame, can increase confidence and adapt the object data in real-time. Thus, the object properties and tracking of changes in the object properties over time may be used to reliably track objects that change in position and orientation from frame to frame in real time. The capture device captures data at interactive rates, increasing the fidelity of the data and allowing the disclosed techniques to process the raw depth data, digitize the objects in the scene, extract the surface and texture of the object, and perform any of these techniques in real-

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	time such that the display can provide a real-time depiction of the scene.” *See* para. [0134].  FIG. 1

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	 FIG. 1B

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	 FIG. 3

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	 FIG. 4

Asserted Claim of the '109 Patent	Exemplary Citations to Geisner
	 FIG. 9 This limitation would have been obvious to a person of ordinary skill in the art based on (1) Geisner 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	Geisner 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. "As shown in FIG. 2, the capture device 20 may include an image camera component 22. According to an example embodiment, the image camera component 22 may be a depth camera that may capture the depth image of a scene. The depth image may include a two-dimensional (2-D) pixel area of the captured scene where each pixel in the 2-D

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	pixel area may represent a depth value such as a length or distance in, for example, centimeters, millimeters, or the like of an object in the captured scene from the camera. As shown in FIG. 2, according to an example embodiment, the image camera component 22 may include an IR light component 24, a three-dimensional (3-D) camera 26, and an RGB camera 28 that may be used to capture the depth image of a scene. Each of these components is focused on a scene. For example, in time-of-flight analysis, the IR light component 24 of the capture device 20 may emit an infrared light onto the scene and may then use sensors (not shown) to detect the backscattered light from the surface of one or more targets and objects in the scene using, for example, the 3-D camera 26 and/or the RGB camera 28. In some embodiments, pulsed infrared light may be used such that the time between an outgoing light pulse and a corresponding incoming light pulse may be measured and used to determine a physical distance from the capture device 20 to a particular location on the targets or objects in the scene. Additionally, in other example embodiments, the phase of the outgoing light wave may be compared to the phase of the incoming light wave to determine a phase shift. The phase shift may then be used to determine a physical distance from the capture device 20 to a particular location on the targets or objects. According to another example embodiment, time-of-flight analysis may be used to indirectly determine a physical distance from the capture device 20 to a particular location on the targets or objects by analyzing the intensity of the reflected beam of light over time via various techniques including, for example, shuttered light pulse imaging. In another example embodiment, the capture device 20 may use a structured light to capture depth information. In such an analysis, patterned light (i.e., light displayed as a known pattern such as grid pattern or a stripe pattern) may be projected onto the scene via, for example, the IR light component 24. Upon striking the surface of one or more targets or objects in the scene, the pattern may become deformed in response. Such a deformation of the pattern may be captured by, for example, the 3-D camera 26 and/or the RGB camera 28 and may then be analyzed to determine a physical distance from the

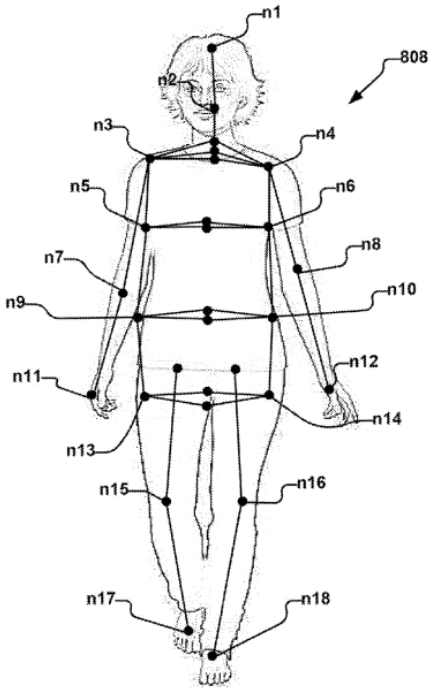
Asserted Claim of the '109 Patent	Exemplary Citations to Geisner
	capture device 20 to a particular location on the targets or objects." *See* paras. [0035]-[0038]. "According to one embodiment, at 605, a depth image may be received. The capture device 20 may capture or observe a scene that may include one or more targets or objects. In an example embodiment, the capture device 20 may be a depth camera configured to obtain a depth image of the scene using any suitable technique such as time-of-flight analysis, structured light analysis, stereo vision analysis, or the like. The depth image may be a plurality of observed pixels where each observed pixel has an observed depth value. The depth image may include a two-dimensional (2-D) pixel area of the captured scene where each pixel in the 2-D pixel area may have a depth value such as a length or distance in, for example, centimeters, millimeters, or the like of an object in the captured scene from the capture device." *See* para. [0115]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Geisner 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.	Geisner 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. "FIG. 3 illustrates an example embodiment of a computing system that may be the computing system 12 shown in FIGS. 1A-2 used to track motion and/or animate (or otherwise update) an avatar or other on-screen object displayed by an application. The computing system such as the computing system 12 described above with respect to FIGS. 1A-2 may be a multimedia console 100, such as a gaming console. As shown in FIG. 3, the multimedia console 100 has a central processing unit (CPU) 101 having a level 1 cache 102, a level 2 cache 104, and a flash ROM (Read Only Memory) 106. The level 1 cache 102 and a level 2 cache 104 temporarily store data and hence reduce the

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	number of memory access cycles, thereby improving processing speed and throughput. The CPU 101 may be provided having more than one core, and thus, additional level 1 and level 2 caches 102 and 104. The flash ROM 106 may store executable code that is loaded during an initial phase of a boot process when the multimedia console 100 is powered on. A graphics processing unit (GPU) 108 and a video encoder/video codec (coder/decoder) 114 form a video processing pipeline for high speed and high resolution graphics processing. Data is carried from the graphics processing unit 108 to the video encoder/video codec 114 via a bus. The video processing pipeline outputs data to an A/V (audio/video) port 140 for transmission to a television or other display. A memory controller 110 is connected to the GPU 108 to facilitate processor access to various types of memory 112, such as, but not limited to, a RAM (Random Access Memory)." *See* paras. [0080]-[0081]. "Any known technique or technique disclosed herein that provides the ability to scan a known/unknown object, scan a human, and scan background aspects in a scene (e.g., floors, walls) may be used to detect features of a target in the physical space. The scan data for each, which may include a combination of depth and RGB data, may be used to create a three-dimensional model of the object. The RGB data is applied to the corresponding area of the model. Temporal tracking, from frame to frame, can increase confidence and adapt the object data in real-time. Thus, the object properties and tracking of changes in the object properties over time may be used to reliably track objects that change in position and orientation from frame to frame in real time. The capture device captures data at interactive rates, increasing the fidelity of the data and allowing the disclosed techniques to process the raw depth data, digitize the objects in the scene, extract the surface and texture of the object, and perform any of these techniques in real-time such that the display can provide a real-time depiction of the scene." *See* para. [0134]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Geisner alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the

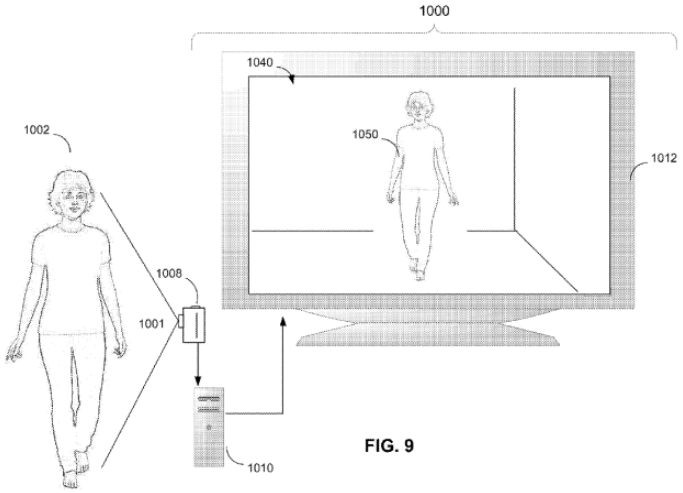
Asserted Claim of the '109 Patent	Exemplary Citations to Geisner
	teachings with respect to this claim element as detailed in the cover document of Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

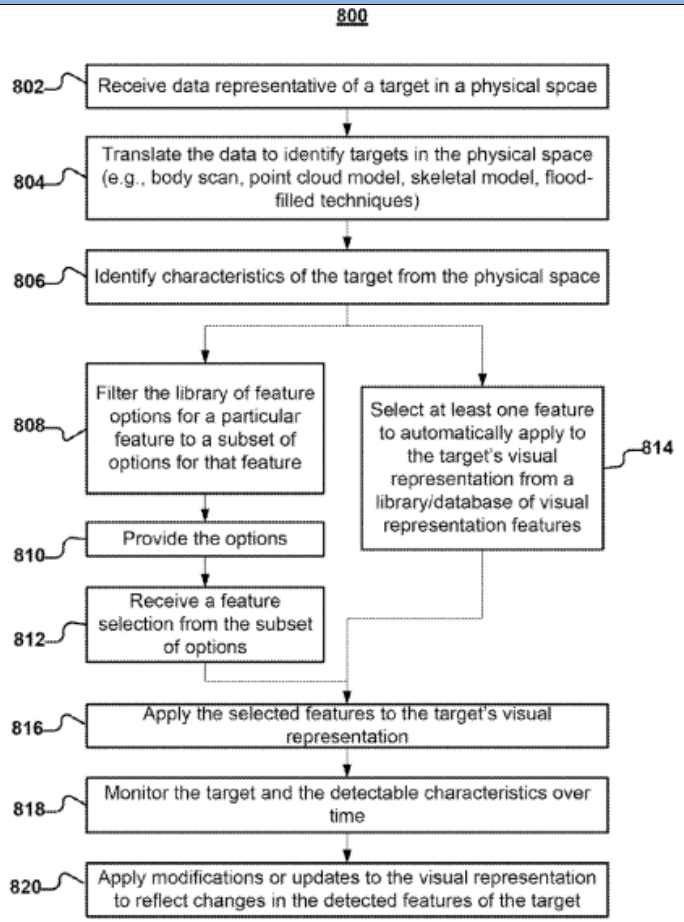
Asserted Claim of the '109 Patent	Exemplary Citations to Geisner
Claim 2	
2. The method of claim 1, wherein the transformation mapping renders an image appearing to have been taken from a camera positioned at eye-level height and pointing horizontally.	Geisner expressly and/or inherently discloses and/or 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. "As shown in FIG. 8, the skeletal model 808 may include one or more joints n1-n18. According to an example embodiment, each of the joints n1-n18 may enable one or more body parts defined there between to move relative to one or more other body parts. For example, a model representing a human target may include a plurality of rigid and/or deformable body parts that may be defined by one or more structural members such as "bones" with the joints n1-n18 located at the intersection of adjacent bones. The joints n1-n18 may enable various body parts associated with the bones and joints n1-n18 to move independently of each other. For example, the bone defined between the joints n7 and n11, shown in FIG. 9, corresponds to a forearm that may be moved independent of, for example, the bone defined between joints n15 and n17 that corresponds to a calf. **Each of the joints represents a place in the skeleton where the skeleton can pivot in the x, y, z directions or a place of interest on the body. Other methods for tracking can also be used. Suitable tracking technology is disclosed the teachings of U.S. patent application Ser. Nos. 12/475,308, 12/696,282, 12/641,788, and 12/575,388, cited above. FIG. 9 illustrates a user 1002 and an on-screen representation of the user 1050 provided by system 20. Through moving her body, a user 1002 may create gestures. A gesture

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	comprises a motion or pose by a user that may be captured as image data and parsed for meaning. A user's gestures may be used for input in a general computing context. For instance, various motions of the hands or other body parts may correspond to common system wide tasks such as navigate up or down in a hierarchical list, open a file, close a file, and save a file. For instance, a user may hold his hand with the fingers pointing up and the palm facing the capture device 20. He may then close his fingers towards the palm to make a fist, and this could be a gesture that indicates that the focused window in a window-based user-interface computing environment should be closed. Gestures may also be used in a video-game-specific context, depending on the game. For instance, with a driving game, various motions of the hands and feet may correspond to steering a vehicle in a direction, shifting gears, accelerating, and braking. Thus, a gesture may indicate a wide variety of motions that map to a displayed user representation, and in a wide variety of applications, such as video games, text editors, word processing, data management, etc." *See* paras. [0124]-[0127].

Asserted Claim of the ’109 Patent	Exemplary Citations to Geisner
	 FIG. 8 “FIGS. 9 and 10 illustrate the creation of an on screen representation 1050 of a user 1002. The techniques for generating an on-screen representation are disclosed in U.S. patent application Ser. No. 12/511,850, entitled Auto Generating a Visual Representation, filed 29 Jul. 2009, fully incorporated herein by reference. The on-screen representation may be auto-generated by the system to provide a visual representation of a target that has features resembling the detected features of the target. Alternately, the system may provide a subset of selectable features from which the user may choose. The system may select the features based on the detected features of the target and apply the

Asserted Claim of the '109 Patent	Exemplary Citations to Geisner
	selections to the visual representation of the target. Thus, auto-generation techniques may remove a large amount of the effort from a user. For example, the system can make selections, on behalf of the user, and apply them to the user's visual representation. As shown in FIG. 9, the system renders a visual representation 1050 on a display 1000 that corresponds to the user 1002 in the physical space 1001. In this example, the system auto-generated the on-screen representation 1050 by detecting features of the user 1002, comparing the detected features to a library of feature options, or imaging information in an imaging library, selecting the feature options that resemble the detected features of the user 1002, and automatically applying them to the user's on-screen representation 1050. The auto-generation of the on-screen representation removes work from the user 1002 and creates an experience for the user 1002 as they are transported into the game or application experience. By tracking the model generated at step 408, system 20 can display the on-screen representation in real time and update the feature selections applied to the on-screen representation in real time. The system may track the user in the physical space over time and apply modifications or update the features applied to the on-screen representation, also in real time. For example, the system may track a user and identify that the user has removed a sweatshirt. The system may identify the user's body movements and recognize a change in the user's clothing type and color. The system may use any of the user's identified characteristics to assist in the feature selection process and/or updated the features selected from the features library and applied to the visual representation. Image data and/or depth information may be used in to identify target features. Such target features for a human target may include, for example, height and/or arm length and may be obtained based on, for example, a body scan, a skeletal model, the extent of a user 1002 on a pixel area or any other suitable process or data. Using for example, the depth values in a plurality of observed pixels that are associated with a human target and the extent of one or more aspects of the human target such as the height, the width of the head, or the width of the shoulders, or the like, the size of the human target may be determined. The camera 1008 may process the image data and use it to determine the

Asserted Claim of the ’109 Patent	Exemplary Citations to Geisner
	shape, colors, and size of various parts of the user, including the user's hair, clothing, etc. The detected features may be compared to a catalog of feature options for application to a visual representation, such as the visual representation feature options in the features library 197.” *See* paras. [0129]-[0132].  FIG. 9

Asserted Claim of the ’109 Patent	Exemplary Citations to Geisner
	 **FIG. 10** This limitation would have been obvious to a person of ordinary skill in the art based on (1) Geisner 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 Geisner
	Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

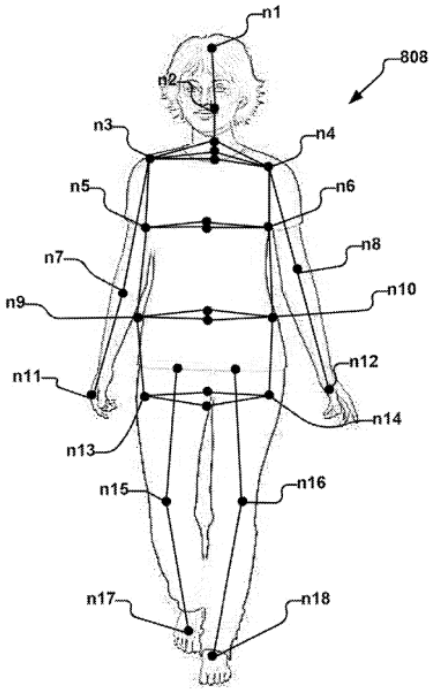
Asserted Claim of the '109 Patent	Exemplary Citations to Geisner
Claim 7	
7[pre]. The method of claim 1, further comprising the steps:	To the extent the preamble is limiting, Geisner expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. *See* Claim Limitations 1[pre]-1[h]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Geisner 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;	Geisner expressly and/or inherently discloses and/or renders obvious obtaining a reference image. *See*, *e.g.*, disclosures below. "In an example embodiment, the capture device 20 may further include a processor 32 that may be in operative communication with the image camera component 22. The processor 32 may include a standardized processor, a specialized processor, a microprocessor, or the like that may execute instructions that may include instructions for receiving the depth image, determining whether a suitable target may be included in the depth image, converting the suitable target into a skeletal representation or model of the target, or any other suitable instruction. The capture device 20 may further include a memory component 34 that may store the instructions that may be executed by the processor 32, images or frames of images

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	captured by the 3-d camera 26 or RGB camera 28, or any other suitable information, images, or the like. According to an example embodiment, the memory component 34 may include random access memory (RAM), read only memory (ROM), cache, Flash memory, a hard disk, or any other suitable storage component. As shown in FIG. 2, in one embodiment, the memory component 34 may be a separate component in communication with the image capture component 22 and the processor 32. According to another embodiment, the memory component 34 may be integrated into the processor 32 and/or the image capture component 22." *See* paras. [0042]-[0043]. "Additionally, the capture device 20 may provide the depth information and images captured by, for example, the 3-D camera 26 and/or the RGB camera 28, and a skeletal model that may be generated by the capture device 20 to the computing environment 12 via the communication link 36. The computing environment 12 may then use the skeletal model, depth information, and captured images to, for example, control an application such as a game or word processor. For example, as shown, in FIG. 2, the computing environment 12 may include a gestures library 192." *See* para. [0045]. "As shown, in FIG. 2, the computing environment 12 may include a gestures library 192 and a gestures recognition engine 190. The gestures recognition engine 190 may include a collection of gesture filters 191. A filter may comprise code and associated data that can recognize gestures or otherwise process depth, RGB, or skeletal data. Each filter 191 may comprise information defining a gesture along with parameters, or metadata, for that gesture. For instance, a throw, which comprises motion of one of the hands from behind the rear of the body to past the front of the body, may be implemented as a gesture filter 191 comprising information representing the movement of one of the hands of the user from behind the rear of the body to past the front of the body, as that movement would be captured by a depth camera. Parameters may then be set for that gesture. Where the gesture is a throw, a parameter may be a threshold velocity that the hand has to reach, a distance the hand must travel (either absolute, or relative to the size of the user as a whole), and a confidence rating by the recognizer engine that the gesture occurred. These

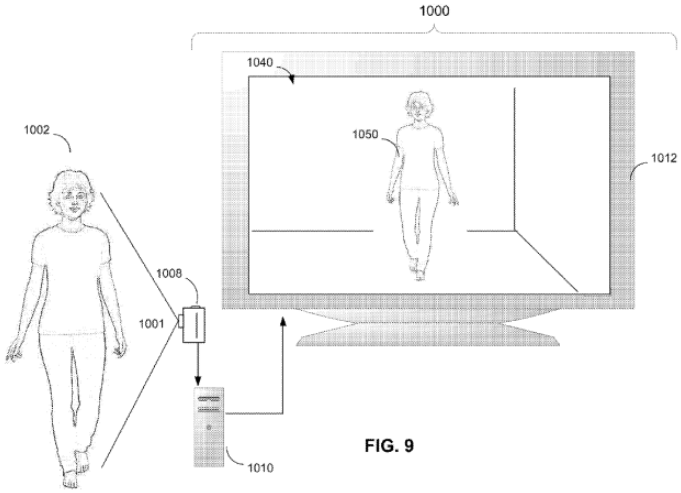
Asserted Claim of the '109 Patent	Exemplary Citations to Geisner
	parameters for the gesture may vary between applications, between contexts of a single application, or within one context of one application over time. While it is contemplated that the gestures recognition engine 190 may include a collection of gesture filters 191, where a filter may comprise code or otherwise represent a component for processing depth, RGB, or skeletal data, the use of a filter is not intended to limit the analysis to a filter. The filter is a representation of an example component or section of code that analyzes data of a scene received by a system, and comparing that data to base information that represents a gesture. As a result of the analysis, the system may produce an output corresponding to whether the input data corresponds to the gesture. The base information representing the gesture may be adjusted to correspond to the recurring feature in the history of data representative of the user's capture motion. The base information, for example, may be part of a gesture filter as described above. But, any suitable manner for analyzing the input data and gesture data is contemplated." *See* paras. [0049]-[0050]. "The processor may have a features comparison module 196. The features comparison module 196 may compare the detected features of a target to the options in the features library 197. The features library 197 may provide visual representation feature options, such as color options, facial feature options, body type options, size options, etc, and the options may vary for human and non-human targets. The library may be a catalog, a database, memory, or the like, that stores the features for the visual representation. The library may an organized or unorganized collection of features options. The system or user may add features to the catalog. For example, an application may have a pre-packaged set of feature options or the system may have a default number of available features. Additional feature options may be added to or updated in the features library 197. For example, the user may purchase additional feature options in a virtual marketplace, a user may gift feature options to another user, or the system may generate feature options by taking a snapshot of the user's detected features. The image library 188 may be a collection of images retrieved by the capture device 20 including particular features of users who interact with the capture device. Images may

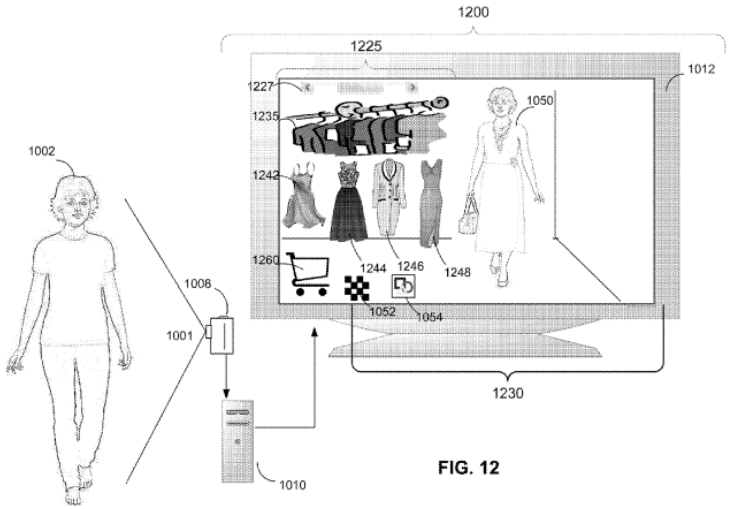
Asserted Claim of the '109 Patent	Exemplary Citations to Geisner
	be used to render on-screen scenes in accordance with the discussion below. The image library 188 may also store images scanned by the capture device of articles in the scene." *See* paras. [0056]-[0057]. "In one embodiment, in order for a user's motion to be used to control an application the user must first be enrolled or bound to the application. In one embodiment, each user will be asked to identify himself or herself by standing in front of the system so that depth images and/or visual images can be obtained from multiple angles for that user. For example, the user may be asked to stand in front of the camera, turn around, and make various poses while depth images and visual images are obtained. After the system obtains enough depth and/or visual images, the system will create a set of identifying data from the images that uniquely identifies the user. The system will create a unique identification and associate that unique identification with on-screen representation (e.g., avatar) or other object in the game/application. After a user is enrolled in (or bound to) the application, the system will track the motion of that user while the user is actively engaged with the application (e.g., playing the game or using the application). However, in the past, other people in the room who are not actively engaged with the application, (e.g., not bound to application, bound to application but not playing current game, or bound to application but currently not having a turn to play) do not have a way to interact with the application." *See* para. [0103]. "For example, according to an example embodiment, a model such as a skeletal model, a mesh human model, or the like of a user such as the user 18 described with respect to FIG. 8. The visual appearance of an on-screen character may then be changed in response to changes to the model being tracked. For example, a user such as the user 18 described above with respect to FIGS. 1A and 1B playing an electronic game on a gaming console may be tracked by the gaming console as described herein. In particular, a body model such as a skeletal model may be used to model the target game player, and the body model may be used to render an on-screen player avatar. As the game player straightens one arm, the gaming console may track this motion, then in response to the tracked

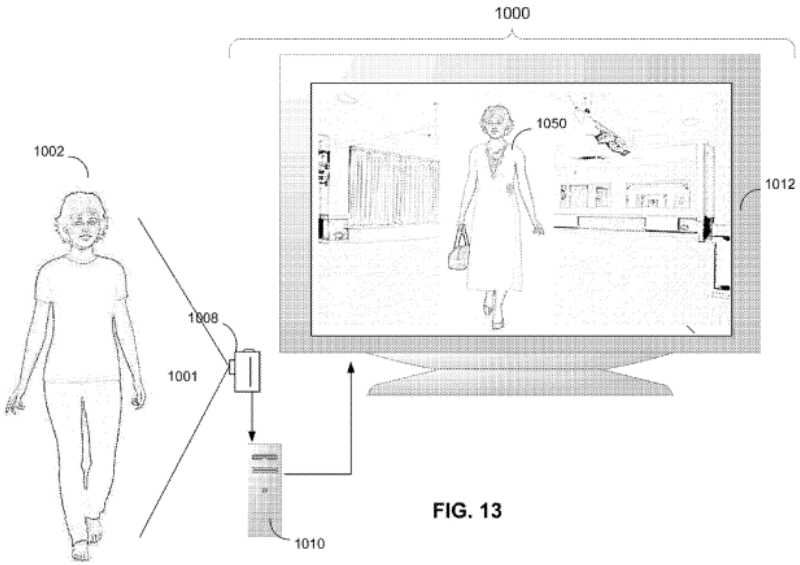
Asserted Claim of the '109 Patent	Exemplary Citations to Geisner
	motion, adjust the body model accordingly. The gaming console may also apply one or more constraints to movements of the body model. Upon making such adjustments and applying such constraints, the gaming console may display the adjusted player avatar. FIG. 8 illustrates an example embodiment of a skeletal model 808 representing a scanned human target used to track a user, such as user 18 or 1002. The model is shown relative to the user 1002. According to an example embodiment, the skeletal model 808 may include one or more data structures that may represent the human target 18 or 1002 as a three-dimensional model. Each body part may be characterized as a mathematical vector defining joints and bones of the skeletal model 808. As shown in FIG. 8, the skeletal model 808 may include one or more joints n1-n18. According to an example embodiment, each of the joints n1-n18 may enable one or more body parts defined there between to move relative to one or more other body parts. For example, a model representing a human target may include a plurality of rigid and/or deformable body parts that may be defined by one or more structural members such as "bones" with the joints n1-n18 located at the intersection of adjacent bones. The joints n1-n18 may enable various body parts associated with the bones and joints n1-n18 to move independently of each other. For example, the bone defined between the joints n7 and n11, shown in FIG. 9, corresponds to a forearm that may be moved independent of, for example, the bone defined between joints n15 and n17 that corresponds to a calf. **Each of the joints represents a place in the skeleton where the skeleton can pivot in the x, y, z directions or a place of interest on the body. Other methods for tracking can also be used. Suitable tracking technology is disclosed the teachings of U.S. patent application Ser. Nos. 12/475,308, 12/696,282, 12/641,788, and 12/575,388, cited above." *See* paras. [0121]-[0125].

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	 FIG. 8 “FIGS. 9 and 10 illustrate the creation of an on screen representation 1050 of a user 1002. The techniques for generating an on-screen representation are disclosed in U.S. patent application Ser. No. 12/511,850, entitled Auto Generating a Visual Representation, filed 29 Jul. 2009, fully incorporated herein by reference. The on-screen representation may be auto-generated by the system to provide a visual representation of a target that has features resembling the detected features of the target. Alternately, the system may provide a subset of selectable features from which the user may choose. The system may select the features based on the detected features of the target and apply the

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	selections to the visual representation of the target. Thus, auto-generation techniques may remove a large amount of the effort from a user. For example, the system can make selections, on behalf of the user, and apply them to the user's visual representation. As shown in FIG. 9, the system renders a visual representation 1050 on a display 1000 that corresponds to the user 1002 in the physical space 1001. In this example, the system auto-generated the on-screen representation 1050 by detecting features of the user 1002, comparing the detected features to a library of feature options, or imaging information in an imaging library, selecting the feature options that resemble the detected features of the user 1002, and automatically applying them to the user's on-screen representation 1050. The auto-generation of the on-screen representation removes work from the user 1002 and creates an experience for the user 1002 as they are transported into the game or application experience. By tracking the model generated at step 408, system 20 can display the on-screen representation in real time and update the feature selections applied to the on-screen representation in real time. The system may track the user in the physical space over time and apply modifications or update the features applied to the on-screen representation, also in real time. For example, the system may track a user and identify that the user has removed a sweatshirt. The system may identify the user's body movements and recognize a change in the user's clothing type and color. The system may use any of the user's identified characteristics to assist in the feature selection process and/or updated the features selected from the features library and applied to the visual representation. Image data and/or depth information may be used in to identify target features. Such target features for a human target may include, for example, height and/or arm length and may be obtained based on, for example, a body scan, a skeletal model, the extent of a user 1002 on a pixel area or any other suitable process or data. Using for example, the depth values in a plurality of observed pixels that are associated with a human target and the extent of one or more aspects of the human target such as the height, the width of the head, or the width of the shoulders, or the like, the size of the human target may be determined. The camera 1008 may process the image data and use it to determine the

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	shape, colors, and size of various parts of the user, including the user's hair, clothing, etc. The detected features may be compared to a catalog of feature options for application to a visual representation, such as the visual representation feature options in the features library 197.” *See* paras. [0129]-[0132].  FIG. 9

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	 FIG. 12

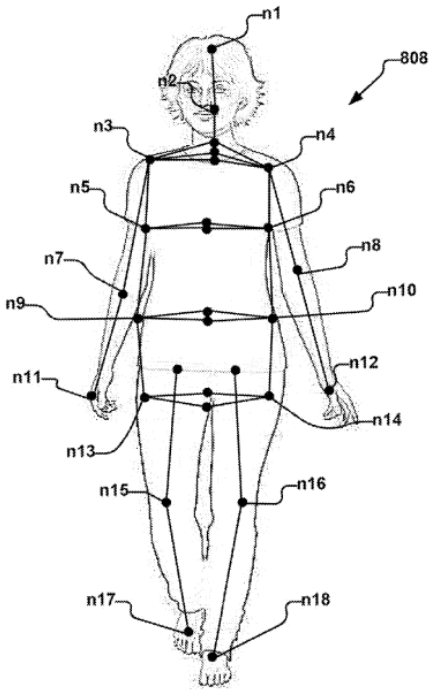
Asserted Claim of the '109 Patent	Exemplary Citations to Geisner
	 FIG. 13 This limitation would have been obvious to a person of ordinary skill in the art based on (1) Geisner alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element 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;	Geisner expressly and/or inherently discloses and/or renders obvious performing registration of the digital image with the reference image. *See*, *e.g.*, disclosures below. "In an example embodiment, the capture device 20 may further include a processor 32 that may be in operative communication with the image camera component 22. The processor 32 may include a standardized processor, a specialized processor, a microprocessor, or the like that may execute instructions that may include instructions

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	for receiving the depth image, determining whether a suitable target may be included in the depth image, converting the suitable target into a skeletal representation or model of the target, or any other suitable instruction. The capture device 20 may further include a memory component 34 that may store the instructions that may be executed by the processor 32, images or frames of images captured by the 3-d camera 26 or RGB camera 28, or any other suitable information, images, or the like. According to an example embodiment, the memory component 34 may include random access memory (RAM), read only memory (ROM), cache, Flash memory, a hard disk, or any other suitable storage component. As shown in FIG. 2, in one embodiment, the memory component 34 may be a separate component in communication with the image capture component 22 and the processor 32. According to another embodiment, the memory component 34 may be integrated into the processor 32 and/or the image capture component 22." *See* paras. [0042]-[0043]. "Additionally, the capture device 20 may provide the depth information and images captured by, for example, the 3-D camera 26 and/or the RGB camera 28, and a skeletal model that may be generated by the capture device 20 to the computing environment 12 via the communication link 36. The computing environment 12 may then use the skeletal model, depth information, and captured images to, for example, control an application such as a game or word processor. For example, as shown, in FIG. 2, the computing environment 12 may include a gestures library 192." *See* para. [0045]. "As shown, in FIG. 2, the computing environment 12 may include a gestures library 192 and a gestures recognition engine 190. The gestures recognition engine 190 may include a collection of gesture filters 191. A filter may comprise code and associated data that can recognize gestures or otherwise process depth, RGB, or skeletal data. Each filter 191 may comprise information defining a gesture along with parameters, or metadata, for that gesture. For instance, a throw, which comprises motion of one of the hands from behind the rear of the body to past the front of the body, may be implemented as a gesture filter 191 comprising information representing the movement of one of the hands of the user from behind the rear of the body to past the front of the body, as that movement

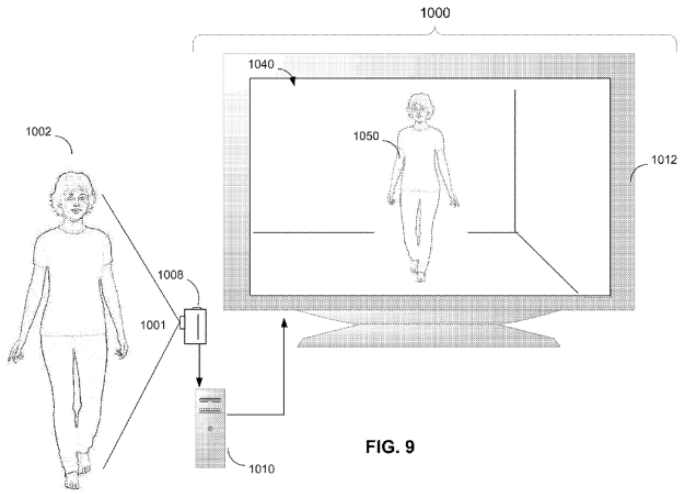
Asserted Claim of the '109 Patent	Exemplary Citations to Geisner
	would be captured by a depth camera. Parameters may then be set for that gesture. Where the gesture is a throw, a parameter may be a threshold velocity that the hand has to reach, a distance the hand must travel (either absolute, or relative to the size of the user as a whole), and a confidence rating by the recognizer engine that the gesture occurred. These parameters for the gesture may vary between applications, between contexts of a single application, or within one context of one application over time. While it is contemplated that the gestures recognition engine 190 may include a collection of gesture filters 191, where a filter may comprise code or otherwise represent a component for processing depth, RGB, or skeletal data, the use of a filter is not intended to limit the analysis to a filter. The filter is a representation of an example component or section of code that analyzes data of a scene received by a system, and comparing that data to base information that represents a gesture. As a result of the analysis, the system may produce an output corresponding to whether the input data corresponds to the gesture. The base information representing the gesture may be adjusted to correspond to the recurring feature in the history of data representative of the user's capture motion. The base information, for example, may be part of a gesture filter as described above. But, any suitable manner for analyzing the input data and gesture data is contemplated." *See* paras. [0049]-[0050]. "The processor may have a features comparison module 196. The features comparison module 196 may compare the detected features of a target to the options in the features library 197. The features library 197 may provide visual representation feature options, such as color options, facial feature options, body type options, size options, etc, and the options may vary for human and non-human targets. The library may be a catalog, a database, memory, or the like, that stores the features for the visual representation. The library may an organized or unorganized collection of features options. The system or user may add features to the catalog. For example, an application may have a pre-packaged set of feature options or the system may have a default number of available features. Additional feature options may be added to or updated in the features library 197. For example, the user may purchase additional feature options in a virtual

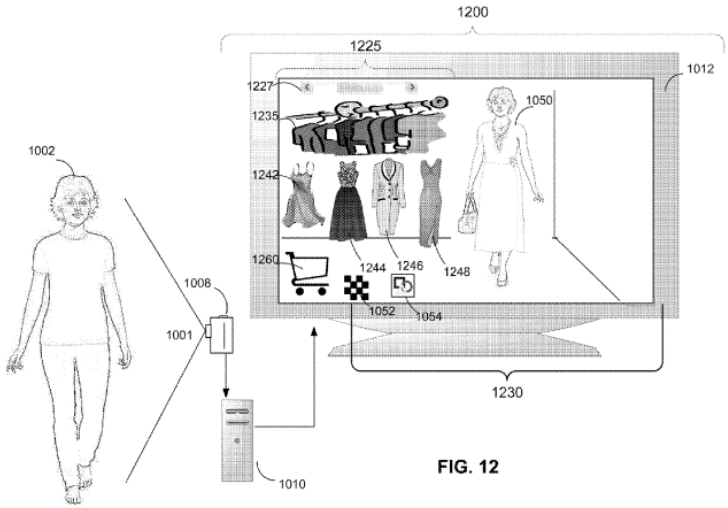
Asserted Claim of the '109 Patent	Exemplary Citations to Geisner
	marketplace, a user may gift feature options to another user, or the system may generate feature options by taking a snapshot of the user's detected features. The image library 188 may be a collection of images retrieved by the capture device 20 including particular features of users who interact with the capture device. Images may be used to render on-screen scenes in accordance with the discussion below. The image library 188 may also store images scanned by the capture device of articles in the scene." *See* paras. [0056]-[0057]. "In one embodiment, in order for a user's motion to be used to control an application the user must first be enrolled or bound to the application. In one embodiment, each user will be asked to identify himself or herself by standing in front of the system so that depth images and/or visual images can be obtained from multiple angles for that user. For example, the user may be asked to stand in front of the camera, turn around, and make various poses while depth images and visual images are obtained. After the system obtains enough depth and/or visual images, the system will create a set of identifying data from the images that uniquely identifies the user. The system will create a unique identification and associate that unique identification with on-screen representation (e.g., avatar) or other object in the game/application. After a user is enrolled in (or bound to) the application, the system will track the motion of that user while the user is actively engaged with the application (e.g., playing the game or using the application). However, in the past, other people in the room who are not actively engaged with the application, (e.g., not bound to application, bound to application but not playing current game, or bound to application but currently not having a turn to play) do not have a way to interact with the application." *See* para. [0103]. "For example, according to an example embodiment, a model such as a skeletal model, a mesh human model, or the like of a user such as the user 18 described with respect to FIG. 8. The visual appearance of an on-screen character may then be changed in response to changes to the model being tracked. For example, a user such as the user 18 described

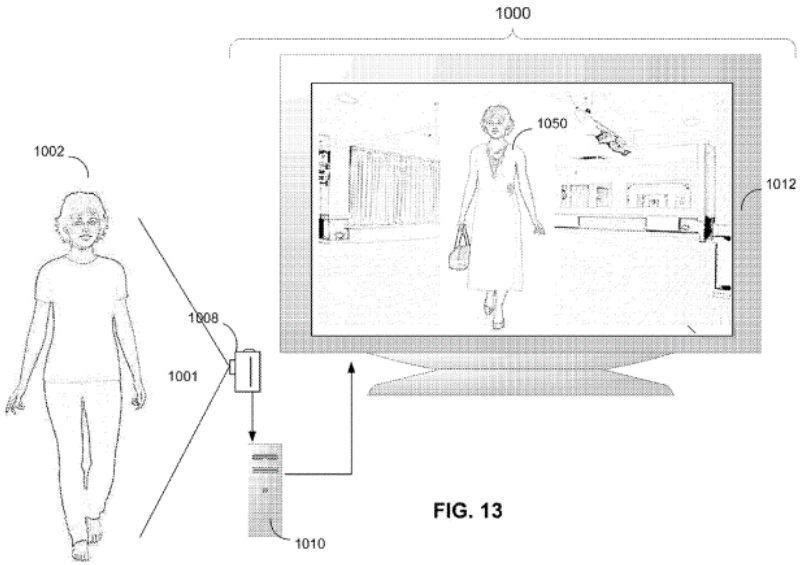
Asserted Claim of the '109 Patent	Exemplary Citations to Geisner
	above with respect to FIGS. 1A and 1B playing an electronic game on a gaming console may be tracked by the gaming console as described herein. In particular, a body model such as a skeletal model may be used to model the target game player, and the body model may be used to render an on-screen player avatar. As the game player straightens one arm, the gaming console may track this motion, then in response to the tracked motion, adjust the body model accordingly. The gaming console may also apply one or more constraints to movements of the body model. Upon making such adjustments and applying such constraints, the gaming console may display the adjusted player avatar. FIG. 8 illustrates an example embodiment of a skeletal model 808 representing a scanned human target used to track a user, such as user 18 or 1002. The model is shown relative to the user 1002. According to an example embodiment, the skeletal model 808 may include one or more data structures that may represent the human target 18 or 1002 as a three-dimensional model. Each body part may be characterized as a mathematical vector defining joints and bones of the skeletal model 808. As shown in FIG. 8, the skeletal model 808 may include one or more joints n1-n18. According to an example embodiment, each of the joints n1-n18 may enable one or more body parts defined there between to move relative to one or more other body parts. For example, a model representing a human target may include a plurality of rigid and/or deformable body parts that may be defined by one or more structural members such as "bones" with the joints n1-n18 located at the intersection of adjacent bones. The joints n1-n18 may enable various body parts associated with the bones and joints n1-n18 to move independently of each other. For example, the bone defined between the joints n7 and n11, shown in FIG. 9, corresponds to a forearm that may be moved independent of, for example, the bone defined between joints n15 and n17 that corresponds to a calf. **Each of the joints represents a place in the skeleton where the skeleton can pivot in the x, y, z directions or a place of interest on the body. Other methods for tracking can also be used. Suitable tracking technology is disclosed the teachings of U.S. patent

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	application Ser. Nos. 12/475,308, 12/696,282, 12/641,788, and 12/575,388, cited above." *See* paras. [0121]-[0125].  FIG. 8 "FIGS. 9 and 10 illustrate the creation of an on screen representation 1050 of a user 1002. The techniques for generating an on-screen representation are disclosed in U.S. patent application Ser. No. 12/511,850, entitled Auto Generating a Visual Representation, filed 29 Jul. 2009, fully incorporated herein by reference. The on-screen representation may be auto-generated by the system to provide a visual representation of

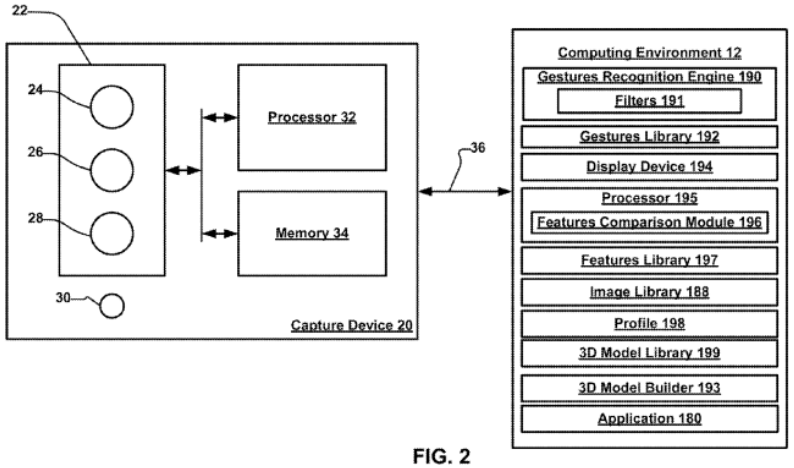
Asserted Claim of the '109 Patent	Exemplary Citations to Geisner
	a target that has features resembling the detected features of the target. Alternately, the system may provide a subset of selectable features from which the user may choose. The system may select the features based on the detected features of the target and apply the selections to the visual representation of the target. Thus, auto-generation techniques may remove a large amount of the effort from a user. For example, the system can make selections, on behalf of the user, and apply them to the user's visual representation. As shown in FIG. 9, the system renders a visual representation 1050 on a display 1000 that corresponds to the user 1002 in the physical space 1001. In this example, the system auto-generated the on-screen representation 1050 by detecting features of the user 1002, comparing the detected features to a library of feature options, or imaging information in an imaging library, selecting the feature options that resemble the detected features of the user 1002, and automatically applying them to the user's on-screen representation 1050. The auto-generation of the on-screen representation removes work from the user 1002 and creates an experience for the user 1002 as they are transported into the game or application experience. By tracking the model generated at step 408, system 20 can display the on-screen representation in real time and update the feature selections applied to the on-screen representation in real time. The system may track the user in the physical space over time and apply modifications or update the features applied to the on-screen representation, also in real time. For example, the system may track a user and identify that the user has removed a sweatshirt. The system may identify the user's body movements and recognize a change in the user's clothing type and color. The system may use any of the user's identified characteristics to assist in the feature selection process and/or updated the features selected from the features library and applied to the visual representation. Image data and/or depth information may be used in to identify target features. Such target features for a human target may include, for example, height and/or arm length and may be obtained based on, for example, a body scan, a skeletal model, the extent of a user 1002 on a pixel area or any other suitable process or data. Using for example, the depth values in a plurality of observed pixels that are associated with a human target and

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	the extent of one or more aspects of the human target such as the height, the width of the head, or the width of the shoulders, or the like, the size of the human target may be determined. The camera 1008 may process the image data and use it to determine the shape, colors, and size of various parts of the user, including the user's hair, clothing, etc. The detected features may be compared to a catalog of feature options for application to a visual representation, such as the visual representation feature options in the features library 197.” *See* paras. [0129]-[0132].  FIG. 9

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	 FIG. 12

Asserted Claim of the '109 Patent	Exemplary Citations to Geisner
	 FIG. 13 This limitation would have been obvious to a person of ordinary skill in the art based on (1) Geisner 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.	Geisner 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. "According to another embodiment, the capture device 20 may include two or more physically separated cameras that may view a scene from different angles, to obtain visual stereo data that may be resolved to generate depth information." *See* para. [0039].

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	"Processor 195 can execute instructions for receiving data of a scene, wherein the data includes data representative of the target in a physical space. The instructions comprise instructions for detecting at least one target feature from the data, and comparing the at least one detected target feature to visual representation feature options from the features library 195. The visual representation feature options may comprise selectable options configured for application to the visual representation. Further instructions provide for selecting a visual representation feature from the visual representation feature options, applying the visual representation feature to the visual representation of the target, and rendering the visual representation. The visual representation may be auto-generated from the comparison of the at least one detected feature to the visual representation feature options such that the selection of the visual representation feature is performed without manual selection by a user. The selection of the visual representation feature may comprise selecting the visual representation feature that is similar to the detected target feature. The visual representation feature may be at least one of a facial feature, a body part, a color, a size, a height, a width, a shape, an accessory, or a clothing item. The instructions may provide for generating a subset of visual representation feature options, from the visual representation feature options, for the visual representation feature, and providing the generated subset of feature options for user selection of the visual representation feature to apply to the visual representation. The generated subset of visual representation feature options may comprise multiple visual representation feature options that are similar to the detected target feature. The instructions may provide for receiving a user selection of a visual representation feature from the generated subset of feature options, wherein selecting the visual representation feature from the visual representation feature options comprises selecting the visual representation feature that corresponds to the user selection. The visual representation, having the visual representation feature, may be rendered in real time. Furthermore, the instructions may provide for monitoring the target and detecting a change in the detected target feature, and updating the visual representation of the target by updating the visual representation feature applied to the visual representation, in real time, based on the change in the detected target feature.

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	As shown, in FIG. 2, the computing environment 12 may include a gestures library 192 and a gestures recognition engine 190. The gestures recognition engine 190 may include a collection of gesture filters 191. A filter may comprise code and associated data that can recognize gestures or otherwise process depth, RGB, or skeletal data. Each filter 191 may comprise information defining a gesture along with parameters, or metadata, for that gesture. For instance, a throw, which comprises motion of one of the hands from behind the rear of the body to past the front of the body, may be implemented as a gesture filter 191 comprising information representing the movement of one of the hands of the user from behind the rear of the body to past the front of the body, as that movement would be captured by a depth camera. Parameters may then be set for that gesture. Where the gesture is a throw, a parameter may be a threshold velocity that the hand has to reach, a distance the hand must travel (either absolute, or relative to the size of the user as a whole), and a confidence rating by the recognizer engine that the gesture occurred. These parameters for the gesture may vary between applications, between contexts of a single application, or within one context of one application over time." *See* paras. [0047]-[0049].  FIG. 2

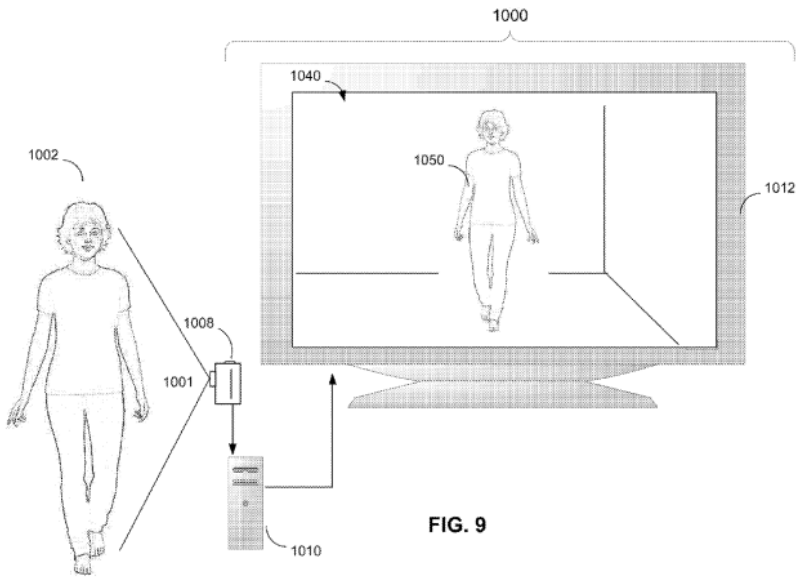
Asserted Claim of the '109 Patent	Exemplary Citations to Geisner
	"In an example embodiment, a gesture may be recognized as a trigger for the entry into a modification mode, where a user can modify the visual representation auto-generated by the system. For example, a gesture filter 191 may comprise information for recognizing a modification trigger gesture. If the modification trigger gesture is recognized, the application may go into a modification mode. The modification trigger gesture may vary between applications, between systems, between users, or the like. For example, the same gesture in a tennis gaming application may not be the same modification trigger gesture in a bowling game application. Consider an example modification trigger gesture that comprises a user motioning the user's right hand, presented in front of the user's body, with the pointer finger pointing upward and moving in a circular motion. The parameters set for the modification trigger gesture may be used to identify that the user's hand is in front of the user's body, the user's pointer finger is pointed in an upward motion, and identifying that the pointer finger is moving in a circular motion. Certain gestures may be identified as a request to enter into a modification mode, where if an application is currently executing, the modification mode interrupts the current state of the application and enters into a modification mode. The modification mode may cause the application to pause, where the application can be resumed at the pause point when the user leaves the modification mode. Alternately, the modification mode may not result in a pause to the application, and the application may continue to execute while the user makes modifications. The data captured by the cameras 26, 28 and device 20 in the form of the skeletal model and movements associated with it may be compared to the gesture filters 191 in the gestures library 192 to identify when a user (as represented by the skeletal model) has performed one or more gestures. Thus, inputs to a filter such as filter 191 may comprise things such as joint data about a user's joint position, like angles formed by the bones that meet at the joint, RGB color data from the scene, and the rate of change of an aspect of the user. As mentioned, parameters may be set for the gesture. Outputs from a filter

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	191 may comprise things such as the confidence that a given gesture is being made, the speed at which a gesture motion is made, and a time at which the gesture occurs. The computing environment 12 may include a processor 195 that can process the depth image to determine what targets are in a scene, such as a user 18 or an object in the room. This can be done, for instance, by grouping together of pixels of the depth image that share a similar distance value. The image may also be parsed to produce a skeletal representation of the user, where features, such as joints and tissues that run between joints are identified. There exist skeletal mapping techniques to capture a person with a depth camera and from that determine various spots on that user's skeleton, joints of the hand, wrists, elbows, knees, nose, ankles, shoulders, and where the pelvis meets the spine. Other techniques include transforming the image into a body model representation of the person and transforming the image into a mesh model representation of the person." *See* paras. [0051]-[0054]. "In another example, the target is a human user and the system detects the user's features, such as eye color, size, and shape, hair color, type, and length, etc. The system may compare the detected features to a catalog of feature options and apply selected features to the visual representation. As described above, the system may combine features and alter those features. For example, the features may be altered by applying a color, positioning, or scaling to the target. The features may be altered by the selection of additional features from the features library 197, such as a color, or by using image data from a snapshot of the target. For example, an application may provide a generic set of solid color pants, t-shirts, and shoe types in the features library 197. The system may select from the generic clothing features but alter the selected clothing features by applying colors to the clothing to reflect the colors of the target's clothing detected by the system." *See* para. [0062]. "The computing environment 12 may use the gestures library 192 to interpret movements of the skeletal model and to control an application based on the movements. Filters may be modular or interchangeable so that a first filter may be replaced with a second filter that has the same number and types of inputs and outputs as the first filter

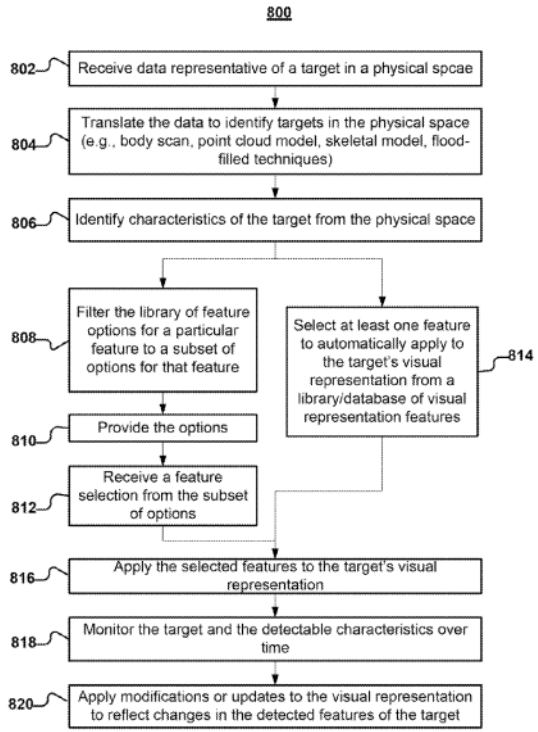
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	without altering any other aspect of the recognizer engine architecture. For instance, there may be a first filter for driving that takes as input skeletal data and outputs a confidence that the gesture associated with the filter is occurring and an angle of steering. Where one wishes to substitute this first driving filter with a second driving filter—perhaps because the second driving filter is more efficient and requires fewer processing resources—one may do so by simply replacing the first filter with the second filter so long as the second filter has those same inputs and outputs—one input of skeletal data type, and two outputs of confidence type and angle type. A filter need not have a parameter. For instance, a "user height" filter that returns the user's height may not allow for any parameters that may be tuned. An alternate "user height" filter may have tunable parameters—such as to whether to account for a user's footwear, hairstyle, headwear and posture in determining the user's height. Inputs to a filter may comprise things such as joint data about a user's joint position, like angles formed by the bones that meet at the joint, RGB color data from the scene, and the rate of change of an aspect of the user. Outputs from a filter may comprise things such as the confidence that a given gesture is being made, the speed at which a gesture motion is made, and a time at which a gesture motion is made." *See* paras. [0066]-[0068]. "In one embodiment, in order for a user's motion to be used to control an application the user must first be enrolled or bound to the application. In one embodiment, each user will be asked to identify himself or herself by standing in front of the system so that depth images and/or visual images can be obtained from multiple angles for that user. For example, the user may be asked to stand in front of the camera, turn around, and make various poses while depth images and visual images are obtained. After the system obtains enough depth and/or visual images, the system will create a set of identifying data from the images that uniquely identifies the user. The system will create a unique identification and associate that unique identification with on-screen representation (e.g., avatar) or other object in the game/application. After a user is enrolled in (or bound to) the application, the system will track the motion of that user while the user is actively engaged with the application (e.g., playing the game or using the application). However,

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	in the past, other people in the room who are not actively engaged with the application, (e.g., not bound to application, bound to application but not playing current game, or bound to application but currently not having a turn to play) do not have a way to interact with the application." *See* para. [0103]. "If a user performs a gesture and the gesture is recognized at 440, action consistent with the gesture within the shopping application is applied at 450. As discussed below, shopping applications gestures can comprise two general types of gestures: an article manipulation gesture or a transaction manipulation gesture. An article manipulation gesture may comprise, for example, any of a number of shopping consistent actions consistent with the interface presented to the user. If the user is presented a selection of virtual articles comprising clotting and an on-screen representation of themselves, article manipulation actions may comprise actions such as selecting clothes, putting on clothes, taking off clothes, adjusting clothes, changing backgrounds, changing accessories, moving room elements within a scene, placing items within a scene, placing the on-screen representation with a variety of backgrounds in particular clothing, and the like. A transaction gesture may comprise a gesture used to facilitate a transaction such as movement of an article into a shopping cart, removing an article from a shopping cart, entry of financial information and the like." *See* para. [0111]. "As shown in FIG. 8, the skeletal model 808 may include one or more joints n1-n18. According to an example embodiment, each of the joints n1-n18 may enable one or more body parts defined there between to move relative to one or more other body parts. For example, a model representing a human target may include a plurality of rigid and/or deformable body parts that may be defined by one or more structural members such as "bones" with the joints n1-n18 located at the intersection of adjacent bones. The joints n1-n18 may enable various body parts associated with the bones and joints n1-n18 to move independently of each other. For example, the bone defined between the joints n7 and n11, shown in FIG. 9, corresponds to a forearm that may be moved independent of, for example, the bone defined between joints n15 and n17 that corresponds to a calf.

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	**Each of the joints represents a place in the skeleton where the skeleton can pivot in the x, y, z directions or a place of interest on the body. Other methods for tracking can also be used. Suitable tracking technology is disclosed the teachings of U.S. patent application Ser. Nos. 12/475,308, 12/696,282, 12/641,788, and 12/575,388, cited above. FIG. 9 illustrates a user 1002 and an on-screen representation of the user 1050 provided by system 20. Through moving her body, a user 1002 may create gestures. A gesture comprises a motion or pose by a user that may be captured as image data and parsed for meaning. A user's gestures may be used for input in a general computing context. For instance, various motions of the hands or other body parts may correspond to common system wide tasks such as navigate up or down in a hierarchical list, open a file, close a file, and save a file. For instance, a user may hold his hand with the fingers pointing up and the palm facing the capture device 20. He may then close his fingers towards the palm to make a fist, and this could be a gesture that indicates that the focused window in a window-based user-interface computing environment should be closed. Gestures may also be used in a video-game-specific context, depending on the game. For instance, with a driving game, various motions of the hands and feet may correspond to steering a vehicle in a direction, shifting gears, accelerating, and braking. Thus, a gesture may indicate a wide variety of motions that map to a displayed user representation, and in a wide variety of applications, such as video games, text editors, word processing, data management, etc." *See* paras. [0124]-[0127].

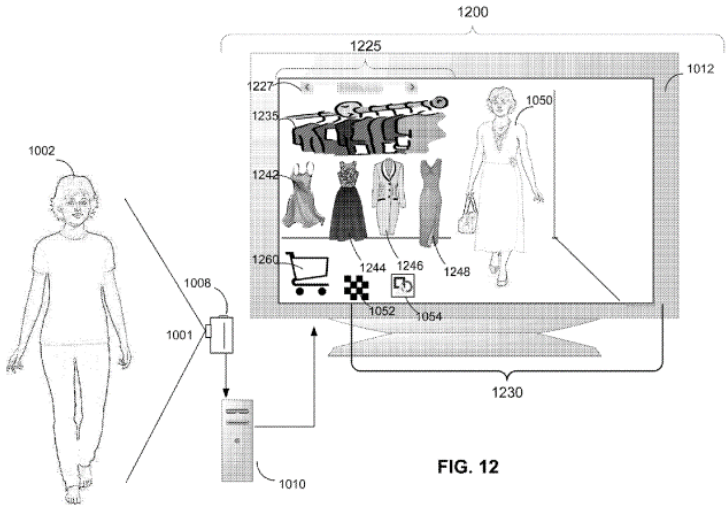
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	 FIG. 9 “FIGS. 9 and 10 illustrate the creation of an on screen representation 1050 of a user 1002. The techniques for generating an on-screen representation are disclosed in U.S. patent application Ser. No. 12/511,850, entitled Auto Generating a Visual Representation, filed 29 Jul. 2009, fully incorporated herein by reference. The on-screen representation may be auto-generated by the system to provide a visual representation of a target that has features resembling the detected features of the target. Alternately, the system may provide a subset of selectable features from which the user may choose. The system may select the features based on the detected features of the target and apply the selections to the visual representation of the target. Thus, auto-generation techniques may remove a large amount of the effort from a user. For example, the system can make selections, on behalf of the user, and apply them to the user's visual representation.

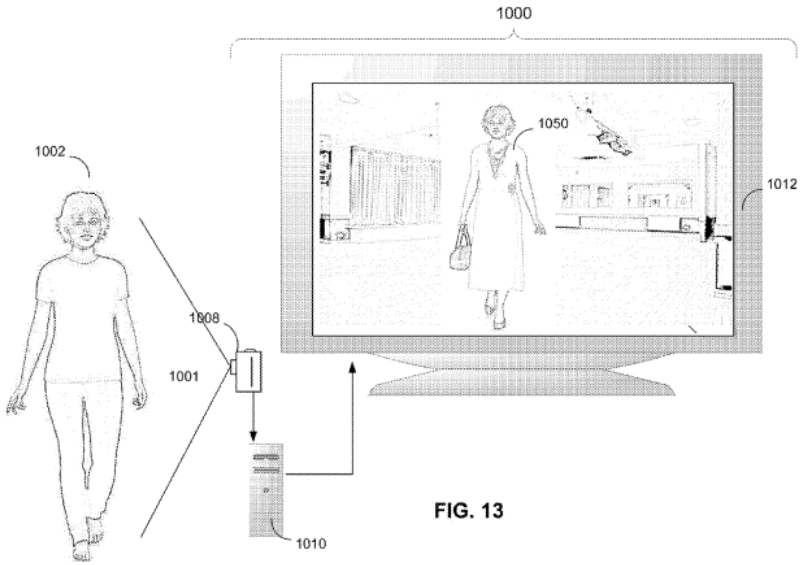
Asserted Claim of the '109 Patent	Exemplary Citations to Geisner
	As shown in FIG. 9, the system renders a visual representation 1050 on a display 1000 that corresponds to the user 1002 in the physical space 1001. In this example, the system auto-generated the on-screen representation 1050 by detecting features of the user 1002, comparing the detected features to a library of feature options, or imaging information in an imaging library, selecting the feature options that resemble the detected features of the user 1002, and automatically applying them to the user's on-screen representation 1050. The auto-generation of the on-screen representation removes work from the user 1002 and creates an experience for the user 1002 as they are transported into the game or application experience. By tracking the model generated at step 408, system 20 can display the on-screen representation in real time and update the feature selections applied to the on-screen representation in real time. The system may track the user in the physical space over time and apply modifications or update the features applied to the on-screen representation, also in real time. For example, the system may track a user and identify that the user has removed a sweatshirt. The system may identify the user's body movements and recognize a change in the user's clothing type and color. The system may use any of the user's identified characteristics to assist in the feature selection process and/or updated the features selected from the features library and applied to the visual representation. Image data and/or depth information may be used in to identify target features. Such target features for a human target may include, for example, height and/or arm length and may be obtained based on, for example, a body scan, a skeletal model, the extent of a user 1002 on a pixel area or any other suitable process or data. Using for example, the depth values in a plurality of observed pixels that are associated with a human target and the extent of one or more aspects of the human target such as the height, the width of the head, or the width of the shoulders, or the like, the size of the human target may be determined. The camera 1008 may process the image data and use it to determine the shape, colors, and size of various parts of the user, including the user's hair, clothing, etc. The detected features may be compared to a catalog of feature options for application

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	to a visual representation, such as the visual representation feature options in the features library 197." *See* paras. [0129]-[0132].  FIG. 10 "In another example embodiment, the system can identify characteristics of the user and use the identified characteristics to select features for the visual representation, the system may use target digitization techniques. The techniques comprise identifying surfaces, textures, and object dimensions from unorganized point clouds derived from a capture device, such as a depth sensing device. Employing target digitization may comprise surface extraction, identifying points in a point cloud, labeling surface normals,

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	computing object properties, tracking changes in object properties over time, and increasing confidence in the object boundaries and identity as additional frames are captured. For example, a point cloud of data points related to objects in a physical space may be received or observed. The point cloud may then be analyzed to determine whether the point cloud includes an object. A collection of point clouds may be identified as an object and fused together to represent a single object. A surface of the point clouds may be extracted from the object identified. Any known technique or technique disclosed herein that provides the ability to scan a known/unknown object, scan a human, and scan background aspects in a scene (e.g., floors, walls) may be used to detect features of a target in the physical space. The scan data for each, which may include a combination of depth and RGB data, may be used to create a three-dimensional model of the object. The RGB data is applied to the corresponding area of the model. Temporal tracking, from frame to frame, can increase confidence and adapt the object data in real-time. Thus, the object properties and tracking of changes in the object properties over time may be used to reliably track objects that change in position and orientation from frame to frame in real time. The capture device captures data at interactive rates, increasing the fidelity of the data and allowing the disclosed techniques to process the raw depth data, digitize the objects in the scene, extract the surface and texture of the object, and perform any of these techniques in real-time such that the display can provide a real-time depiction of the scene." *See* paras. [0133]-[0134]. "Step 1126 illustrates a small set of possible gestures representing an action which may occur in an shopping application 180. These actions may include, for example, an action to: select article, apply article to on-screen image, remove article from avatar, add article to scene, remove article from scene, un-select article, apply background, remove article from rack, place article on rack, adjust article properties, and move object into scene. The aforementioned gestures should not be construed as limiting but are exemplary of the type of gestures a user may need in a shopping application when manipulating an article.

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	Selecting an article may comprise a gesture indicating that that the user intends to select an article in the interface. An interface for the application may be presented in a display, as shown below at FIG. 12. Selection can be of an article in a rendered scene or in the interface selection portion of the scene. Such a gesture may comprise, for example, a motion to grab a virtual garment by moving to position the on-screen representation of the user's hand over the garment and closing one's hand. A gesture applying an article to an on-screen image may comprise moving a selected garment from a rack of hanging virtual clothes, and placing the garment on top of the on-screen representation. Conversely, a gesture may comprise removing an article. A gesture may indicate the user wishes to adjust the clothing. For example, the user may wish to raise the user's collar, roll up the user's pants, roll up the user's sleeves, or the like. Any of these types of gestures may result in the adjustment of the clothing in the interface at 1128. Alternatively, the user may wish to place themselves in a different physical background at 1128. A gesture such as selecting a background tile from the interface and applying the background tile into the user's screen will result in applying or removing a background at 1128. Any other of a number of types of actions at 1126 may result in a corresponding action 1128 within the interface." *See* paras. [0153]-[0154].

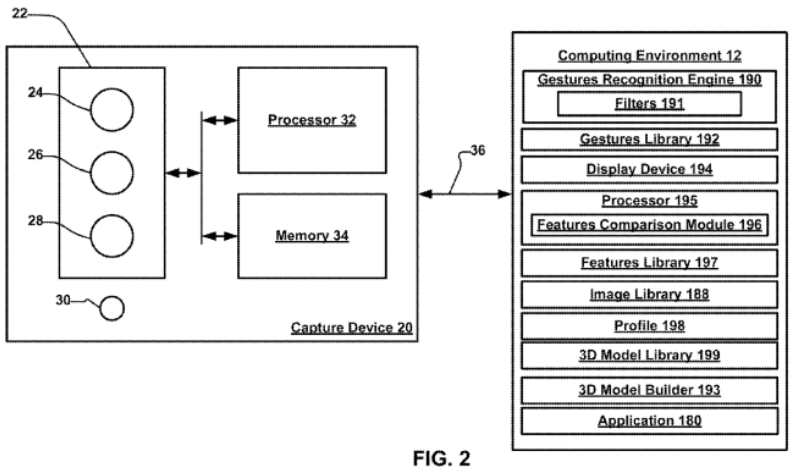
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	 FIG. 12

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	 FIG. 13 This limitation would have been obvious to a person of ordinary skill in the art based on (1) Geisner 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 8	

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8. The method of claim 1, further comprising applying a translation transformation to move the image within display area of the monitor.	Geisner 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. "According to another embodiment, the capture device 20 may include two or more physically separated cameras that may view a scene from different angles, to obtain visual stereo data that may be resolved to generate depth information." *See* para. [0039]. "Processor 195 can execute instructions for receiving data of a scene, wherein the data includes data representative of the target in a physical space. The instructions comprise instructions for detecting at least one target feature from the data, and comparing the at least one detected target feature to visual representation feature options from the features library 195. The visual representation feature options may comprise selectable options configured for application to the visual representation. Further instructions provide for selecting a visual representation feature from the visual representation feature options, applying the visual representation feature to the visual representation of the target, and rendering the visual representation. The visual representation may be auto-generated from the comparison of the at least one detected feature to the visual representation feature options such that the selection of the visual representation feature is performed without manual selection by a user. The selection of the visual representation feature may comprise selecting the visual representation feature that is similar to the detected target feature. The visual representation feature may be at least one of a facial feature, a body part, a color, a size, a height, a width, a shape, an accessory, or a clothing item. The instructions may provide for generating a subset of visual representation feature options, from the visual representation feature options, for the visual representation feature, and providing the generated subset of feature options for user selection of the visual representation feature to apply to the visual representation. The generated subset of visual representation feature options may comprise multiple visual representation feature options that are similar to the detected target feature. The instructions may provide for receiving a user selection of a visual representation feature from the generated subset of feature options,

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	wherein selecting the visual representation feature from the visual representation feature options comprises selecting the visual representation feature that corresponds to the user selection. The visual representation, having the visual representation feature, may be rendered in real time. Furthermore, the instructions may provide for monitoring the target and detecting a change in the detected target feature, and updating the visual representation of the target by updating the visual representation feature applied to the visual representation, in real time, based on the change in the detected target feature. As shown, in FIG. 2, the computing environment 12 may include a gestures library 192 and a gestures recognition engine 190. The gestures recognition engine 190 may include a collection of gesture filters 191. A filter may comprise code and associated data that can recognize gestures or otherwise process depth, RGB, or skeletal data. Each filter 191 may comprise information defining a gesture along with parameters, or metadata, for that gesture. For instance, a throw, which comprises motion of one of the hands from behind the rear of the body to past the front of the body, may be implemented as a gesture filter 191 comprising information representing the movement of one of the hands of the user from behind the rear of the body to past the front of the body, as that movement would be captured by a depth camera. Parameters may then be set for that gesture. Where the gesture is a throw, a parameter may be a threshold velocity that the hand has to reach, a distance the hand must travel (either absolute, or relative to the size of the user as a whole), and a confidence rating by the recognizer engine that the gesture occurred. These parameters for the gesture may vary between applications, between contexts of a single application, or within one context of one application over time." *See* paras. [0047]-[0049].

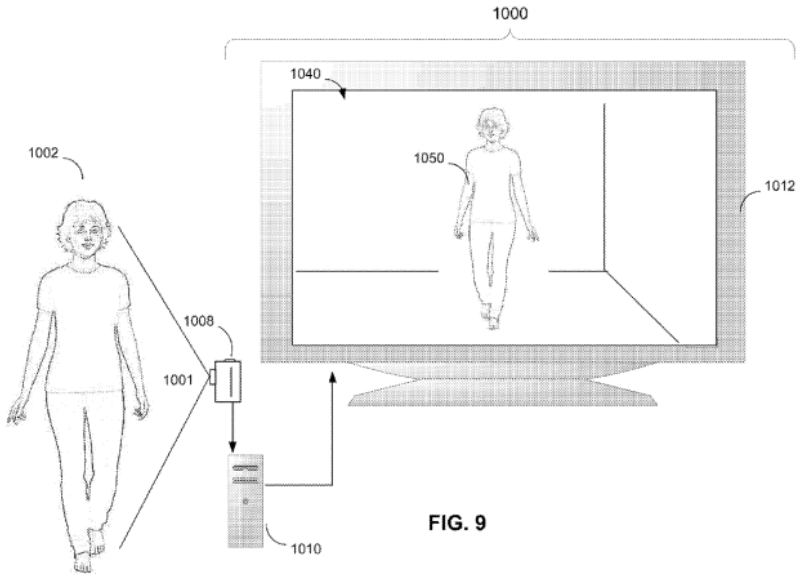
Asserted Claim of the '109 Patent	Exemplary Citations to Geisner
	 FIG. 2 "In an example embodiment, a gesture may be recognized as a trigger for the entry into a modification mode, where a user can modify the visual representation auto-generated by the system. For example, a gesture filter 191 may comprise information for recognizing a modification trigger gesture. If the modification trigger gesture is recognized, the application may go into a modification mode. The modification trigger gesture may vary between applications, between systems, between users, or the like. For example, the same gesture in a tennis gaming application may not be the same modification trigger gesture in a bowling game application. Consider an example modification trigger gesture that comprises a user motioning the user's right hand, presented in front of the user's body, with the pointer finger pointing upward and moving in a circular motion. The parameters set for the modification trigger gesture may be used to identify that the user's hand is in front of the user's body, the user's pointer finger is pointed in an upward motion, and identifying that the pointer finger is moving in a circular motion. Certain gestures may be identified as a request to enter into a modification mode, where if an application is currently executing, the modification mode interrupts the current state

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	of the application and enters into a modification mode. The modification mode may cause the application to pause, where the application can be resumed at the pause point when the user leaves the modification mode. Alternately, the modification mode may not result in a pause to the application, and the application may continue to execute while the user makes modifications. The data captured by the cameras 26, 28 and device 20 in the form of the skeletal model and movements associated with it may be compared to the gesture filters 191 in the gestures library 192 to identify when a user (as represented by the skeletal model) has performed one or more gestures. Thus, inputs to a filter such as filter 191 may comprise things such as joint data about a user's joint position, like angles formed by the bones that meet at the joint, RGB color data from the scene, and the rate of change of an aspect of the user. As mentioned, parameters may be set for the gesture. Outputs from a filter 191 may comprise things such as the confidence that a given gesture is being made, the speed at which a gesture motion is made, and a time at which the gesture occurs. The computing environment 12 may include a processor 195 that can process the depth image to determine what targets are in a scene, such as a user 18 or an object in the room. This can be done, for instance, by grouping together of pixels of the depth image that share a similar distance value. The image may also be parsed to produce a skeletal representation of the user, where features, such as joints and tissues that run between joints are identified. There exist skeletal mapping techniques to capture a person with a depth camera and from that determine various spots on that user's skeleton, joints of the hand, wrists, elbows, knees, nose, ankles, shoulders, and where the pelvis meets the spine. Other techniques include transforming the image into a body model representation of the person and transforming the image into a mesh model representation of the person." *See* paras. [0051]-[0054]. "In another example, the target is a human user and the system detects the user's features, such as eye color, size, and shape, hair color, type, and length, etc. The system may compare the detected features to a catalog of feature options and apply selected features to the visual representation. As described above, the system may combine features and

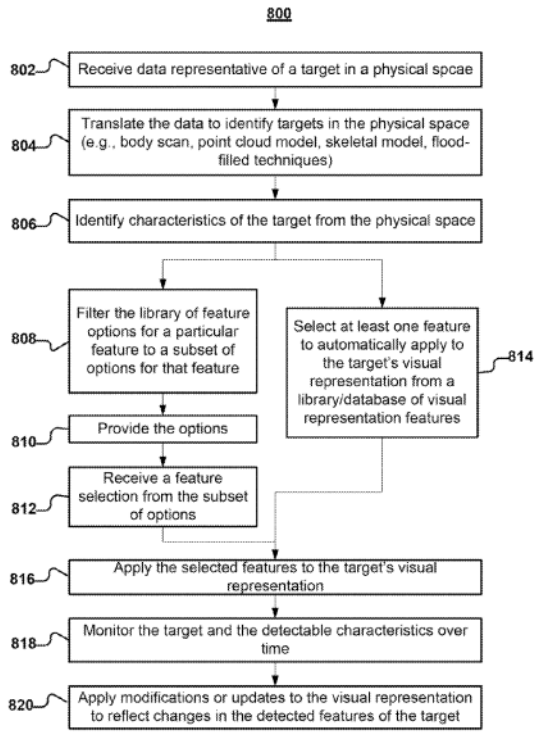
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	alter those features. For example, the features may be altered by applying a color, positioning, or scaling to the target. The features may be altered by the selection of additional features from the features library 197, such as a color, or by using image data from a snapshot of the target. For example, an application may provide a generic set of solid color pants, t-shirts, and shoe types in the features library 197. The system may select from the generic clothing features but alter the selected clothing features by applying colors to the clothing to reflect the colors of the target's clothing detected by the system." *See* para. [0062]. "The computing environment 12 may use the gestures library 192 to interpret movements of the skeletal model and to control an application based on the movements. Filters may be modular or interchangeable so that a first filter may be replaced with a second filter that has the same number and types of inputs and outputs as the first filter without altering any other aspect of the recognizer engine architecture. For instance, there may be a first filter for driving that takes as input skeletal data and outputs a confidence that the gesture associated with the filter is occurring and an angle of steering. Where one wishes to substitute this first driving filter with a second driving filter—perhaps because the second driving filter is more efficient and requires fewer processing resources—one may do so by simply replacing the first filter with the second filter so long as the second filter has those same inputs and outputs—one input of skeletal data type, and two outputs of confidence type and angle type. A filter need not have a parameter. For instance, a "user height" filter that returns the user's height may not allow for any parameters that may be tuned. An alternate "user height" filter may have tunable parameters—such as to whether to account for a user's footwear, hairstyle, headwear and posture in determining the user's height. Inputs to a filter may comprise things such as joint data about a user's joint position, like angles formed by the bones that meet at the joint, RGB color data from the scene, and the rate of change of an aspect of the user. Outputs from a filter may comprise things

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	such as the confidence that a given gesture is being made, the speed at which a gesture motion is made, and a time at which a gesture motion is made." *See* paras. [0066]-[0068]. "In one embodiment, in order for a user's motion to be used to control an application the user must first be enrolled or bound to the application. In one embodiment, each user will be asked to identify himself or herself by standing in front of the system so that depth images and/or visual images can be obtained from multiple angles for that user. For example, the user may be asked to stand in front of the camera, turn around, and make various poses while depth images and visual images are obtained. After the system obtains enough depth and/or visual images, the system will create a set of identifying data from the images that uniquely identifies the user. The system will create a unique identification and associate that unique identification with on-screen representation (e.g., avatar) or other object in the game/application. After a user is enrolled in (or bound to) the application, the system will track the motion of that user while the user is actively engaged with the application (e.g., playing the game or using the application). However, in the past, other people in the room who are not actively engaged with the application, (e.g., not bound to application, bound to application but not playing current game, or bound to application but currently not having a turn to play) do not have a way to interact with the application." *See* para. [0103]. "If a user performs a gesture and the gesture is recognized at 440, action consistent with the gesture within the shopping application is applied at 450. As discussed below, shopping applications gestures can comprise two general types of gestures: an article manipulation gesture or a transaction manipulation gesture. An article manipulation gesture may comprise, for example, any of a number of shopping consistent actions consistent with the interface presented to the user. If the user is presented a selection of virtual articles comprising clotting and an on-screen representation of themselves, article manipulation actions may comprise actions such as selecting clothes, putting on clothes, taking off clothes, adjusting clothes, changing backgrounds, changing accessories, moving room elements within a scene, placing items within a scene, placing the on-screen representation with a variety of backgrounds in particular clothing, and the like. A transaction gesture may comprise a gesture used to facilitate a transaction such as

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	movement of an article into a shopping cart, removing an article from a shopping cart, entry of financial information and the like." *See* para. [0111]. "As shown in FIG. 8, the skeletal model 808 may include one or more joints n1-n18. According to an example embodiment, each of the joints n1-n18 may enable one or more body parts defined there between to move relative to one or more other body parts. For example, a model representing a human target may include a plurality of rigid and/or deformable body parts that may be defined by one or more structural members such as "bones" with the joints n1-n18 located at the intersection of adjacent bones. The joints n1-n18 may enable various body parts associated with the bones and joints n1-n18 to move independently of each other. For example, the bone defined between the joints n7 and n11, shown in FIG. 9, corresponds to a forearm that may be moved independent of, for example, the bone defined between joints n15 and n17 that corresponds to a calf. **Each of the joints represents a place in the skeleton where the skeleton can pivot in the x, y, z directions or a place of interest on the body. Other methods for tracking can also be used. Suitable tracking technology is disclosed the teachings of U.S. patent application Ser. Nos. 12/475,308, 12/696,282, 12/641,788, and 12/575,388, cited above. FIG. 9 illustrates a user 1002 and an on-screen representation of the user 1050 provided by system 20. Through moving her body, a user 1002 may create gestures. A gesture comprises a motion or pose by a user that may be captured as image data and parsed for meaning. A user's gestures may be used for input in a general computing context. For instance, various motions of the hands or other body parts may correspond to common system wide tasks such as navigate up or down in a hierarchical list, open a file, close a file, and save a file. For instance, a user may hold his hand with the fingers pointing up and the palm facing the capture device 20. He may then close his fingers towards the palm to make a fist, and this could be a gesture that indicates that the focused window in a window-based user-interface computing environment should be closed. Gestures may also be used in a video-game-specific context, depending on the game. For instance, with

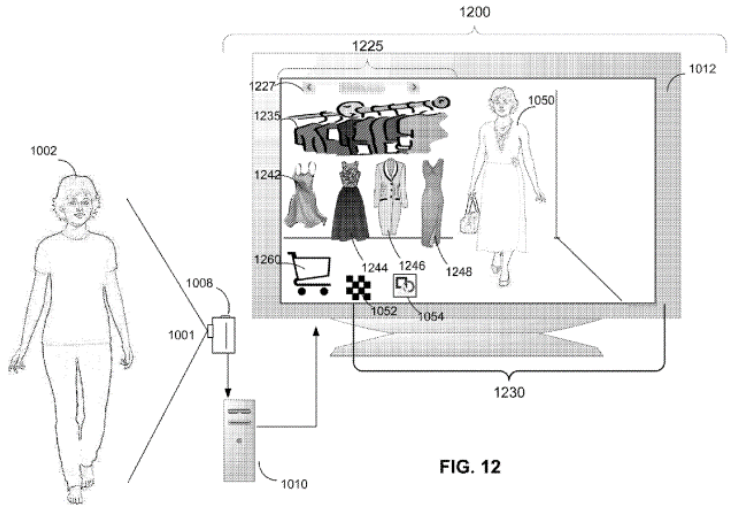
Asserted Claim of the ’109 Patent	Exemplary Citations to Geisner
	a driving game, various motions of the hands and feet may correspond to steering a vehicle in a direction, shifting gears, accelerating, and braking. Thus, a gesture may indicate a wide variety of motions that map to a displayed user representation, and in a wide variety of applications, such as video games, text editors, word processing, data management, etc.” *See* paras. [0124]-[0127].  FIG. 9 “FIGS. 9 and 10 illustrate the creation of an on screen representation 1050 of a user 1002. The techniques for generating an on-screen representation are disclosed in U.S. patent application Ser. No. 12/511,850, entitled Auto Generating a Visual Representation, filed 29 Jul. 2009, fully incorporated herein by reference. The on-screen representation may be auto-generated by the system to provide a visual representation of a target that has features resembling the detected features of the target. Alternately, the

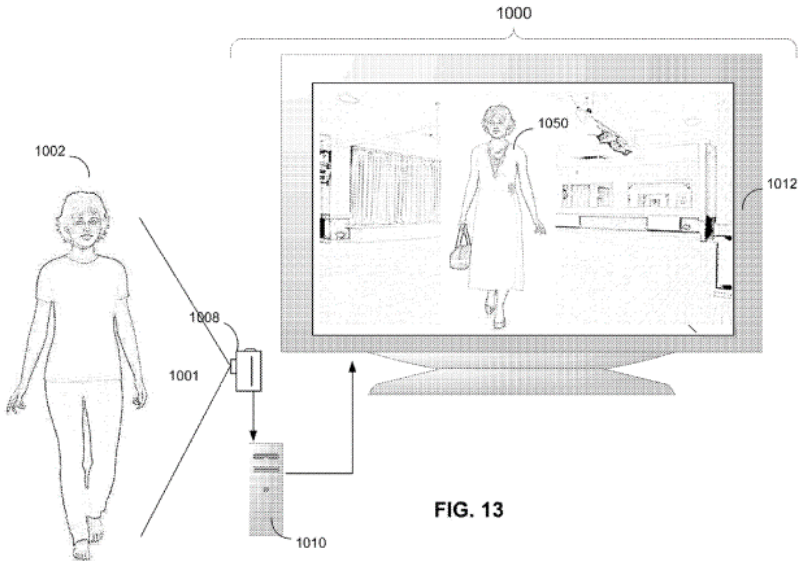
Asserted Claim of the '109 Patent	Exemplary Citations to Geisner
	system may provide a subset of selectable features from which the user may choose. The system may select the features based on the detected features of the target and apply the selections to the visual representation of the target. Thus, auto-generation techniques may remove a large amount of the effort from a user. For example, the system can make selections, on behalf of the user, and apply them to the user's visual representation. As shown in FIG. 9, the system renders a visual representation 1050 on a display 1000 that corresponds to the user 1002 in the physical space 1001. In this example, the system auto-generated the on-screen representation 1050 by detecting features of the user 1002, comparing the detected features to a library of feature options, or imaging information in an imaging library, selecting the feature options that resemble the detected features of the user 1002, and automatically applying them to the user's on-screen representation 1050. The auto-generation of the on-screen representation removes work from the user 1002 and creates an experience for the user 1002 as they are transported into the game or application experience. By tracking the model generated at step 408, system 20 can display the on-screen representation in real time and update the feature selections applied to the on-screen representation in real time. The system may track the user in the physical space over time and apply modifications or update the features applied to the on-screen representation, also in real time. For example, the system may track a user and identify that the user has removed a sweatshirt. The system may identify the user's body movements and recognize a change in the user's clothing type and color. The system may use any of the user's identified characteristics to assist in the feature selection process and/or updated the features selected from the features library and applied to the visual representation. Image data and/or depth information may be used in to identify target features. Such target features for a human target may include, for example, height and/or arm length and may be obtained based on, for example, a body scan, a skeletal model, the extent of a user 1002 on a pixel area or any other suitable process or data. Using for example, the depth values in a plurality of observed pixels that are associated with a human target and the extent of one or more aspects of the human target such as the height, the width of the

Asserted Claim of the '109 Patent	Exemplary Citations to Geisner
	head, or the width of the shoulders, or the like, the size of the human target may be determined. The camera 1008 may process the image data and use it to determine the shape, colors, and size of various parts of the user, including the user's hair, clothing, etc. The detected features may be compared to a catalog of feature options for application to a visual representation, such as the visual representation feature options in the features library 197." *See* paras. [0129]-[0132].  FIG. 10 "In another example embodiment, the system can identify characteristics of the user and use the identified characteristics to select features for the visual representation, the

Asserted Claim of the '109 Patent	Exemplary Citations to Geisner
	system may use target digitization techniques. The techniques comprise identifying surfaces, textures, and object dimensions from unorganized point clouds derived from a capture device, such as a depth sensing device. Employing target digitization may comprise surface extraction, identifying points in a point cloud, labeling surface normals, computing object properties, tracking changes in object properties over time, and increasing confidence in the object boundaries and identity as additional frames are captured. For example, a point cloud of data points related to objects in a physical space may be received or observed. The point cloud may then be analyzed to determine whether the point cloud includes an object. A collection of point clouds may be identified as an object and fused together to represent a single object. A surface of the point clouds may be extracted from the object identified. Any known technique or technique disclosed herein that provides the ability to scan a known/unknown object, scan a human, and scan background aspects in a scene (e.g., floors, walls) may be used to detect features of a target in the physical space. The scan data for each, which may include a combination of depth and RGB data, may be used to create a three-dimensional model of the object. The RGB data is applied to the corresponding area of the model. Temporal tracking, from frame to frame, can increase confidence and adapt the object data in real-time. Thus, the object properties and tracking of changes in the object properties over time may be used to reliably track objects that change in position and orientation from frame to frame in real time. The capture device captures data at interactive rates, increasing the fidelity of the data and allowing the disclosed techniques to process the raw depth data, digitize the objects in the scene, extract the surface and texture of the object, and perform any of these techniques in real-time such that the display can provide a real-time depiction of the scene." *See* paras. [0133]-[0134]. "Step 1126 illustrates a small set of possible gestures representing an action which may occur in an shopping application 180. These actions may include, for example, an action to: select article, apply article to on-screen image, remove article from avatar, add article to scene, remove article from scene, un-select article, apply background, remove article from rack, place article on rack, adjust article properties, and move object into scene.

Asserted Claim of the '109 Patent	Exemplary Citations to Geisner
	The aforementioned gestures should not be construed as limiting but are exemplary of the type of gestures a user may need in a shopping application when manipulating an article. Selecting an article may comprise a gesture indicating that that the user intends to select an article in the interface. An interface for the application may be presented in a display, as shown below at FIG. 12. Selection can be of an article in a rendered scene or in the interface selection portion of the scene. Such a gesture may comprise, for example, a motion to grab a virtual garment by moving to position the on-screen representation of the user's hand over the garment and closing one's hand. A gesture applying an article to an on-screen image may comprise moving a selected garment from a rack of hanging virtual clothes, and placing the garment on top of the on-screen representation. Conversely, a gesture may comprise removing an article. A gesture may indicate the user wishes to adjust the clothing. For example, the user may wish to raise the user's collar, roll up the user's pants, roll up the user's sleeves, or the like. Any of these types of gestures may result in the adjustment of the clothing in the interface at 1128. Alternatively, the user may wish to place themselves in a different physical background at 1128. A gesture such as selecting a background tile from the interface and applying the background tile into the user's screen will result in applying or removing a background at 1128. Any other of a number of types of actions at 1126 may result in a corresponding action 1128 within the interface." *See* paras. [0153]-[0154].

Asserted Claim of the ’109 Patent	Exemplary Citations to Geisner
	 FIG. 12

Asserted Claim of the ’109 Patent	Exemplary Citations to Geisner
	 FIG. 13 This limitation would have been obvious to a person of ordinary skill in the art based on (1) Geisner 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 Geisner
Claim 9	

Asserted Claim of the '109 Patent	Exemplary Citations to Geisner
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.	Geisner 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. "Backgrounds 1052, 1054 may comprise scanned scenes stored by the user using the capture device 20, or stock scenes provided by retailers or third parties. In one embodiment, the interface presents the user in the scene presented to the capture device. Other stored scenes may be utilized and selected by the user in the interface. Other interface elements may be provided to allow the user to change the appearance of the on-screen representation. For example, lighting controls may allow a user to change the type and position of lighting sources on a scene. Certain articles, such as lamps, may include, in metadata associated with the model, information to allow the system to generate a light source from the article to allow a user to determine how source light from the lamp will change the appearance of a scene. Each of the elements may be represented within the interface by suitable on-screen controls." *See* paras. [0159]-[0160]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Geisner 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 Geisner
Claim 11	
11[pre]. The method of claim 1, further comprising:	To the extent the preamble is limiting, Geisner expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below.

Asserted Claim of the '109 Patent	Exemplary Citations to Geisner
	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) Geisner 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,	Geisner 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]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Geisner 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.	Geisner expressly and/or inherently discloses and/or renders obvious varying resolution of the image according to the distance.. *See*, *e.g.*, disclosures below. "A graphics processing unit (GPU) 108 and a video encoder/video codec (coder/decoder) 114 form a video processing pipeline for high speed and high resolution graphics processing. Data is carried from the graphics processing unit 108 to the video encoder/video codec 114 via a bus. The video processing pipeline outputs data to an A/V (audio/video) port 140 for transmission to a television or other display. A memory controller 110 is connected to the GPU 108 to facilitate processor access to various types of memory 112, such as, but not limited to, a RAM (Random Access Memory)." *See* para. [0081].

Asserted Claim of the '109 Patent	Exemplary Citations to Geisner
	"The multimedia console 100 may be operated as a standalone system by simply connecting the system to a television or other display. In this standalone mode, the multimedia console 100 allows one or more users to interact with the system, watch movies, or listen to music. However, with the integration of broadband connectivity made available through the network interface 124 or the wireless adapter 148, the multimedia console 100 may further be operated as a participant in a larger network community. When the multimedia console 100 is powered ON, a set amount of hardware resources are reserved for system use by the multimedia console operating system. These resources may include a reservation of memory (e.g., 16 MB), CPU and GPU cycles (e.g., 5%), networking bandwidth (e.g., 8 kbs), etc. Because these resources are reserved at system boot time, the reserved resources do not exist from the application's view. In particular, the memory reservation preferably is large enough to contain the launch kernel, concurrent system applications and drivers. The CPU reservation is preferably constant such that if the reserved CPU usage is not used by the system applications, an idle thread will consume any unused cycles. With regard to the GPU reservation, lightweight messages generated by the system applications (e.g., pop ups) are displayed by using a GPU interrupt to schedule code to render popup into an overlay. The amount of memory required for an overlay depends on the overlay area size and the overlay preferably scales with screen resolution. Where a full user interface is used by the concurrent system application, it is preferable to use a resolution independent of application resolution. A scaler may be used to set this resolution such that the need to change frequency and cause a TV resynch is eliminated." *See* paras. [0088]-[0091]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Geisner 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 Geisner
	Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Exhibit A-22: Invalidity of U.S. Patent No. 8,982,109 in view of JP Patent Pub. No. 2003153263 ("Ikui")

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.

Ikui was originally filed November 19, 2001 and published on May 23, 2003, 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) and (b).

Ikui anticipates the Asserted Claims of the '109 Patent. To the extent it is found Ikui 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 Ikui does not anticipate the Asserted Claims, Ikui 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 Ikui
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, Ikui expressly and/or inherently discloses and/or renders obvious this limitation. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Ikui 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;	Ikui expressly and/or inherently discloses and/or renders obvious obtaining a digital image from a camera. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Ikui 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;	Ikui 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) Ikui 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;	Ikui 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. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Ikui 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 '109 Patent	Exemplary Citations to Ikui
	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;	Ikui 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. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Ikui 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;	Ikui 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. "In order to achieve the above object, the present invention divides one screen into a plurality of display areas and displays an image for each display area. Obtaining the subject's viewpoint position and line-of-sight direction, processing the video data to be displayed in each display area based on it, generating transmission video data with a small amount of data, transmitting this, and displaying it in each display area It is characterized by. Specifically, the distance from the viewpoint position of the subject to each display area is acquired, and the image resolution, color resolution, time resolution, and / or data compression method of video data displayed in each display area according to the distance And processing the video data with the determined image resolution, color resolution, time resolution, and / or data compression method to create transmission video data having a smaller data amount than the original video data, There is a method of transmitting and displaying in a plurality of display areas on the subject side." *See* Ikui at paras. [0005]-[0006]; *see also* [0016], [0020]. [0038], [0043], [0045].

Asserted Claim of the '109 Patent	Exemplary Citations to Ikui
	This limitation would have been obvious to a person of ordinary skill in the art based on (1) Ikui 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;	Ikui 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. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Ikui 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	Ikui 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. "2 and 3, reference numeral 201 denotes a line-of-sight vector information acquisition apparatus that measures the viewpoint position and line-of-sight direction of a subject, and is measured by a three-dimensional measuring machine such as a gyroscope or an ultrasonic sensor. Reference numeral 202 denotes a line-of-sight vector information transmitting apparatus that transmits line-of-sight vector information measured by the line-of-sight vector information acquisition apparatus 201 to a remote place where video data exists via the network 209." *See* Ikui at para. [0014]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Ikui 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 Ikui
	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.	Ikui 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 order to achieve the above object, the present invention divides one screen into a plurality of display areas and displays an image for each display area. Obtaining the subject's viewpoint position and line-of-sight direction, processing the video data to be displayed in each display area based on it, generating transmission video data with a small amount of data, transmitting this, and displaying it in each display area It is characterized by. Specifically, the distance from the viewpoint position of the subject to each display area is acquired, and the image resolution, color resolution, time resolution, and / or data compression method of video data displayed in each display area according to the distance And processing the video data with the determined image resolution, color resolution, time resolution, and / or data compression method to create transmission video data having a smaller data amount than the original video data, There is a method of transmitting and displaying in a plurality of display areas on the subject side." *See Ikui* at [0005]-[0006]; *see also* [0001], [0026], [0038], [0043]-[0047]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Ikui 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 Ikui
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.	Ikui 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. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Ikui 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 Ikui
Claim 7	
7[pre]. The method of claim 1, further comprising the steps:	To the extent the preamble is limiting, Ikui 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) Ikui 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;	Ikui expressly and/or inherently discloses and/or renders obvious obtaining a reference image. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Ikui 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 Ikui
	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;	Ikui expressly and/or inherently discloses and/or renders obvious performing registration of the digital image with the reference image. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Ikui 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.	Ikui expressly and/or inherently discloses and/or renders obvious using data obtained from the registration to generate the transformation mapping. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Ikui 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 Ikui
Claim 8	
8. The method of claim 1, further comprising applying a translation transformation to move the image within display area of the monitor.	Ikui expressly and/or inherently discloses and/or renders obvious applying a translation transformation to move the image within display area of the monitor. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Ikui 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 Ikui
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.	Ikui 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) Ikui 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 Ikui
Claim 11	
11[pre]. The method of claim 1, further comprising:	To the extent the preamble is limiting, Ikui 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) Ikui 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,	Ikui expressly and/or inherently discloses and/or renders obvious determining distance to a user appearing in the image. *See, e.g.*, disclosures below.

Asserted Claim of the '109 Patent	Exemplary Citations to Ikui
	See Claim Limitation 1[g]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Ikui 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.	Ikui expressly and/or inherently discloses and/or renders obvious varying resolution of the image according to the distance. *See, e.g.*, disclosures below. "In order to achieve the above object, the present invention divides one screen into a plurality of display areas and displays an image for each display area. Obtaining the subject's viewpoint position and line-of-sight direction, processing the video data to be displayed in each display area based on it, generating transmission video data with a small amount of data, transmitting this, and displaying it in each display area It is characterized by. Specifically, the distance from the viewpoint position of the subject to each display area is acquired, and the image resolution, color resolution, time resolution, and / or data compression method of video data displayed in each display area according to the distance And processing the video data with the determined image resolution, color resolution, time resolution, and / or data compression method to create transmission video data having a smaller data amount than the original video data, There is a method of transmitting and displaying in a plurality of display areas on the subject side." *See* Ikui at [0005]-[0006]; *see also* [0001], [0026], [0038], [0043]-[0047]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Ikui 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 Ikui
	Defendants’ Invalidity Contentions and Defendants’ other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

Exhibit A-23: Invalidity of U.S. Patent No. 8,982,109 in view of U.S. Patent No. 9,122,320 ("Rowles")

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.

Rowles was originally filed February 16, 2011 and issued on September 1, 2015, 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).

Rowles anticipates the Asserted Claims of the '109 Patent. To the extent it is found Rowles 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 Rowles does not anticipate the Asserted Claims, Rowles 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 Rowles
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, Rowles expressly and/or inherently discloses and/or renders obvious this limitation. *See, e.g.*, disclosures below. "In one embodiment of the invention, a digital mirror is disclosed including an enclosure; a display device mounted in the enclosure to display images at a front side of the enclosure; an image capture device mounted in the enclosure adjacent the display device to reduce parallax error; lights mounted in the enclosure adjacent the display device; and a light diffuser mounted to the enclosure around the display device over the one or more lights. The one or more lights provide lighting in front of the display device and the image capture device captures images in the field of view in the front. The light diffuser diffuses and softens the light emitted by the one or more lights. Alternatively, the image capture device may be mounted on an articulated arm that may be used to capture and display various angles in the filed of view of the digital mirror." *See* Abstract. "The embodiments of the invention generally relate to digital cameras, digital picture frames, and mirrors." *See* 1:24-25. "Typical optical mirrors composed of a reflective material and potentially, encapsulated in glass, have characteristics that may not satisfy a user's requirements. A digital mirror has the ability to improve the user's experience in providing extended views of the user's features. The digital mirror also has the ability to enhance displayed images through the using imaging electronic components and software. Additionally, the combination of a plurality of lighting sources with selectable intensity, a plurality of camera choices and mounting applications may also enhance the user's experience." *See* 3:37-46. "A self-supported digital mirror (DM) may be used as a vanity mirror. It may include means for capturing side views for left, right and center viewing. The angle of the display of the digital mirror may be adjusted by a stand. A user interface further enables the user to select lighting, images to be viewed, and mirrored images (transposed from left to right) or true images (non transposed).

Asserted Claim of the ’109 Patent	Exemplary Citations to Rowles
	In other embodiments of the invention, multiple cameras may extend to the left and right of the user to capture left, right, and side images for displaying on a single center display. The additional cameras can be moved to capture or whatever angles the user desires to view. The user simply may select the desired view through a menu of a graphics user interface or buttons of an electromechanical user interface. Multiple images of different views may be concurrently displayed in a mosaic arrangement on a display. This is different with an optical mirror. The enclosure houses together one or more of the lighting capabilities and arrangements, the camera views, and the display device software executed by a process may further enhance the display of images on a digital mirror. The ability to alter digital images is a common technique used in digital photography. Software may interactive with the elemental components such that lighting can be automatically dimmed or made brighter depending on the user's preference settings, such as an auto brightness feature. The enclosure may house one or more lighting sources such as incandescent lights, florescent lights, compact florescent lights, or LED (light emitting diode) devices, may be used singularly or in any combination in order to facilitate the user's desired lighting. Light sources have well defined characteristics such as incandescent lights sources may be seen as having a yellow tint where as florescent lights may be seen to have a bluish tint. Lighting to display appropriate shades of images provided by the digital mirror may also be responsive to the user's movement and ambient lighting conditions given the time of day.” *See* 3:61-4:30. “The ability to alter digital images is a common technique used in digital photography. Software may interactive with the elemental components such that lighting can be automatically dimmed or made brighter depending on the user's preference settings, such as an auto brightness feature. The enclosure may house one or more lighting sources such as incandescent lights, florescent lights, compact florescent lights, or LED (light emitting diode) devices, may be used singularly or in any combination in order to facilitate the user's desired lighting. Light sources have well defined characteristics such as incandescent lights sources may be seen as having a yellow tint where as florescent lights may be seen to have a bluish tint. Lighting to display appropriate shades of images

Asserted Claim of the ’109 Patent	Exemplary Citations to Rowles
	provided by the digital mirror may also be responsive to the user's movement and ambient lighting conditions given the time of day. In another embodiment of the invention a portable, battery powered compact digital mirror would be very beneficial for travel or where AC powered accessories are not easily supported. In this case the camera, the lighting sources, and display device technology are selected to support battery-powered operation. Sensors may be used to prevent excessive battery-power drain and increase viewing time by adjusting the lighting intensity in response to the reflective light and ambient light. The cameras of each digital mirror may act as the light sensor for each. Sensors may adjust lighting intensity and color depending on the users preferred settings for a particular ambient environment. For example, a compact version of the digital mirror may be used in a dark setting. In this case a sensor setting may be used to prevent a bright display that may be distracting. The digital mirror also provides the ability to view a true non-transposed image of a user. Typical optical mirrors provide a transposed or mirrored image to the viewer such that the left side of an object/user is transposed to the right side of the image and the right side of an object/user is transposed to the left side of the image. A digital mirror can display either view depending on the user's selection through a GUI or an electromechanical user interface. Digital images can also be enhanced through software to change the user's appearance, such as remove wrinkles or age spots or any other variety of commonly undesired user appearance features. Digital imaging software may also manipulate the user's image to add features to the user's image. In another embodiment of the invention, the camera may be detachable or separate from the display. The camera may communicate wirelessly through a common wireless protocol, such as IEEE 802.11. The ability to eliminate wires between the camera and display provides additional flexibility in locating the camera. For example, a detachable camera may be positioned behind the user's head. Additionally, left and right side wired/wireless cameras may be used to communicate with the display base to produce a

Asserted Claim of the ’109 Patent	Exemplary Citations to Rowles
	plurality of images for the user to select from. Each camera may have its own lighting sources within its enclosure. Each camera may also provide a light sensor capability to sense the ambient light, the reflected light, and auto focus the camera's lenses, if any, in order to produce the user's desired displayed views. The digital mirror may also be used to store or archive pictures for future comparisons. The user may also select a number of stored images in the digital mirror to be shown in a continuous manner similar to a slide show. The growth or development of a user may be displayed by capturing facial changes over the years. The captured image frames may be correlated an displayed as a movie or video. The camera may be used to take individual pictures, single image frame, or record video (a plurality of image frames over a time period) depending on the amount of storage available. Subsequently, the user may elect to show pictures for the purpose of décor, such as a digital picture frame. A wireless interface allows a user to store pictures and or movies on a remote computer system and transmit them to the digital mirror in the form of a stream file. The digital mirror may also send pictures back to the remote computer system for archival and or further editing or manipulation. A built-in image signal processor allows the captured images on the digital mirror to be manipulated. This allows the user to enhance their characteristics, such as to reduce wrinkles or remove skin blemishes for example. Selective control of the lighting intensity can also improve the image quality captured by the digital mirror.” *See* 4:15-5:29. “Digital Mirror System A digital mirror is an apparatus that captures and displays an image to a user through the use of a digital electronic system. The digital mirror includes an image capture device and a display device on the same side to display the captured image to a user. A digital mirror further includes a user interface and an internal electronic control and image

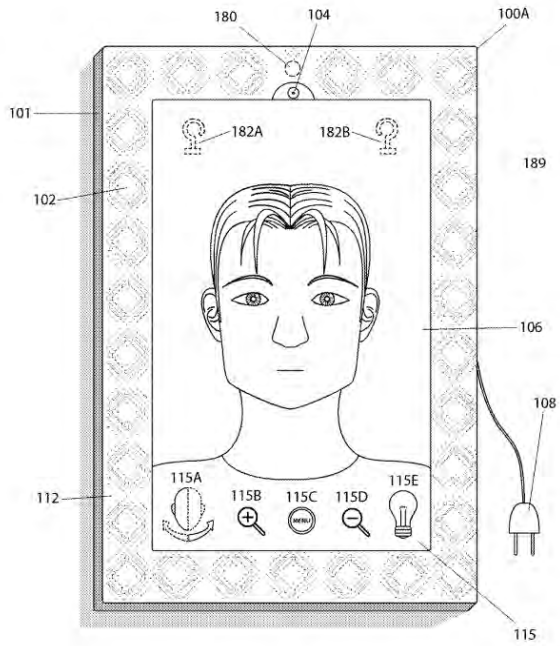
Asserted Claim of the ’109 Patent	Exemplary Citations to Rowles
	processing system to control the camera and the display device and process captured images for display on the display device. A digital mirror has a number of advantages over an optical mirror. A digital mirror provides a user with an improved mirror viewing experience compared to a conventional reflective optical mirror through the capabilities of digital imaging. A traditional optical mirror is limited by the ambient environment such as physical location, lighting, and viewing angle of the user. A poorly lit environment can significantly influence the image seen by a user. The user is also limited by their own vision being able to see only in a direct line of sight. A traditional optical mirror is limited in that it can only display to the user a mirrored or reflected image. A digital mirror can overcome one or more of these limitations. The influence of asymmetry in humans plays a large role in how we view ourselves and how the rest of the world views us. A digital mirror has an ability to show the user a true life image of how others see them, rather than a mirrored image. In one embodiment of the invention, a freeze frame capture or video replay in a true view mode is provided so that users may study themselves without having to remain fixed in one position. A digital mirror enables the captured image input to be separated from the displayed output. Because the image capture device (e.g., a camera) and the display device are separate devices, the image capture device may be positioned so that the user's desired view may be displayed without changing the users position. Furthermore, users are not limited to direct line of sight viewing or using multiple mirrors in order to view themselves from different perspectives. The camera or image capture device may include lighting proximately mounted to illuminate the subject. In order to secure the position of the camera without the user holding it, the camera may include a clamp or stand coupled to a flexible arm or an articulating arm. The digital mirror includes an image processor that allows the manipulation of captured images for display on the display device. The digital mirror may include a digital zoom to zoom in and zoom out of the captured image. The image processor can further adjust

Asserted Claim of the ’109 Patent	Exemplary Citations to Rowles
	the image displayed by compensating for poor lighting, modifying the image displayed so that a user can make themselves look better or more realistic, or perform any number of digital modifications that are possible in the digital imaging field with an image processor. The digital mirror may provide substantially all the lighting a user needs to capture images. There is no need to adjust the environment to a digital mirror. The digital mirror can adapt to the user's environment. The digital mirror, along with a detachable camera if so equipped, includes or more light sources to illuminate the user within expected distances of use. Exposure and gain of the image capture device can be adjusted to improve image capture and or video displayed to the user. The digital mirror can store captured images to separate them from the image being displayed by the display device. A user can selectively freeze an image or replay a stored image to see themselves as they were in the past. Users no longer need to hold a position or expression, perform a motion over and over, or hold their eyes open to see themselves as the digital mirror can capture images for later display when a user's eyes are closed. A digital camera, also referred to as an image capture device, may provide enhanced optics to capture images otherwise not seen by unaided eyes. The image capture device may include an optical lens or a combination of optical lenses with various properties such as: a telephoto lens for a closer view, a wide angle lens to allow a wider view, or an optical zoom lens to provide both. Utilizing a telephoto lens, an optical zoom view is possible without users having to readjust their face closer to the digital mirror. The optical zoom lens may optically zoom in and out on the user to select a frame of for captured images for display on the display device of the digital mirror. A wide-angle lens provides a wide view that can be displayed without the user moving away from the device. The camera may include an auto-focus system to provide sharpness and or resolution, regardless of where the user is positioned relative to the device.

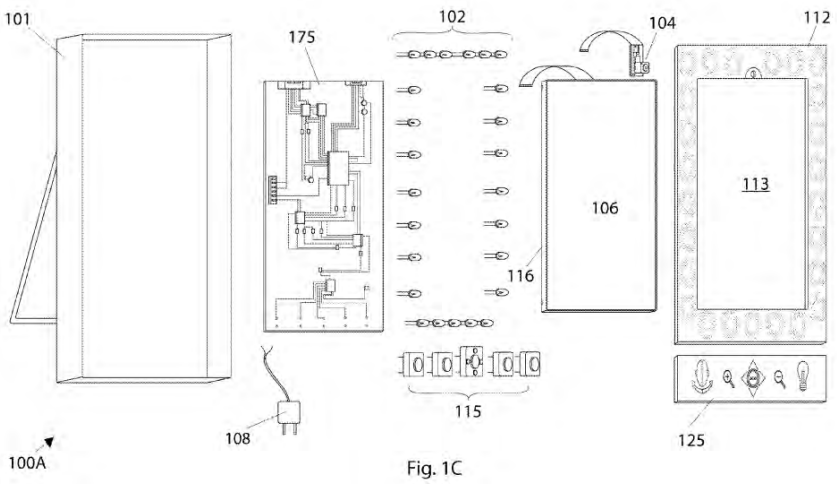
Asserted Claim of the '109 Patent	Exemplary Citations to Rowles
	The digital mirror is not limited to displaying only one full frame perspective view. Multiple cameras of a digital mirror can concurrently capture more than one perspective view of the user for display on a display device. The additional captured views can provide a more complete view of the user and or their surroundings. Alternatively, additional captured views may be used to provide a side-by-side perspective comparison. The digital camera can capture images for display full frame, side-by-side, picture in picture, or in a mosaic on the same display or on separate displays. With an optical mirror, the user previously had to move the mirror or position their own body in order to see a desired viewing angle. With multiple cameras, a user can capture different perspective views all at once. A digital mirror can displace optical mirrors as a decoration in a home or office environment. Because the digital mirror provides its own illumination, it has the ability to capture and display an image, even in poor lighting conditions. The digital mirror can be used in poorly lit rooms within the home, a visor mirror in automobiles at night, or in a plurality of environments in its portable compact version." *See* 5:31-7:3. "Referring now to FIG. 1A, a first digital mirror 100A is illustrated that is wall mountable. The digital mirror 100A includes an enclosure 101 with at least one mounting device, a hole 180 or hooks 182A-182B in its backside, so that the digital mirror can be mounted to a wall 189. The digital mirror 100A further includes one or more selective light sources 102, an image capture device 104 (also referred to as a camera), a display device 106, a light diffuser 112, a user interface 115, and an image processing and control system (see the control systems 600A-600B illustrated in FIGS. 6A-6B) mounted in or to the enclosure 101." *See* 7:4-14. "The image capture device 104 may be an OMNIVISION™ OV3642 three megapixel CAMERACHIP™ sensor with a fixed focal length lens in one embodiment of the invention, for example. In this case, a digital zoom may be used to zoom in and/or zoom out on a portion of an image. Alternatively, a camera module with an optical zoom may be used that mechanically moves lenses in a linear manner back and forth, such as commonly found in point and shoot digital cameras, or a camera module with a more

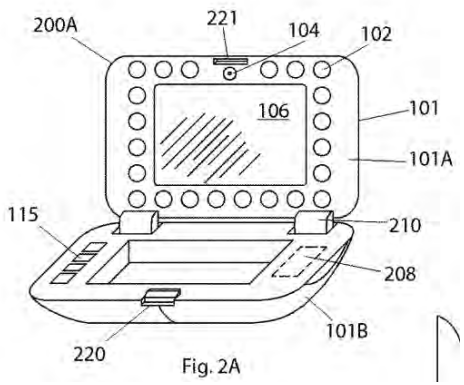
Asserted Claim of the '109 Patent	Exemplary Citations to Rowles
	compact zoom may be used such as shown and described in U.S. Patent Application Publication 2006/0216018 filed by Jen Tsorng Chang on Mar. 20, 2006, incorporated herein by reference, for example. The display device 106 may be a liquid crystal display (LCD) device or an organic light emitting diode (OLED) display device. The display device 106 provides the viewing medium for the user to observe one or more desired images captured by the camera 104. Surrounding the display device 106 is the selective light sources 102 that may be one or more of light emitting diodes (LED), incandescent, florescent, or any combination of light source that can provide light and illuminate a user. The lighting provided by the light sources 102 of the digital mirror may be responsive to the environment (e.g., ambient lighting) and one or more user preferred settings (e.g., automatic light sensing, manual light control) that are stored and provided to the digital image processing control electronics." *See* 7:20-45. "In FIG. 1A, the camera 104 can be located just above the display device 106 near a notched out area of the selective lighting 102 and light diffuser 112. To minimize parallax and ensure the user can obtain the desired angle of view, the camera 104 is mounted as close as possible to the display device or under/over the display device. For example, the camera 104 may be centered within the display device 106 in order to minimize parallax. The camera 104 may also be mounted over display device 106, such as shown in FIGS. 3E-3F for example. Alternatively, the camera 104 may be mounted under the display device, such as shown in FIG. 3G for example. Digital imaging software may be used to compensate for the pixels in the display device 106 that are covered or interrupted by the camera. The number of pixels covered by the camera may be determined from the size of the camera and depth of field required for the digital mirror 100A. The digital mirror 100A further includes a touchscreen user interface (UI) 115 mounted over the display device 106. The touchscreen UI 115 provides the user the ability to select the preferred image from a user interface menu. The touchscreen UI 115 may use capacitive sensing, surface acoustic wave (SAW), or resistive touchscreen technology.

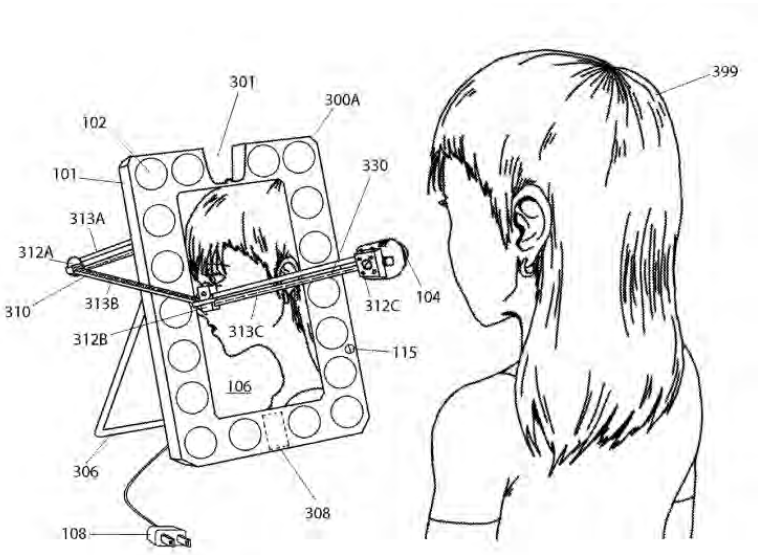
Asserted Claim of the ’109 Patent	Exemplary Citations to Rowles
	The user interface 115 may include a view mode button 115A, a zoom in button 115B to magnify a portion of the image, a menu selector button 115C, a zoom out button 115D to demagnify a portion of the image, and a light source dimmer/brightness button 115E to manually adjust the light intensity. The view mode button 115A allows a user to select between a true view mode or a mirror view mode and the display of images as either true images or mirrored images, respectively. The menu selector button 115C initiates a menu to be displayed on the display device 106 from which a user can select different control functions, such as camera control functions, display control functions, lighting control functions, and power control functions. A user may pan the image through the touch screen user interface as well. A power on/off switch/button may be included as part of the interface. Alternatively, a sensor may be used to automatically power on and off the digital mirror. While the user interface 115 may be a touchscreen UI as described, other types of user interfaces may be used with a digital mirror such as a gesture recognition user interface, a voice recognition user interface (e.g., microphone, voice recognizer/decoder, speaker to question/acknowledge), an electro-mechanical user interface (e.g., buttons, switches, etc.), or a graphical user interface with a pointer, such as a mouse or stylus.” 7:65-8:43

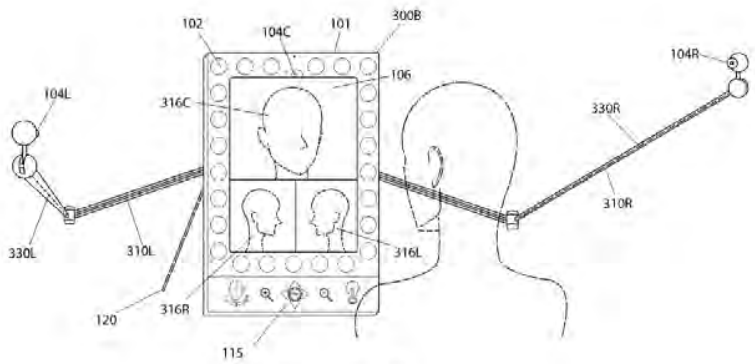
Asserted Claim of the ’109 Patent	Exemplary Citations to Rowles
	 Fig. 1A “Referring now to FIG. 1B, a second digital mirror 100B is illustrated that stands up and is self-supported upon a vanity or desktop surface. The digital mirror 100B receives AC power for the lighting, the digital imaging electronics, and the display through the AC power cord 108. The digital mirror 100B includes an enclosure 101 that has a pivotal stand 120. The pivotal stand 120 stands the digital mirror up upon a surface. The pivotal stand 120 can pivot to adjust its angle with the enclosure to provide flexibility in adjusting the angle and height of the mirror to the user's position. The display device 106 is mounted in the enclosure 101. The display device 106 may be an LCD display, a plasma display, an OLED display, or any other type of image display medium.

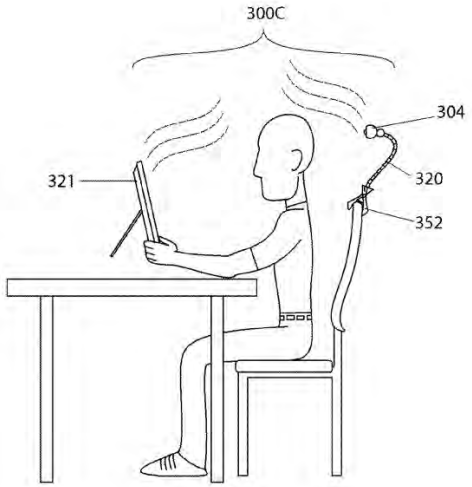
Asserted Claim of the '109 Patent	Exemplary Citations to Rowles
	The camera 104 is located near the top and in front of the display to minimize parallax. The digital mirror 100B includes light diffuser 112 to scatter the light from the device light source 102 surrounding the display device 106. The enclosure 101 houses the display device 106." *See* 8:53-9:3. "Referring now to FIG. 1C, an exploded view of a digital mirror is shown including an enclosure 101 with a pivotal stand 120, an electronics controller board 175 that has circuits and components mounted on a printed circuit board (PCB), one or more light sources 102 to provide lighting, the user interface 115 buttons that control the image display and user menu, a device display 106, and a light diffuser 112 with opening 113. The electronics controller board 175 is mounted in the enclosure under the display device 106. One or more of the components and circuits of the imaging control systems shown in FIGS. 6A-6B and described herein may be mounted on the electronics controller board 175. The display device 106 is an LCD display with LCD backlighting 116. The image capture device 104 is shown separate from the enclosure. The display device 106 and camera or image capture device 104 are connected to the electronics board 175 via ribbon cable. Covering the enclosure is the light diffuser 112 with an opening 113. The light diffuser 112 is mounted over light source 102. The user interface bezel 125 includes icons that mount over and protect the user interface buttons 115." *See* 9:18-38.

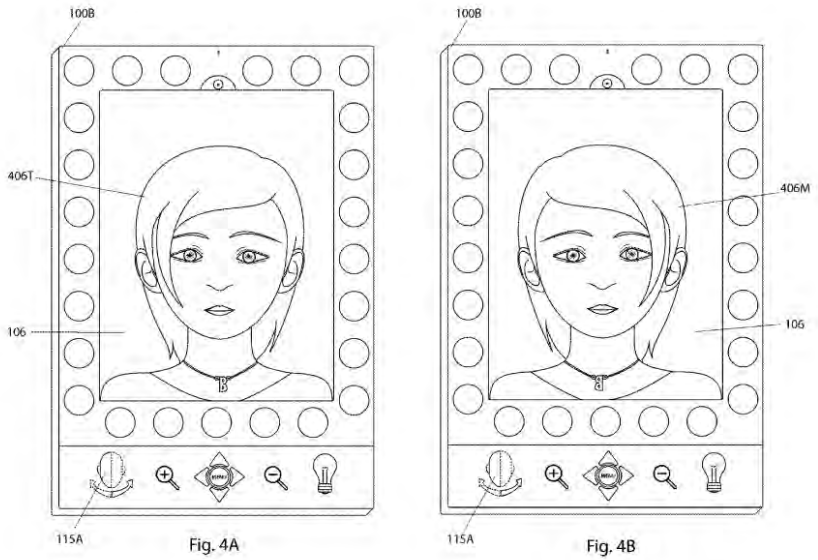
Asserted Claim of the ’109 Patent	Exemplary Citations to Rowles
	 Fig. 1C “Referring now to FIG. 2A, a compact portable digital mirror 200A is illustrated. The compact portable digital mirror 200A is powered by a direct current (DC) power source provided by one or more batteries 208 mounted in a second enclosure half 101B of the enclosure 101. The enclosure 101 includes a first enclosure half 101 and the second enclosure half 101B pivotally coupled together by a hinge 210 like a clamshell. The compact portable digital mirror 200A further includes the enclosure 101, a display device 106 mounted in the first enclosure half 101A, one or more light sources mounted in the first enclosure half 101A around the display device; a camera 140 (also referred to as an image capture device) mounted in the first enclosure half adjacent the display device 106; and a user interface 115 mounted in the enclosure. In one embodiment of the invention, the display device 106 is a liquid crystal display (LCD device and the one or more light sources are light emitting diodes (LEDs). The camera 104 is located near the top of the first enclosure half 101A to be in the field of view of a user looking into the display device. The enclosure 101 includes a hinge 210 coupled to the upper and lower half of the enclosure to allow it to pivot open and

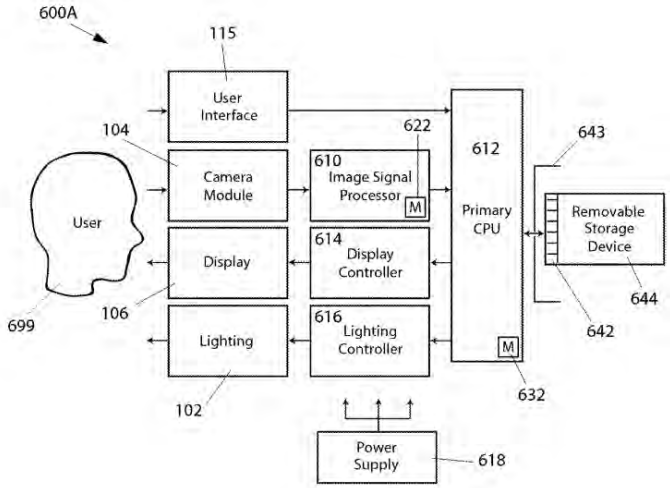
Asserted Claim of the '109 Patent	Exemplary Citations to Rowles
	closed. The first enclosure half 101A includes a catch 221 and the second enclosure half 101B includes a latch 220 to receive the catch 221. When engaged, the latch and catch releasably keep the two enclosure halves 101A-101B pivotally coupled together when the digital mirror is not in use. The user interface 115 for the portable digital mirror 200A may be a single electro-mechanical button that is responsive to the number of times the button is toggled. For example, depressing the button in rapid succession three times may execute a change in the rotation of the view angle. Alternatively, holding the button down may increase the LED lighting 102 brightness to a peak illumination and then start to decrease the brightness. Once the desired level of brightness is achieved, the user can let go of the button." *See* 9:43-10:12.  Fig. 2A "Referring now to FIG. 3A, a digital mirror 300A is now illustrated capturing an image of a user 399 that is displayed on the display device 106. The digital mirror 300A is a rechargeable, self standing digital mirror including a pivotal stand 306 and rechargeable batteries 308. The pivotal stand 306 is pivotally coupled to a back side of the enclosure 101 to support the digital mirror on surface.

Asserted Claim of the '109 Patent	Exemplary Citations to Rowles
	The digital mirror 300A further includes a detachable camera 104 that is coupled to the enclosure 101 by an articulating arm 310. The camera 104 is mounted at the distal end of the arm 310. The proximal end of the arm 310 is coupled to the enclosure 101. One or more lights 102 that may be mounted adjacent the camera 104 to provide lighting in front of the digital camera 104 to facilitate the capture of images, such as shown by FIG. 3D. A camera cable 330 may couple the camera 104 to the underlying image processing system (see FIG. 6A) to provide power and control signals and receive pixel data for each image frame captured. Alternatively, wireless transmitter/receivers may be used to send the captured images to the underlying image processing system (see FIG. 6B) mounted in the enclosure 101." *See* 10:53-11:6.  Fig. 3A "Referring now to FIG. 3B, a digital mirror 300B is illustrated that includes a plurality of cameras—a left camera 104L, a center camera 140C, and a right camera 104R. The

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	digital mirror 300B is self-supporting including an optional stand 120 and/or means to be wall mounted (e.g. hole 180 or hooks 182A-182B shown in FIG. 1A) so that it can capture images hands-free, without the user having to hold any camera. One or more lights 102 may be mounted adjacent each of the left camera 104L and the right camera 104R, such as shown by FIG. 3D, to provide lighting in front of each and facilitate the capture of images. One or more lights 102 may also be mounted around the display device 106 to provide lighting in front of the display device to facilitate the capture of images." *See* 11:44-57.  Fig. 3B "Referring now to FIG. 3C, a wireless digital mirror 300C is illustrated. The wireless digital mirror 300C has a wireless digital mirror base 321 and the wireless detachable camera 304. The wireless digital camera 304 may be tethered to the wireless digital mirror base 321 through a wireless protocol such as the common I.E.E.E. 802.11 industry standard. This allows the detachable camera to be placed anywhere without being coupled to the enclosure 101 by an arm. However, the camera 304 may connect to a flexible arm 320 with a stand or clamp 352 to couple to and support the camera above a

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	surface. A user can position the camera 304 when supported by the clamp/stand 352 for a desired viewing angle. The wireless digital mirror base 321 may communicate wirelessly with a remote computer system to upload captured images through a similar wireless protocol. Pictures and/or video may be transmitted to/or received from the remote computer system by the wireless digital mirror base 321. The wireless digital mirror base 321 may then be used as a picture frame so that pictures and or video may be displayed at the users discretion. The digital mirror may serve a dual purpose; one for viewing oneself, one of a digital picture frame, and one for saved pictures." *See* 12:56-13:10.  Fig. 3C "Referring now to FIG. 4A, in response to true view mode being selected through the view mode selector 115A of the user interface, a true image 406T is displayed by the display device 106 of the digital mirror 100B. A conventional optical mirror does not

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	display the true image 406T if a user stands in front of the optical mirror. The letter B on the necklace in the true image 406T has a proper orientation. FIG. 4B illustrates a mirrored image 406M being displayed in response to the mirror view mode being selected by the user interface view mode selector 115A. A conventional optical mirror may display an image similar to the mirrored image 406M." *See* 14:6-17.  "Referring now to FIG. 6A, a first block diagram an image processing and control system 600A for the digital mirrors is shown. FIG. 6A illustrates a user 699 in front of the camera module 104 to have his/her image captured and displayed by the display device 106 after the captured images have undergone further processing by the image processing and control system 600A. The block diagram shown in FIG. 6A illustrate basic data flow in the system by arrows illustrated between the blocks. The image

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	processing and control system 600A includes one or more of the user interface 115, the lighting sources 102 coupled to a lighting controller 616, an image signal processor 610 coupled to the camera module 104, the display controller 614 coupled to the display device 106, a storage device 644, a power supply 618, and a primary central processing unit (CPU) 612 coupled together as shown." *See* 14:61-15:8.  Fig. 6A This limitation would have been obvious to a person of ordinary skill in the art based on (1) Rowles 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

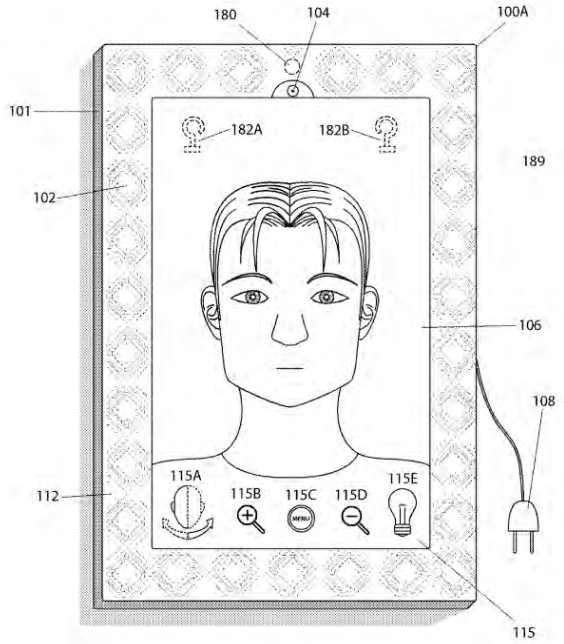
Asserted Claim of the '109 Patent	Exemplary Citations to Rowles
1[a]. obtaining a digital image from a camera;	Rowles expressly and/or inherently discloses and/or renders obvious obtaining a digital image from a camera. *See, e.g.*, disclosures below. "In one embodiment of the invention, a digital mirror is disclosed including an enclosure; a display device mounted in the enclosure to display images at a front side of the enclosure; an image capture device mounted in the enclosure adjacent the display device to reduce parallax error; lights mounted in the enclosure adjacent the display device; and a light diffuser mounted to the enclosure around the display device over the one or more lights. The one or more lights provide lighting in front of the display device and the image capture device captures images in the field of view in the front. The light diffuser diffuses and softens the light emitted by the one or more lights. Alternatively, the image capture device may be mounted on an articulated arm that may be used to capture and display various angles in the filed of view of the digital mirror." *See* Abstract. "The embodiments of the invention generally relate to digital cameras, digital picture frames, and mirrors." *See* 1:24-25. "Typical optical mirrors composed of a reflective material and potentially, encapsulated in glass, have characteristics that may not satisfy a user's requirements. A digital mirror has the ability to improve the user's experience in providing extended views of the user's features. The digital mirror also has the ability to enhance displayed images through the using imaging electronic components and software. Additionally, the combination of a plurality of lighting sources with selectable intensity, a plurality of camera choices and mounting applications may also enhance the user's experience." *See* 3:37-46. "The enclosure may also be integral in how the digital mirror may be configured to be compatible with the user's environment. The ability for a digital mirror to either be a focal point for the user's environment or an accessory to the user's environment may determine the style of the enclosure and thus the display size, lighting, number and size of camera as well as the resolution and focus of the camera sensor." *See* 3:54-60.

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	“In other embodiments of the invention, multiple cameras may extend to the left and right of the user to capture left, right, and side images for displaying on a single center display. The additional cameras can be moved to capture or whatever angles the user desires to view. The user simply may select the desired view through a menu of a graphics user interface or buttons of an electromechanical user interface. Multiple images of different views may be concurrently displayed in a mosaic arrangement on a display. This is different with an optical mirror. The enclosure houses together one or more of the lighting capabilities and arrangements, the camera views, and the display device software executed by a process may further enhance the display of images on a digital mirror.” *See* 4:1-14. “Sensors may be used to prevent excessive battery-power drain and increase viewing time by adjusting the lighting intensity in response to the reflective light and ambient light. The cameras of each digital mirror may act as the light sensor for each. Sensors may adjust lighting intensity and color depending on the users preferred settings for a particular ambient environment. For example, a compact version of the digital mirror may be used in a dark setting. In this case a sensor setting may be used to prevent a bright display that may be distracting.” *See* 4:37-46. “In another embodiment of the invention, the camera may be detachable or separate from the display. The camera may communicate wirelessly through a common wireless protocol, such as IEEE 802.11. The ability to eliminate wires between the camera and display provides additional flexibility in locating the camera. For example, a detachable camera may be positioned behind the user's head. Additionally, left and right side wired/wireless cameras may be used to communicate with the display base to produce a plurality of images for the user to select from. Each camera may have its own lighting sources within its enclosure. Each camera may also provide a light sensor capability to sense the ambient light, the reflected light, and auto focus the camera's lenses, if any, in order to produce the user's desired displayed views. The digital mirror may also be used to store or archive pictures for future comparisons. The user may also select a number of stored images in the digital mirror to be shown in

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	a continuous manner similar to a slide show. The growth or development of a user may be displayed by capturing facial changes over the years. The captured image frames may be correlated an displayed as a movie or video. The camera may be used to take individual pictures, single image frame, or record video (a plurality of image frames over a time period) depending on the amount of storage available. Subsequently, the user may elect to show pictures for the purpose of décor, such as a digital picture frame." *See* 4:60-5:18. "A digital mirror is an apparatus that captures and displays an image to a user through the use of a digital electronic system. The digital mirror includes an image capture device and a display device on the same side to display the captured image to a user. A digital mirror further includes a user interface and an internal electronic control and image processing system to control the camera and the display device and process captured images for display on the display device." *See* 5:33-40. "A digital mirror enables the captured image input to be separated from the displayed output. Because the image capture device (e.g., a camera) and the display device are separate devices, the image capture device may be positioned so that the user's desired view may be displayed without changing the users position. Furthermore, users are not limited to direct line of sight viewing or using multiple mirrors in order to view themselves from different perspectives. The camera or image capture device may include lighting proximately mounted to illuminate the subject. In order to secure the position of the camera without the user holding it, the camera may include a clamp or stand coupled to a flexible arm or an articulating arm." *See* 5:61-6:6. "A digital camera, also referred to as an image capture device, may provide enhanced optics to capture images otherwise not seen by unaided eyes. The image capture device may include an optical lens or a combination of optical lenses with various properties such as: a telephoto lens for a closer view, a wide angle lens to allow a wider view, or an optical zoom lens to provide both. Utilizing a telephoto lens, an optical zoom view is possible without users having to readjust their face closer to the digital mirror. The

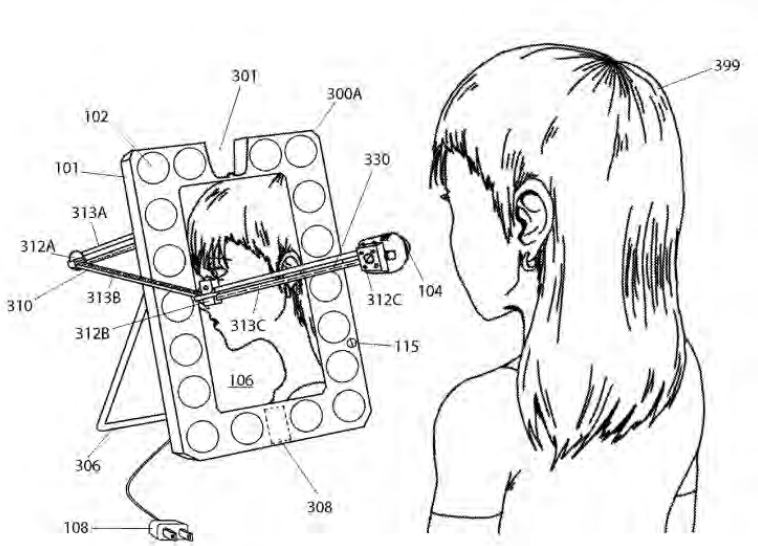
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	optical zoom lens may optically zoom in and out on the user to select a frame of for captured images for display on the display device of the digital mirror." *See* 6:33-44. "The digital mirror is not limited to displaying only one full frame perspective view. Multiple cameras of a digital mirror can concurrently capture more than one perspective view of the user for display on a display device. The additional captured views can provide a more complete view of the user and or their surroundings. Alternatively, additional captured views may be used to provide a side-by-side perspective comparison. The digital camera can capture images for display full frame, side-by-side, picture in picture, or in a mosaic on the same display or on separate displays. With an optical mirror, the user previously had to move the mirror or position their own body in order to see a desired viewing angle. With multiple cameras, a user can capture different perspective views all at once." *See* 6:50-63. "Referring now to FIG. 1A, a first digital mirror 100A is illustrated that is wall mountable. The digital mirror 100A includes an enclosure 101 with at least one mounting device, a hole 180 or hooks 182A-182B in its backside, so that the digital mirror can be mounted to a wall 189. The digital mirror 100A further includes one or more selective light sources 102, an image capture device 104 (also referred to as a camera), a display device 106, a light diffuser 112, a user interface 115, and an image processing and control system (see the control systems 600A-600B illustrated in FIGS. 6A-6B) mounted in or to the enclosure 101. The digital mirror 100A may further include an alternating current (AC) power cord 108 to receive power from an AC power source. The alternating current (AC) power is provided for the lights, camera and imaging electronics through the AC power cord 108. The image capture device 104 may be an OMNIVISION™ OV3642 three megapixel CAMERACHIP™ sensor with a fixed focal length lens in one embodiment of the invention, for example. In this case, a digital zoom may be used to zoom in and/or zoom out on a portion of an image. Alternatively, a camera module with an optical zoom may be used that mechanically moves lenses in a linear manner back and forth, such as

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	commonly found in point and shoot digital cameras, or a camera module with a more compact zoom may be used such as shown and described in U.S. Patent Application Publication 2006/0216018 filed by Jen Tsorng Chang on Mar. 20, 2006, incorporated herein by reference, for example. The display device 106 may be a liquid crystal display (LCD) device or an organic light emitting diode (OLED) display device. The display device 106 provides the viewing medium for the user to observe one or more desired images captured by the camera 104. Surrounding the display device 106 is the selective light sources 102 that may be one or more of light emitting diodes (LED), incandescent, florescent, or any combination of light source that can provide light and illuminate a user. The lighting provided by the light sources 102 of the digital mirror may be responsive to the environment (e.g., ambient lighting) and one or more user preferred settings (e.g., automatic light sensing, manual light control) that are stored and provided to the digital image processing control electronics. The light diffuser 112 is mounted to the enclosure to cover over the light sources 102. The light diffuser 112 diffuses or scatters the light generated by the light sources 102 in order to produce a softer light for the object or user in the target viewing area. The light diffuser 112 minimizes glare and other lighting aberrations that may tend to wash out or distort images captured by the image capture device 104 (also referred to as a camera). The light diffuser 112 may be shaped similar to the enclosure 101 and has an opening 113 to be mounted around the shape of the display device 106. In one embodiment of the invention, the enclosure and the display device are rectangular in shape such that the light diffuser 112 has a frame shape with a rectangular opening 113 (see FIG. 1C). In another embodiment of the invention, the enclosure and display device are oval shaped such that the light diffuser 112 also has an oval frame shape with an oval opening. The light diffuser 112 may include an opening around the camera to allow the capture of images in the field of view of the front side of the digital mirror. In FIG. 1A, the camera 104 can be located just above the display device 106 near a notched out area of the selective lighting 102 and light diffuser 112. To minimize

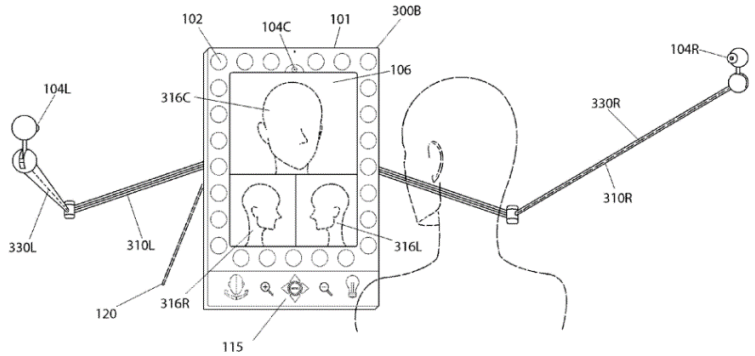
Asserted Claim of the ’109 Patent	Exemplary Citations to Rowles
	parallax and ensure the user can obtain the desired angle of view, the camera 104 is mounted as close as possible to the display device or under/over the display device. For example, the camera 104 may be centered within the display device 106 in order to minimize parallax. The camera 104 may also be mounted over display device 106, such as shown in FIGS. 3E-3F for example. Alternatively, the camera 104 may be mounted under the display device, such as shown in FIG. 3G for example. Digital imaging software may be used to compensate for the pixels in the display device 106 that are covered or interrupted by the camera. The number of pixels covered by the camera may be determined from the size of the camera and depth of field required for the digital mirror 100A.” *See* 7:4-8:13.  Fig. 1A

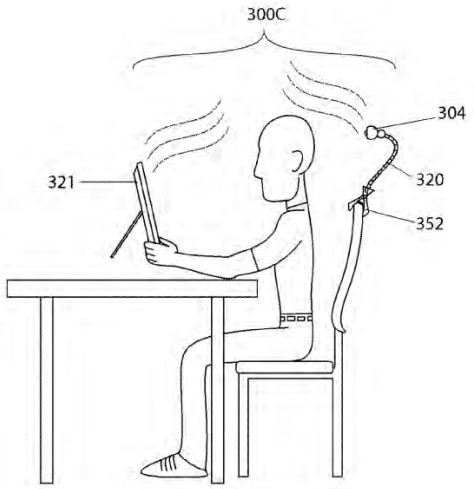
Asserted Claim of the '109 Patent	Exemplary Citations to Rowles
	"The camera 104 is located near the top and in front of the display to minimize parallax. The digital mirror 100B includes light diffuser 112 to scatter the light from the device light source 102 surrounding the display device 106. The enclosure 101 houses the display device 106." *See* 8:66-9:3. "The display device 106 is an LCD display with LCD backlighting 116. The image capture device 104 is shown separate from the enclosure. The display device 106 and camera or image capture device 104 are connected to the electronics board 175 via ribbon cable. Covering the enclosure is the light diffuser 112 with an opening 113. The light diffuser 112 is mounted over light source 102. The user interface bezel 125 includes icons that mount over and protect the user interface buttons 115." *See* 9:30-38. "The compact portable digital mirror 200A further includes the enclosure 101, a display device 106 mounted in the first enclosure half 101A, one or more light sources mounted in the first enclosure half 101A around the display device; a camera 140 (also referred to as an image capture device) mounted in the first enclosure half adjacent the display device 106; and a user interface 115 mounted in the enclosure. In one embodiment of the invention, the display device 106 is a liquid crystal display (LCD device and the one or more light sources are light emitting diodes (LEDs). The camera 104 is located near the top of the first enclosure half 101A to be in the field of view of a user looking into the display device. The enclosure 101 includes a hinge 210 coupled to the upper and lower half of the enclosure to allow it to pivot open and closed. The first enclosure half 101A includes a catch 221 and the second enclosure half 101B includes a latch 220 to receive the catch 221. When engaged, the latch and catch releasably keep the two enclosure halves 101A-101B pivotally coupled together when the digital mirror is not in use." *See* 9:51-10:3. "The digital mirror includes the display device 106 mounted in the first enclosure half 101A, a camera (also referred to as an image capture device) 104 mounted in the first enclosure half 101A, one or more light sources 102 mounted in the enclosure half 101A on the left and right sides of the display device 106, and the user interface 115 mounted

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	in the first enclosure half 101A. The second enclosure half 101B protects the digital mirror 200D when not in use. The second enclosure half 101A houses the components of the digital mirror 200D and provides a means to mount it to the sun visor 250D. Referring now to FIG. 3A, a digital mirror 300A is now illustrated capturing an image of a user 399 that is displayed on the display device 106. The digital mirror 300A is a rechargeable, self standing digital mirror including a pivotal stand 306 and rechargeable batteries 308. The pivotal stand 306 is pivotally coupled to a back side of the enclosure 101 to support the digital mirror on surface. The digital mirror 300A further includes a detachable camera 104 that is coupled to the enclosure 101 by an articulating arm 310. The camera 104 is mounted at the distal end of the arm 310. The proximal end of the arm 310 is coupled to the enclosure 101. One or more lights 102 that may be mounted adjacent the camera 104 to provide lighting in front of the digital camera 104 to facilitate the capture of images, such as shown by FIG. 3D. A camera cable 330 may couple the camera 104 to the underlying image processing system (see FIG. 6A) to provide power and control signals and receive pixel data for each image frame captured. Alternatively, wireless transmitter/receivers may be used to send the captured images to the underlying image processing system (see FIG. 6B) mounted in the enclosure 101." *See* 10:60-11:6.

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	 Fig. 3A “Referring now to FIG. 3B, a digital mirror 300B is illustrated that includes a plurality of cameras—a left camera 104L, a center camera 140C, and a right camera 104R. The digital mirror 300B is self-supporting including an optional stand 120 and/or means to be wall mounted (e.g. hole 180 or hooks 182A-182B shown in FIG. 1A) so that it can capture images hands-free, without the user having to hold any camera. One or more lights 102 may be mounted adjacent each of the left camera 104L and the right camera 104R, such as shown by FIG. 3D, to provide lighting in front of each and facilitate the capture of images. One or more lights 102 may also be mounted around the display device 106 to provide lighting in front of the display device to facilitate the capture of images. The digital mirror 300B includes additional cameras so that the user can concurrently capture and then display images of different views from various fields of view. A digital

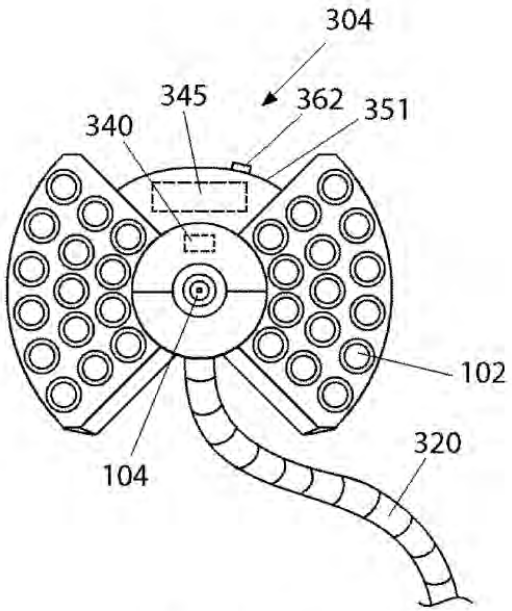
Asserted Claim of the '109 Patent	Exemplary Citations to Rowles
	camera can capture images for display full frame, side-by-side, picture in picture, or in a mosaic on the same display. For example, the left camera 104L may capture a left side view of a user, the center camera 140C may capture a front side view of the user, and the right camera 104R may capture a right side view of the user concurrently. The digital mirror 300B can also concurrently display left side images 316L captured by the left camera 104L, front side images 316C captured by the center camera 140C, and right side images 316R captured by the right camera 104R in a mosaic arrangement on the display device 106, in response to a selection by the user with the user interface 115. The digital mirror 300B can also display these images separately as full frame images on the display device 106, such as shown by FIGS. 1A, 2D, 3A, 4A-4B, and supported by FIGS. 5A-5B and the description thereof, in response to a selection by the user through the user interface 115. The left side images 316L, the front side images 316C, and the right side images 316R displayed in the mosaic arrangement may all be live images continuously captured by the cameras and displayed on the display device 106. Alternatively, one or more of the left side images 316L, the front side images 316C, and the right side images 316R displayed in the mosaic arrangement may be stored images previously captured by the cameras and read out from a storage device. For example, the front side images 316C may be live images while the left side images 316L and the right side images 316R may be stored images read out from the storage device and displayed on the display device. The center camera 104C is mounted to the enclosure 101 adjacent the display device 106 to reduce parallax. The center camera 104C captures a frontal view of the user or alternatively, a back view of the user if the user rotates himself/herself around so his back faces the center camera. For example, the user shown in FIG. 3B facing the camera 104C and the display 106 could turn around so that the back of their head is facing the camera 104C. After capturing and storing a few frames of images of the back of their head, the user can turn back around and select with the user interface 115 to recall the captured images of the back of their head for display on the display device 106. Similarly, frames of left and right side images may be captured with the left and right cameras 1041,104R respectively and stored in a storage device (e.g., see storage device 644 in FIGS. 6A-6B) of the digital mirror. The user can then select through the user interface 115 to recall the captured images of the one more sides of their head for separate

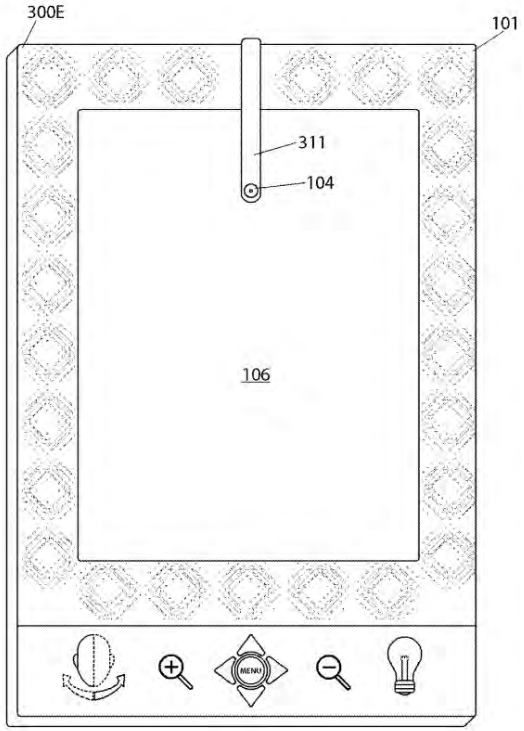
Asserted Claim of the ’109 Patent	Exemplary Citations to Rowles
	or concurrent display on the display device 106 to provide a more complete view of them selves. The left camera 104L and the right camera 104R are respectively mounted to the distal ends of a left articulating arm 310L and a right articulating arm 31 OR respectively. The proximal ends of the left articulating arm 310L and the right articulating arm 31 OR are coupled to the left and right of the enclosure 101 respectively. The left camera 104L and the right camera 104R are electrically coupled to the image processing system (See FIGS. 6A-6B) by cables 330 extending through the arms 310L,310R. The cables 330 may be electrical wire cables or optical fiber cables to couple the cameras 104L,104R and image processor system electronics together. In an alternate embodiment, the cameras 104L,104R may be wireless cameras and communicate with a wireless digital mirror base with a wireless communication protocol as described herein.” *See* 11:44-12:55.  Fig. 3B “Referring now to FIG. 3C, a wireless digital mirror 300C is illustrated. The wireless digital mirror 300C has a wireless digital mirror base 321 and the wireless detachable camera 304. The wireless digital camera 304 may be tethered to the wireless digital

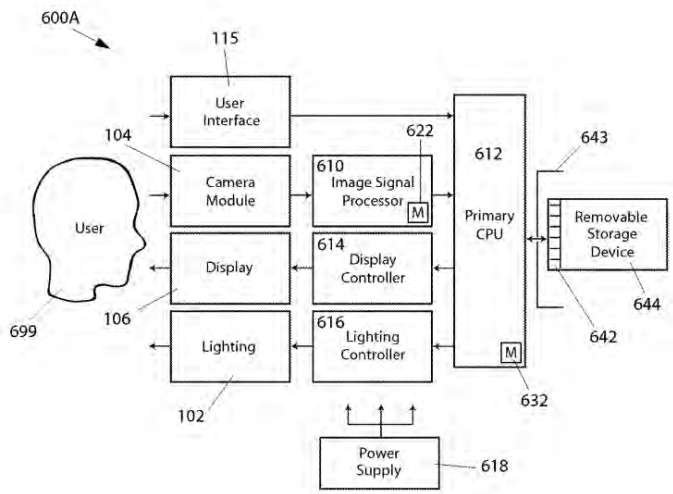
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	mirror base 321 through a wireless protocol such as the common I.E.E.E. 802.11 industry standard. This allows the detachable camera to be placed anywhere without being coupled to the enclosure 101 by an arm. However, the camera 304 may connect to a flexible arm 320 with a stand or clamp 352 to couple to and support the camera above a surface. A user can position the camera 304 when supported by the clamp/stand 352 for a desired viewing angle. The wireless digital mirror base 321 may communicate wirelessly with a remote computer system to upload captured images through a similar wireless protocol. Pictures and/or video may be transmitted to/or received from the remote computer system by the wireless digital mirror base 321. The wireless digital mirror base 321 may then be used as a picture frame so that pictures and or video may be displayed at the users discretion. The digital mirror may serve a dual purpose; one for viewing oneself, one of a digital picture frame, and one for saved pictures.” *See* 12:56-13:10.  Fig. 3C

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	"Referring now to FIG. 3D, a magnified view of the wireless digital camera 304 is illustrated. The wireless digital camera 104 includes, an image capture device or camera, one or more adjacent light sources 102, a wireless transmitter 340, and one or more batteries 345 mounted in a housing or enclosure 351. The one or more lights 102 that are mounted adjacent the camera provide lighting in front of the wireless digital camera 104 to facilitate the capture of images. The wireless digital camera 304 is mounted to a flexible arm 320 to flexibly move the position of the camera. The wireless transmitter 340 may include an on/off switch 362 to selectively power on/off the battery 345 power drain when not in use. Alternatively, the wireless transmitter may have a sleep mode that sleeps the digital camera 304 until activated upon receipt of a signal to turn on from the wireless digital mirror base 321. While the camera 304 has been described as being a wireless digital camera, it may instead be tethered to and in communication with the digital mirror base 321 by a wire cable including a plurality of wires. Referring now to FIGS. 3E-3F, a digital mirror 300E is shown. The digital mirror 300E includes a digital camera 104 mounted over the display device 106 to reduce parallax. The enclosure 101 may include a protrusion or arm 311 to support the camera 104 over the display device 106. The mounting of the camera 104 over the display device can be seen more clearly in the magnified side view shown in FIG. 3F. In FIG. 3F, the camera 104 is mounted to the protrusion 311. The protrusion 311 is molded as part of the enclosure 101 to support the camera 104 over the display device 106. Portions of the display device 106 and the light diffuser 112 are shown in FIG. 3F to illustrate the relative positioning of the elements in the digital mirror 300E. The digital camera 104 can also be mounted under the display device 106 to reduce parallax. Provisional Patent Application No. 61/338,106 filed on Feb. 16, 2010 by John W. Rowles, et al., entitled TECHNIQUES FOR IMAGE CAPTURE THROUGH LIQUID CRYSTAL DISPLAYS, describes how to mount a camera under a liquid crystal display (LCD) device and capture images. The digital camera may be mounted between an LCD pixel panel and a backlighting panel. Alternatively, the camera may replace a few pixels and be interspersed between pixels of the LCD pixel panel. In

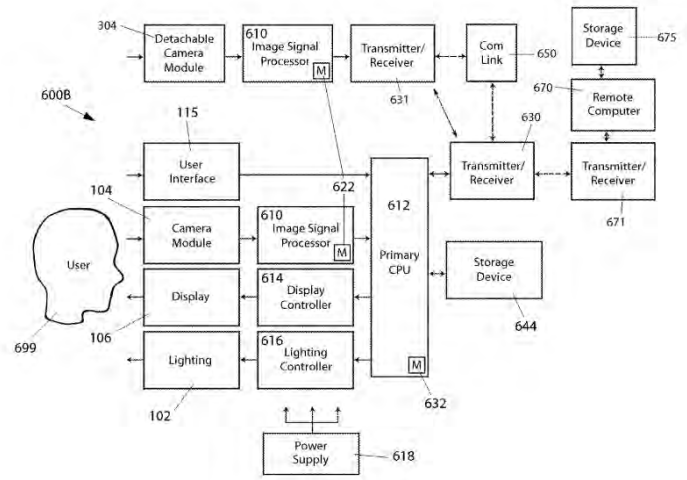
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	another embodiment of the invention, the digital camera 104 can also be mounted under an organic light emitting diode (OLED) display device 106 to reduce parallax. Alternatively, the digital camera 104 may replace a few pixels and be interspersed between pixels of the organic light emitting diodes. Referring now to FIG. 3G, a magnified side view of a portion of a display device 106G for an alternate embodiment of a digital mirror is shown. The display device 106G is an organic light emitting diode (OLED) display device. The digital mirror includes an image capture device 104G. In this case, the image capture 104G device may be a camera mounted behind the OLED display device 106G. Referring now to FIG. 3H, a magnified top view of a portion of the OLED display device 106G is shown. The display device 106G, being an OLED display device, includes an array of M by N OLED pixels 370. The display device 106G includes a lens 374 mounted over the camera 104G that is positioned between OLED pixels 370 of the OLED display device 106G." *See* 13:11-14:5.

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	 Fig. 3D

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	 Fig. 3E “Referring now to FIG. 6A, a first block diagram an image processing and control system 600A for the digital mirrors is shown. FIG. 6A illustrates a user 699 in front of the camera module 104 to have his/her image captured and displayed by the display device 106 after the captured images have undergone further processing by the image processing and control system 600A. The block diagram shown in FIG. 6A illustrate basic data flow in the system by arrows illustrated between the blocks. The image processing and control system 600A includes one or more of the user interface 115, the lighting sources 102 coupled to a lighting controller 616, an image signal processor 610 coupled to the camera module 104, the display controller 614 coupled to the display

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	device 106, a storage device 644, a power supply 618, and a primary central processing unit (CPU) 612 coupled together as shown.” *See* 14:61-15:8.  Fig. 6A “The user interface 115 of the digital mirror receives a user's requests and sends commands or instructions to the primary CPU 612 for processing. The user interface 115 may be used by a user to control a plurality of functions of the digital mirror through the primary CPU 612. For example, the user interface 115 can be used to control the display controller 614, the lighting controller 616, the image signal processor, and in some cases, the camera module 104, through the primary CPU 612. The user interface 115 may be an electro-mechanical user interface, a graphical user interface, a voice command user interface, a visual command interface or a touchscreen user interface that can be managed through the use of buttons, a microphone and voice recognition, or through a

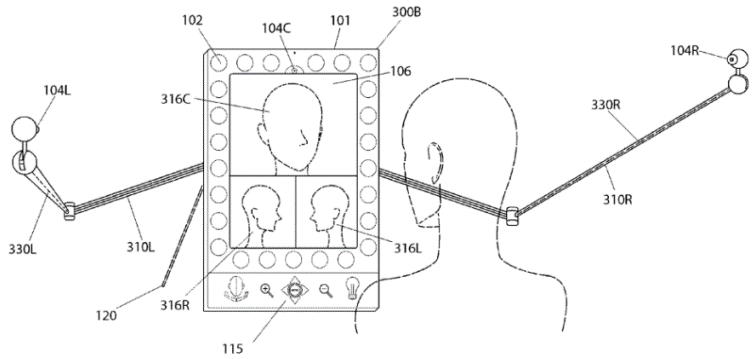
Asserted Claim of the ’109 Patent	Exemplary Citations to Rowles
	touch-screen system over the display device for example. The primary CPU 612 receives the requests from the user interface and performs the requested tasks.” *See* 15:43-58. “The image signal processor 610 includes a frame buffer memory 622 to store pixel data of one or more frames of images. Like the primary CPU, the image signal process can perform image processing operations on the pixel data stored in the frame buffer memory in response to software instructions. Additionally, the image signal processor may be used to control the camera module 104 and any sensors mounted in the camera module 104. It is desirable that the image single processor be of sufficient speed/data bandwidth to manage a video stream of a plurality of frames of pixel data in order to capture video images and display video on the display device. The image signal processor 610 may process image data on its own or in conjunction with the primary CPU 612 before it is displayed on the display device 106 by the display controller 614. The camera module 104, also referred to as an image capture device, may include a lens system, an image sensor, and an optional external Image Signal Processor (ISP). The camera preferably has a high depth of field from any combination of decreased sensor size, decreased aperture size, and/or an Extended Depth of Field technology within the sensor and image processing system. The image processing may be handled internally on a System-On-Chip (SOC) or on an external ISP. Referring now to FIG. 6B, a second block diagram of an image processing and control system 600B for digital mirrors is shown. The image processing and control system 600B is similar to the image processing and control system 600A illustrated in FIG. 6A but includes a communication link 650 (e.g., wireless router) for a digital mirror base unit to communicate with a detachable camera 304 and/or a remote computer system 670. The description of the common numbered blocks that were described previously are incorporated here by reference.” *See* 16:24-57.

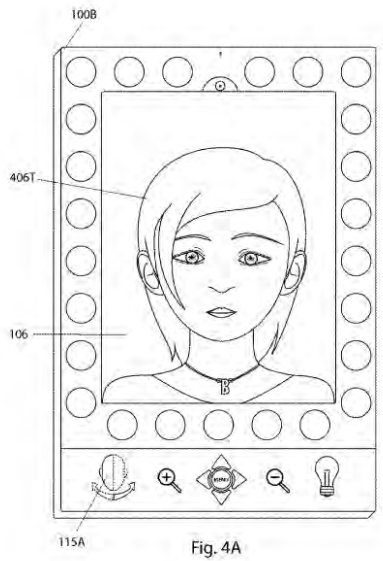
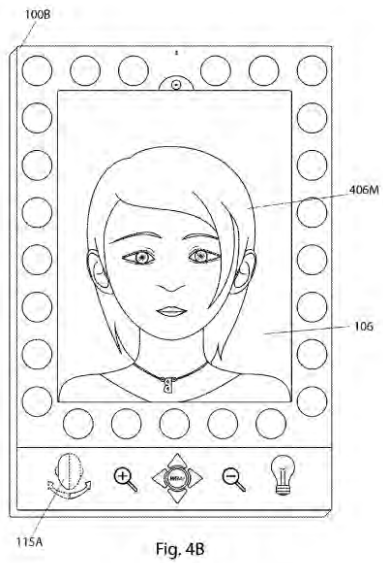
Asserted Claim of the '109 Patent	Exemplary Citations to Rowles
	 Fig. 6B This limitation would have been obvious to a person of ordinary skill in the art based on (1) Rowles alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as 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;	Rowles 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. "Optical mirrors are common household items that are used to adjust or verify the users appearance and features. With optical mirrors, a reflective material is typically encapsulated with glass that provides a reflection or a reverse image of the actual user. While optical mirrors are extremely useful in providing information that cannot be viewed directly, aberrations may occur in the medium used to reflect the information.

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	Moreover, optical mirrors provide a transposed image to the user. Objects shown in an optical mirror are horizontally flipped (e.g., from left to right and vice versa).” *See* 1:29-38. “A self-supported digital mirror (DM) may be used as a vanity mirror. It may include means for capturing side views for left, right and center viewing. The angle of the display of the digital mirror may be adjusted by a stand. A user interface further enables the user to select lighting, images to be viewed, and mirrored images (transposed from left to right) or true images (non transposed). In other embodiments of the invention, multiple cameras may extend to the left and right of the user to capture left, right, and side images for displaying on a single center display. The additional cameras can be moved to capture or whatever angles the user desires to view. The user simply may select the desired view through a menu of a graphics user interface or buttons of an electromechanical user interface. Multiple images of different views may be concurrently displayed in a mosaic arrangement on a display. This is different with an optical mirror. The enclosure houses together one or more of the lighting capabilities and arrangements, the camera views, and the display device software executed by a process may further enhance the display of images on a digital mirror.” *See* 3:61-4:14. “The digital mirror also provides the ability to view a true non-transposed image of a user. Typical optical mirrors provide a transposed or mirrored image to the viewer such that the left side of an object/user is transposed to the right side of the image and the right side of an object/user is transposed to the left side of the image. A digital mirror can display either view depending on the user's selection through a GUI or an electromechanical user interface. Digital images can also be enhanced through software to change the user's appearance, such as remove wrinkles or age spots or any other variety of commonly undesired user appearance features. Digital imaging software may also manipulate the user's image to add features to the user's image.” *See* 4:47-59.

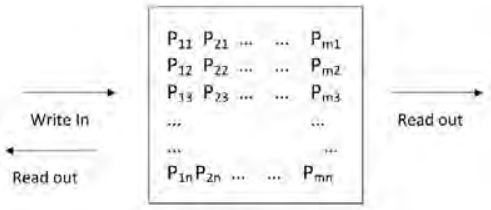
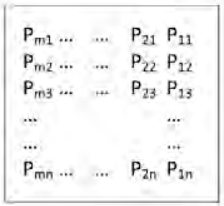
Asserted Claim of the '109 Patent	Exemplary Citations to Rowles
	"Referring now to FIG. 3B, a digital mirror 300B is illustrated that includes a plurality of cameras—a left camera 104L, a center camera 140C, and a right camera 104R. The digital mirror 300B is self-supporting including an optional stand 120 and/or means to be wall mounted (e.g. hole 180 or hooks 182A-182B shown in FIG. 1A) so that it can capture images hands-free, without the user having to hold any camera. One or more lights 102 may be mounted adjacent each of the left camera 104L and the right camera 104R, such as shown by FIG. 3D, to provide lighting in front of each and facilitate the capture of images. One or more lights 102 may also be mounted around the display device 106 to provide lighting in front of the display device to facilitate the capture of images. The digital mirror 300B includes additional cameras so that the user can concurrently capture and then display images of different views from various fields of view. A digital camera can capture images for display full frame, side-by-side, picture in picture, or in a mosaic on the same display. For example, the left camera 104L may capture a left side view of a user, the center camera 140C may capture a front side view of the user, and the right camera 104R may capture a right side view of the user concurrently. The digital mirror 300B can also concurrently display left side images 316L captured by the left camera 104L, front side images 316C captured by the center camera 140C, and right side images 316R captured by the right camera 104R in a mosaic arrangement on the display device 106, in response to a selection by the user with the user interface 115. The digital mirror 300B can also display these images separately as full frame images on the display device 106, such as shown by FIGS. 1A, 2D, 3A, 4A-4B, and supported by FIGS. 5A-5B and the description thereof, in response to a selection by the user through the user interface 115. The left side images 316L, the front side images 316C, and the right side images 316R displayed in the mosaic arrangement may all be live images continuously captured by the cameras and displayed on the display device 106. Alternatively, one or more of the left side images 316L, the front side images 316C, and the right side images 316R displayed in the mosaic arrangement may be stored images previously captured by the cameras and read out from a storage device. For example, the front side images 316C

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	may be live images while the left side images 316L and the right side images 316R may be stored images read out from the storage device and displayed on the display device. The center camera 104C is mounted to the enclosure 101 adjacent the display device 106 to reduce parallax. The center camera 104C captures a frontal view of the user or alternatively, a back view of the user if the user rotates himself/herself around so his back faces the center camera. For example, the user shown in FIG. 3B facing the camera 104C and the display 106 could turn around so that the back of their head is facing the camera 104C. After capturing and storing a few frames of images of the back of their head, the user can turn back around and select with the user interface 115 to recall the captured images of the back of their head for display on the display device 106. Similarly, frames of left and right side images may be captured with the left and right cameras 1041,104R respectively and stored in a storage device (e.g., see storage device 644 in FIGS. 6A-6B) of the digital mirror. The user can then select through the user interface 115 to recall the captured images of the one more sides of their head for separate or concurrent display on the display device 106 to provide a more complete view of them selves. The left camera 104L and the right camera 104R are respectively mounted to the distal ends of a left articulating arm 310L and a right articulating arm 31 OR respectively. The proximal ends of the left articulating arm 310L and the right articulating arm 31 OR are coupled to the left and right of the enclosure 101 respectively. The left camera 104L and the right camera 104R are electrically coupled to the image processing system (See FIGS. 6A-6B) by cables 330 extending through the arms 310L,310R. The cables 330 may be electrical wire cables or optical fiber cables to couple the cameras 104L,104R and image processor system electronics together. In an alternate embodiment, the cameras 104L,104R may be wireless cameras and communicate with a wireless digital mirror base with a wireless communication protocol as described herein." *See* 11:44-12:55.

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	 Fig. 3B “Referring now to FIG. 4A, in response to true view mode being selected through the view mode selector 115A of the user interface, a true image 406T is displayed by the display device 106 of the digital mirror 100B. A conventional optical mirror does not display the true image 406T if a user stands in front of the optical mirror. The letter B on the necklace in the true image 406T has a proper orientation. FIG. 4B illustrates a mirrored image 406M being displayed in response to the mirror view mode being selected by the user interface view mode selector 115A. A conventional optical mirror may display an image similar to the mirrored image 406M.” *See* 14:6-17.

Asserted Claim of the ’109 Patent	Exemplary Citations to Rowles
	 Fig. 4A  Fig. 4B “Referring now to FIG. 5A, a representation of a single frame of pixel data configured into columns and rows is illustrated. A frame of pixel data is captured by the image capture device 104 and stored in digital format into the memory locations of a frame buffer memory. A frame of data may written into the frame buffer memory and organized as illustrated in FIG. 5A, such as by writing from left to right (pixel P11 to pixel Pm1). In response to user selections (e.g., true view mode or mirror view mode), the pixel data stored in the frame buffer memory can be readily processed by an image signal processor as desired. In a true view mode, the frame of data may be read out similarly (e.g., from left to right—pixel P11 to pixel Pm1) and displayed on the display device as shown in FIG. 5A. Pixel P11 is displayed in the upper left corner, pixel Pm1 is displayed in the upper right corner, pixel P1n is displayed in the lower left corner, and pixel Pmn is displayed in the lower right corner. In this manner, the pixel data is displayed on the display device of the digital

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	mirror as it was captured by the image capture device. The true view mode displays true images to the user as how third persons see the user, such as shown in FIG. 4A. In a mirror view mode, the frame of pixel data saved into the frame buffer memory is read out differently from how it was written by reversing the addressing of memory locations into the frame buffer memory. The arrangement of the pixel data in the rows and columns is read out of the memory locations in a reverse order (e.g., from right to left—Pm1 to P11) to transpose or horizontally flip the captured image into a horizontally mirrored image. FIG. 5B illustrates how the mirrored image is displayed on the display device 106 of the digital mirror in response to the mirror view mode. For example, pixel Pm1 is now displayed in the upper left corner of the display device, pixel P11 is displayed in the upper right corner of the display device, pixel Pmn is displayed in the lower left corner, and pixel P1n is displayed in the lower right corner. The mirror view mode displays mirror images on the display device to the user, such as shown in FIG. 4B, similar to how an optical mirror does." *See* 14:18-56.

Asserted Claim of the '109 Patent	Exemplary Citations to Rowles
	 Fig. 5A  Fig. 5B This limitation would have been obvious to a person of ordinary skill in the art based on (1) Rowles 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;	Rowles 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 one embodiment of the invention, a digital mirror is disclosed including an enclosure; a display device mounted in the enclosure to display images at a front side of the enclosure; an image capture device mounted in the enclosure adjacent the display device

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	to reduce parallax error; lights mounted in the enclosure adjacent the display device; and a light diffuser mounted to the enclosure around the display device over the one or more lights. The one or more lights provide lighting in front of the display device and the image capture device captures images in the field of view in the front. The light diffuser diffuses and softens the light emitted by the one or more lights. Alternatively, the image capture device may be mounted on an articulated arm that may be used to capture and display various angles in the filed of view of the digital mirror.” *See* Abstract. “Typical optical mirrors composed of a reflective material and potentially, encapsulated in glass, have characteristics that may not satisfy a user's requirements. A digital mirror has the ability to improve the user's experience in providing extended views of the user's features. The digital mirror also has the ability to enhance displayed images through the using imaging electronic components and software. Additionally, the combination of a plurality of lighting sources with selectable intensity, a plurality of camera choices and mounting applications may also enhance the user's experience. There are a number of different applications for a digital mirror. For example a wall mount digital mirror may be formed of different sizes depending on the user's discretion and interior design preferences. A large digital mirror may be desired for a user to view multiple views. A smaller digital mirror may be desired for smaller spaces and may offer a single view at a time for a quick view or reassurance. The enclosure may also be integral in how the digital mirror may be configured to be compatible with the user's environment. The ability for a digital mirror to either be a focal point for the user's environment or an accessory to the user's environment may determine the style of the enclosure and thus the display size, lighting, number and size of camera as well as the resolution and focus of the camera sensor. A self-supported digital mirror (DM) may be used as a vanity mirror. It may include means for capturing side views for left, right and center viewing. The angle of the display of the digital mirror may be adjusted by a stand. A user interface further enables the user

Asserted Claim of the ’109 Patent	Exemplary Citations to Rowles
	to select lighting, images to be viewed, and mirrored images (transposed from left to right) or true images (non transposed). In other embodiments of the invention, multiple cameras may extend to the left and right of the user to capture left, right, and side images for displaying on a single center display. The additional cameras can be moved to capture or whatever angles the user desires to view. The user simply may select the desired view through a menu of a graphics user interface or buttons of an electromechanical user interface. Multiple images of different views may be concurrently displayed in a mosaic arrangement on a display. This is different with an optical mirror. The enclosure houses together one or more of the lighting capabilities and arrangements, the camera views, and the display device software executed by a process may further enhance the display of images on a digital mirror. The ability to alter digital images is a common technique used in digital photography. Software may interactive with the elemental components such that lighting can be automatically dimmed or made brighter depending on the user's preference settings, such as an auto brightness feature. The enclosure may house one or more lighting sources such as incandescent lights, florescent lights, compact florescent lights, or LED (light emitting diode) devices, may be used singularly or in any combination in order to facilitate the user's desired lighting. Light sources have well defined characteristics such as incandescent lights sources may be seen as having a yellow tint where as florescent lights may be seen to have a bluish tint. Lighting to display appropriate shades of images provided by the digital mirror may also be responsive to the user's movement and ambient lighting conditions given the time of day.” *See* 3:37-4:30. “In another embodiment of the invention a portable, battery powered compact digital mirror would be very beneficial for travel or where AC powered accessories are not easily supported. In this case the camera, the lighting sources, and display device technology are selected to support battery-powered operation.

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	Sensors may be used to prevent excessive battery-power drain and increase viewing time by adjusting the lighting intensity in response to the reflective light and ambient light. The cameras of each digital mirror may act as the light sensor for each. Sensors may adjust lighting intensity and color depending on the users preferred settings for a particular ambient environment. For example, a compact version of the digital mirror may be used in a dark setting. In this case a sensor setting may be used to prevent a bright display that may be distracting. The digital mirror also provides the ability to view a true non-transposed image of a user. Typical optical mirrors provide a transposed or mirrored image to the viewer such that the left side of an object/user is transposed to the right side of the image and the right side of an object/user is transposed to the left side of the image. A digital mirror can display either view depending on the user's selection through a GUI or an electromechanical user interface. Digital images can also be enhanced through software to change the user's appearance, such as remove wrinkles or age spots or any other variety of commonly undesired user appearance features. Digital imaging software may also manipulate the user's image to add features to the user's image. In another embodiment of the invention, the camera may be detachable or separate from the display. The camera may communicate wirelessly through a common wireless protocol, such as IEEE 802.11. The ability to eliminate wires between the camera and display provides additional flexibility in locating the camera. For example, a detachable camera may be positioned behind the user's head. Additionally, left and right side wired/wireless cameras may be used to communicate with the display base to produce a plurality of images for the user to select from. Each camera may have its own lighting sources within its enclosure. Each camera may also provide a light sensor capability to sense the ambient light, the reflected light, and auto focus the camera's lenses, if any, in order to produce the user's desired displayed views. The digital mirror may also be used to store or archive pictures for future comparisons. The user may also select a number of stored images in the digital mirror to be shown in a continuous manner similar to a slide show. The growth or development of a user may

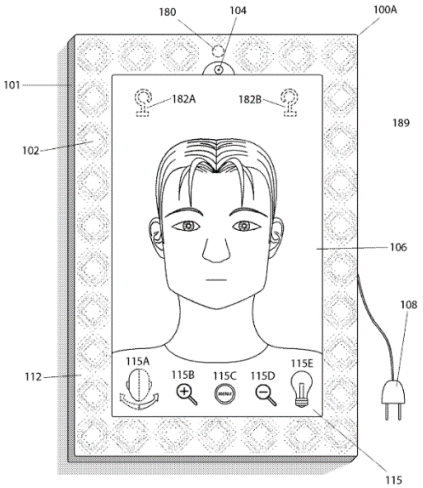
Asserted Claim of the '109 Patent	Exemplary Citations to Rowles
	be displayed by capturing facial changes over the years. The captured image frames may be correlated an displayed as a movie or video. The camera may be used to take individual pictures, single image frame, or record video (a plurality of image frames over a time period) depending on the amount of storage available. Subsequently, the user may elect to show pictures for the purpose of décor, such as a digital picture frame. A wireless interface allows a user to store pictures and or movies on a remote computer system and transmit them to the digital mirror in the form of a stream file. The digital mirror may also send pictures back to the remote computer system for archival and or further editing or manipulation. A built-in image signal processor allows the captured images on the digital mirror to be manipulated. This allows the user to enhance their characteristics, such as to reduce wrinkles or remove skin blemishes for example. Selective control of the lighting intensity can also improve the image quality captured by the digital mirror." *See* 4:31-5:29. "Digital Mirror System A digital mirror is an apparatus that captures and displays an image to a user through the use of a digital electronic system. The digital mirror includes an image capture device and a display device on the same side to display the captured image to a user. A digital mirror further includes a user interface and an internal electronic control and image processing system to control the camera and the display device and process captured images for display on the display device. A digital mirror has a number of advantages over an optical mirror. A digital mirror provides a user with an improved mirror viewing experience compared to a conventional reflective optical mirror through the capabilities of digital imaging. A traditional optical mirror is limited by the ambient environment such as physical location, lighting, and viewing angle of the user. A poorly lit environment can significantly influence the image seen by a user. The user is also limited by their own vision being able to see only in a

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	direct line of sight. A traditional optical mirror is limited in that it can only display to the user a mirrored or reflected image. A digital mirror can overcome one or more of these limitations. The influence of asymmetry in humans plays a large role in how we view ourselves and how the rest of the world views us. A digital mirror has an ability to show the user a true life image of how others see them, rather than a mirrored image. In one embodiment of the invention, a freeze frame capture or video replay in a true view mode is provided so that users may study themselves without having to remain fixed in one position. A digital mirror enables the captured image input to be separated from the displayed output. Because the image capture device (e.g., a camera) and the display device are separate devices, the image capture device may be positioned so that the user's desired view may be displayed without changing the users position. Furthermore, users are not limited to direct line of sight viewing or using multiple mirrors in order to view themselves from different perspectives. The camera or image capture device may include lighting proximately mounted to illuminate the subject. In order to secure the position of the camera without the user holding it, the camera may include a clamp or stand coupled to a flexible arm or an articulating arm. The digital mirror includes an image processor that allows the manipulation of captured images for display on the display device. The digital mirror may include a digital zoom to zoom in and zoom out of the captured image. The image processor can further adjust the image displayed by compensating for poor lighting, modifying the image displayed so that a user can make themselves look better or more realistic, or perform any number of digital modifications that are possible in the digital imaging field with an image processor. The digital mirror may provide substantially all the lighting a user needs to capture images. There is no need to adjust the environment to a digital mirror. The digital mirror can adapt to the user's environment. The digital mirror, along with a detachable camera if so equipped, includes or more light sources to illuminate the user within expected

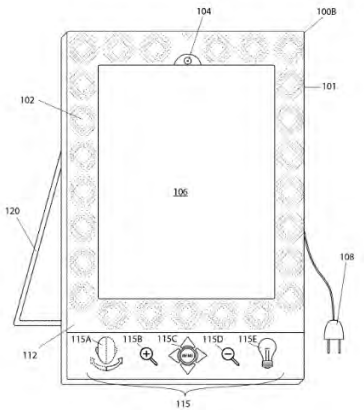
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	distances of use. Exposure and gain of the image capture device can be adjusted to improve image capture and or video displayed to the user. The digital mirror can store captured images to separate them from the image being displayed by the display device. A user can selectively freeze an image or replay a stored image to see themselves as they were in the past. Users no longer need to hold a position or expression, perform a motion over and over, or hold their eyes open to see themselves as the digital mirror can capture images for later display when a user's eyes are closed. A digital camera, also referred to as an image capture device, may provide enhanced optics to capture images otherwise not seen by unaided eyes. The image capture device may include an optical lens or a combination of optical lenses with various properties such as: a telephoto lens for a closer view, a wide angle lens to allow a wider view, or an optical zoom lens to provide both. Utilizing a telephoto lens, an optical zoom view is possible without users having to readjust their face closer to the digital mirror. The optical zoom lens may optically zoom in and out on the user to select a frame of for captured images for display on the display device of the digital mirror. A wide-angle lens provides a wide view that can be displayed without the user moving away from the device. The camera may include an auto-focus system to provide sharpness and or resolution, regardless of where the user is positioned relative to the device. The digital mirror is not limited to displaying only one full frame perspective view. Multiple cameras of a digital mirror can concurrently capture more than one perspective view of the user for display on a display device. The additional captured views can provide a more complete view of the user and or their surroundings. Alternatively, additional captured views may be used to provide a side-by-side perspective comparison. The digital camera can capture images for display full frame, side-by-side, picture in picture, or in a mosaic on the same display or on separate displays. With an optical mirror, the user previously had to move the mirror or position their own body in order to

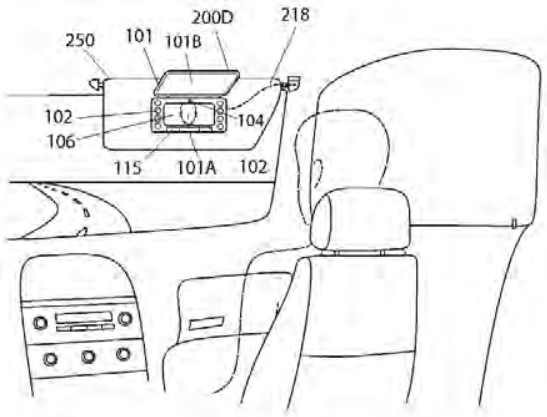
Asserted Claim of the '109 Patent	Exemplary Citations to Rowles
	see a desired viewing angle. With multiple cameras, a user can capture different perspective views all at once. A digital mirror can displace optical mirrors as a decoration in a home or office environment. Because the digital mirror provides its own illumination, it has the ability to capture and display an image, even in poor lighting conditions. The digital mirror can be used in poorly lit rooms within the home, a visor mirror in automobiles at night, or in a plurality of environments in its portable compact version." *See* 5:31-7:3. "The image capture device 104 may be an OMNIVISION™ OV3642 three megapixel CAMERACHIP™ sensor with a fixed focal length lens in one embodiment of the invention, for example. In this case, a digital zoom may be used to zoom in and/or zoom out on a portion of an image. Alternatively, a camera module with an optical zoom may be used that mechanically moves lenses in a linear manner back and forth, such as commonly found in point and shoot digital cameras, or a camera module with a more compact zoom may be used such as shown and described in U.S. Patent Application Publication 2006/0216018 filed by Jen Tsorng Chang on Mar. 20, 2006, incorporated herein by reference, for example. The display device 106 may be a liquid crystal display (LCD) device or an organic light emitting diode (OLED) display device. The display device 106 provides the viewing medium for the user to observe one or more desired images captured by the camera 104. Surrounding the display device 106 is the selective light sources 102 that may be one or more of light emitting diodes (LED), incandescent, florescent, or any combination of light source that can provide light and illuminate a user. The lighting provided by the light sources 102 of the digital mirror may be responsive to the environment (e.g., ambient lighting) and one or more user preferred settings (e.g., automatic light sensing, manual light control) that are stored and provided to the digital image processing control electronics." *See* 7:20-45. "The light diffuser 112 is mounted to the enclosure to cover over the light sources 102. The light diffuser 112 diffuses or scatters the light generated by the light sources 102 in

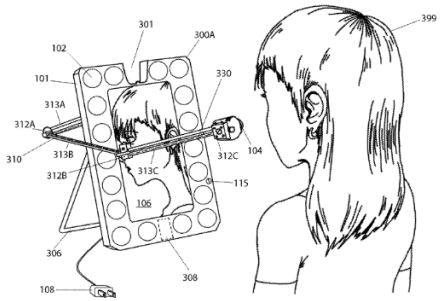
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	order to produce a softer light for the object or user in the target viewing area. The light diffuser 112 minimizes glare and other lighting aberrations that may tend to wash out or distort images captured by the image capture device 104 (also referred to as a camera). The light diffuser 112 may be shaped similar to the enclosure 101 and has an opening 113 to be mounted around the shape of the display device 106. In one embodiment of the invention, the enclosure and the display device are rectangular in shape such that the light diffuser 112 has a frame shape with a rectangular opening 113 (see FIG. 1C). In another embodiment of the invention, the enclosure and display device are oval shaped such that the light diffuser 112 also has an oval frame shape with an oval opening. The light diffuser 112 may include an opening around the camera to allow the capture of images in the field of view of the front side of the digital mirror." *See* 7:46-64. "In FIG. 1A, the camera 104 can be located just above the display device 106 near a notched out area of the selective lighting 102 and light diffuser 112. To minimize parallax and ensure the user can obtain the desired angle of view, the camera 104 is mounted as close as possible to the display device or under/over the display device. For example, the camera 104 may be centered within the display device 106 in order to minimize parallax. The camera 104 may also be mounted over display device 106, such as shown in FIGS. 3E-3F for example. Alternatively, the camera 104 may be mounted under the display device, such as shown in FIG. 3G for example. Digital imaging software may be used to compensate for the pixels in the display device 106 that are covered or interrupted by the camera. The number of pixels covered by the camera may be determined from the size of the camera and depth of field required for the digital mirror 100A. The digital mirror 100A further includes a touchscreen user interface (UI) 115 mounted over the display device 106. The touchscreen UI 115 provides the user the ability to select the preferred image from a user interface menu. The touchscreen UI 115 may use capacitive sensing, surface acoustic wave (SAW), or resistive touchscreen technology. The user interface 115 may include a view mode button 115A, a zoom in button 115B to magnify a portion of the image, a menu selector button 115C, a zoom out button 115D to demagnify a portion of the image, and a light source dimmer/brightness button 115E

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	to manually adjust the light intensity. The view mode button 115A allows a user to select between a true view mode or a mirror view mode and the display of images as either true images or mirrored images, respectively. The menu selector button 115C initiates a menu to be displayed on the display device 106 from which a user can select different control functions, such as camera control functions, display control functions, lighting control functions, and power control functions. A user may pan the image through the touch screen user interface as well. A power on/off switch/button may be included as part of the interface. Alternatively, a sensor may be used to automatically power on and off the digital mirror. While the user interface 115 may be a touchscreen UI as described, other types of user interfaces may be used with a digital mirror such as a gesture recognition user interface, a voice recognition user interface (e.g., microphone, voice recognizer/decoder, speaker to question/acknowledge), an electro-mechanical user interface (e.g., buttons, switches, etc.), or a graphical user interface with a pointer, such as a mouse or stylus.” *See* 7:65-8:43.  Fig. 1A

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	“Referring now to FIG. 1B, a second digital mirror 100B is illustrated that stands up and is self-supported upon a vanity or desktop surface. The digital mirror 100B receives AC power for the lighting, the digital imaging electronics, and the display through the AC power cord 108. The digital mirror 100B includes an enclosure 101 that has a pivotal stand 120. The pivotal stand 120 stands the digital mirror up upon a surface. The pivotal stand 120 can pivot to adjust its angle with the enclosure to provide flexibility in adjusting the angle and height of the mirror to the user's position. The display device 106 is mounted in the enclosure 101. The display device 106 may be an LCD display, a plasma display, an OLED display, or any other type of image display medium. The camera 104 is located near the top and in front of the display to minimize parallax. The digital mirror 100B includes light diffuser 112 to scatter the light from the device light source 102 surrounding the display device 106. The enclosure 101 houses the display device 106. The user interface 115 provides the user the ability to select a desired view. The user interface 115 may be an electromechanical user interface and include a view mode button 115A, a zoom in button 115B, a menu selector button 115C, a zoom out button 115D, and a light source dimmer/brightness button 115E. The view mode button 115A selects between true view mode and mirror view mode to display images as a true view image or a mirror view image, respectively. The menu selector button 115C initiates a menu to be displayed on the display device 106 from which a user can select different control functions, such as camera control functions, display control functions, lighting control functions, and power control functions. The menu also allows a user to select and save user preferred settings, such as for lighting, views etc.” *See* 8:53-9:17.

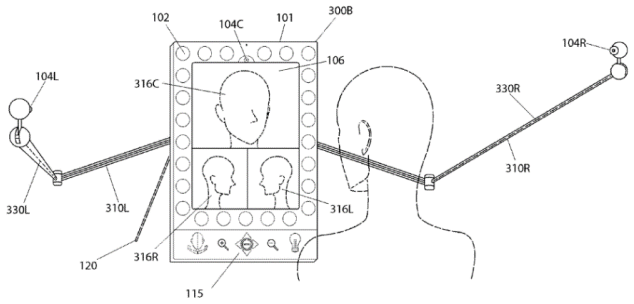
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	 Fig. 18 “The user interface 115 for the portable digital mirror 200A may be a single electro-mechanical button that is responsive to the number of times the button is toggled. For example, depressing the button in rapid succession three times may execute a change in the rotation of the view angle. Alternatively, holding the button down may increase the LED lighting 102 brightness to a peak illumination and then start to decrease the brightness. Once the desired level of brightness is achieved, the user can let go of the button.” *See* 10:4-12. “Referring now to FIG. 2D, a visor digital mirror 200D is shown coupled to an automotive sun visor 250. The visor digital mirror 200D may include enclosure halves 101A-101B that flip open and closed like those of the digital mirror 200A or alternatively, a slideable cover that slides open and closed over the display device in the enclosure half 101A. In either case, the second enclosure half is moveably (e.g., pivotally or slidingly) coupled to the first enclosure half. The enclosure half 101A is mounted to the sun visor 250 and rests thereon when folded up away into the ceiling of the car. When enclosure half 101B is flipped open to reveal the display device 106, a switch may automatically power on the digital mirror. When flipped closed to cover over the display

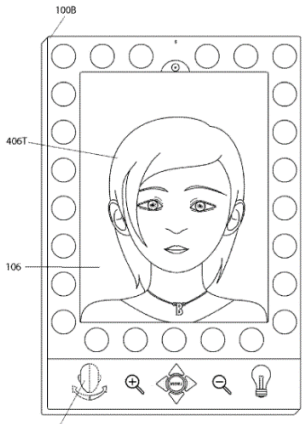
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	device 106 to protect it from dirt and whatever else, the switch may power off the digital mirror. The slideable cover may slide open to reveal the display device 106 and power on the digital mirror and slide closed to cover over the display device 106 and power off the digital mirror. The digital mirror 200D is powered through a wire cable 218 connected to the automobiles direct current power supply having a nominal twelve (12) volts DC. The digital mirror includes the display device 106 mounted in the first enclosure half 101A, a camera (also referred to as an image capture device) 104 mounted in the first enclosure half 101A, one or more light sources 102 mounted in the enclosure half 101A on the left and right sides of the display device 106, and the user interface 115 mounted in the first enclosure half 101A. The second enclosure half 101B protects the digital mirror 200D when not in use. The second enclosure half 101A houses the components of the digital mirror 200D and provides a means to mount it to the sun visor 250D.” *See* 10:21-52.  Fig. 2D

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	“Referring now to FIG. 3A, a digital mirror 300A is now illustrated capturing an image of a user 399 that is displayed on the display device 106. The digital mirror 300A is a rechargeable, self standing digital mirror including a pivotal stand 306 and rechargeable batteries 308. The pivotal stand 306 is pivotally coupled to a back side of the enclosure 101 to support the digital mirror on surface. The digital mirror 300A further includes a detachable camera 104 that is coupled to the enclosure 101 by an articulating arm 310. The camera 104 is mounted at the distal end of the arm 310. The proximal end of the arm 310 is coupled to the enclosure 101. One or more lights 102 that may be mounted adjacent the camera 104 to provide lighting in front of the digital camera 104 to facilitate the capture of images, such as shown by FIG. 3D. A camera cable 330 may couple the camera 104 to the underlying image processing system (see FIG. 6A) to provide power and control signals and receive pixel data for each image frame captured. Alternatively, wireless transmitter/receivers may be used to send the captured images to the underlying image processing system (see FIG. 6B) mounted in the enclosure 101.” *See* 10:53-11:6.  Fig. 3A “Referring now to FIG. 3B, a digital mirror 300B is illustrated that includes a plurality of cameras—a left camera 104L, a center camera 140C, and a right camera 104R. The digital mirror 300B is self-supporting including an optional stand 120 and/or means to

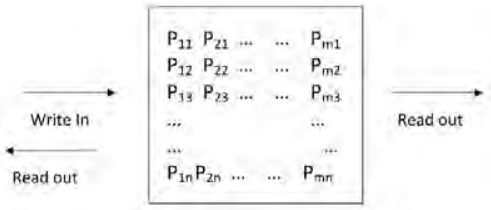
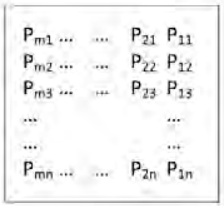
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	be wall mounted (e.g. hole 180 or hooks 182A-182B shown in FIG. 1A) so that it can capture images hands-free, without the user having to hold any camera. One or more lights 102 may be mounted adjacent each of the left camera 104L and the right camera 104R, such as shown by FIG. 3D, to provide lighting in front of each and facilitate the capture of images. One or more lights 102 may also be mounted around the display device 106 to provide lighting in front of the display device to facilitate the capture of images. The digital mirror 300B includes additional cameras so that the user can concurrently capture and then display images of different views from various fields of view. A digital camera can capture images for display full frame, side-by-side, picture in picture, or in a mosaic on the same display. For example, the left camera 104L may capture a left side view of a user, the center camera 140C may capture a front side view of the user, and the right camera 104R may capture a right side view of the user concurrently. The digital mirror 300B can also concurrently display left side images 316L captured by the left camera 104L, front side images 316C captured by the center camera 140C, and right side images 316R captured by the right camera 104R in a mosaic arrangement on the display device 106, in response to a selection by the user with the user interface 115. The digital mirror 300B can also display these images separately as full frame images on the display device 106, such as shown by FIGS. 1A, 2D, 3A, 4A-4B, and supported by FIGS. 5A-5B and the description thereof, in response to a selection by the user through the user interface 115. The left side images 316L, the front side images 316C, and the right side images 316R displayed in the mosaic arrangement may all be live images continuously captured by the cameras and displayed on the display device 106. Alternatively, one or more of the left side images 316L, the front side images 316C, and the right side images 316R displayed in the mosaic arrangement may be stored images previously captured by the cameras and read out from a storage device. For example, the front side images 316C may be live images while the left side images 316L and the right side images 316R may be stored images read out from the storage device and displayed on the display device. The center camera 104C is mounted to the enclosure 101 adjacent the display device 106 to reduce parallax. The center camera 104C captures a frontal view of the user or

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	alternatively, a back view of the user if the user rotates himself/herself around so his back faces the center camera. For example, the user shown in FIG. 3B facing the camera 104C and the display 106 could turn around so that the back of their head is facing the camera 104C. After capturing and storing a few frames of images of the back of their head, the user can turn back around and select with the user interface 115 to recall the captured images of the back of their head for display on the display device 106. Similarly, frames of left and right side images may be captured with the left and right cameras 1041,104R respectively and stored in a storage device (e.g., see storage device 644 in FIGS. 6A-6B) of the digital mirror. The user can then select through the user interface 115 to recall the captured images of the one more sides of their head for separate or concurrent display on the display device 106 to provide a more complete view of them selves. The left camera 104L and the right camera 104R are respectively mounted to the distal ends of a left articulating arm 310L and a right articulating arm 31 OR respectively. The proximal ends of the left articulating arm 310L and the right articulating arm 31 OR are coupled to the left and right of the enclosure 101 respectively. The left camera 104L and the right camera 104R are electrically coupled to the image processing system (See FIGS. 6A-6B) by cables 330 extending through the arms 310L,310R. The cables 330 may be electrical wire cables or optical fiber cables to couple the cameras 104L,104R and image processor system electronics together. In an alternate embodiment, the cameras 104L,104R may be wireless cameras and communicate with a wireless digital mirror base with a wireless communication protocol as described herein." *See* 11:44-12:55.

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	 Fig. 3B “The digital camera 104 can also be mounted under the display device 106 to reduce parallax. Provisional Patent Application No. 61/338,106 filed on Feb. 16, 2010 by John W. Rowles, et al., entitled TECHNIQUES FOR IMAGE CAPTURE THROUGH LIQUID CRYSTAL DISPLAYS, describes how to mount a camera under a liquid crystal display (LCD) device and capture images. The digital camera may be mounted between an LCD pixel panel and a backlighting panel. Alternatively, the camera may replace a few pixels and be interspersed between pixels of the LCD pixel panel. In another embodiment of the invention, the digital camera 104 can also be mounted under an organic light emitting diode (OLED) display device 106 to reduce parallax. Alternatively, the digital camera 104 may replace a few pixels and be interspersed between pixels of the organic light emitting diodes.” *See* 13:43-58. “Referring now to FIG. 4A, in response to true view mode being selected through the view mode selector 115A of the user interface, a true image 406T is displayed by the display device 106 of the digital mirror 100B. A conventional optical mirror does not display the true image 406T if a user stands in front of the optical mirror. The letter B on the necklace in the true image 406T has a proper orientation. FIG. 4B illustrates a mirrored image 406M being displayed in response to the mirror view mode being selected by the user interface view mode selector 115A. A

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	conventional optical mirror may display an image similar to the mirrored image 406M." *See* 14:6-17.  "Referring now to FIG. 5A, a representation of a single frame of pixel data configured into columns and rows is illustrated. A frame of pixel data is captured by the image capture device 104 and stored in digital format into the memory locations of a frame buffer memory. A frame of data may written into the frame buffer memory and organized as illustrated in FIG. 5A, such as by writing from left to right (pixel P11 to pixel Pm1). In response to user selections (e.g., true view mode or mirror view mode), the pixel data stored in the frame buffer memory can be readily processed by an image signal processor as desired. In a true view mode, the frame of data may be read out similarly (e.g., from left to right—pixel P11 to pixel Pm1) and displayed on the display device as shown in FIG. 5A. Pixel P11 is displayed in the upper left corner, pixel Pm1 is displayed in the upper right corner, pixel P1n is displayed in the lower left corner, and pixel Pmn is displayed in the lower right corner. In this manner, the pixel data is displayed on the display device of the digital

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	mirror as it was captured by the image capture device. The true view mode displays true images to the user as how third persons see the user, such as shown in FIG. 4A. In a mirror view mode, the frame of pixel data saved into the frame buffer memory is read out differently from how it was written by reversing the addressing of memory locations into the frame buffer memory. The arrangement of the pixel data in the rows and columns is read out of the memory locations in a reverse order (e.g., from right to left—Pm1 to P11) to transpose or horizontally flip the captured image into a horizontally mirrored image. FIG. 5B illustrates how the mirrored image is displayed on the display device 106 of the digital mirror in response to the mirror view mode. For example, pixel Pm1 is now displayed in the upper left corner of the display device, pixel P11 is displayed in the upper right corner of the display device, pixel Pmn is displayed in the lower left corner, and pixel P1n is displayed in the lower right corner. The mirror view mode displays mirror images on the display device to the user, such as shown in FIG. 4B, similar to how an optical mirror does." *See* 14:18-56.

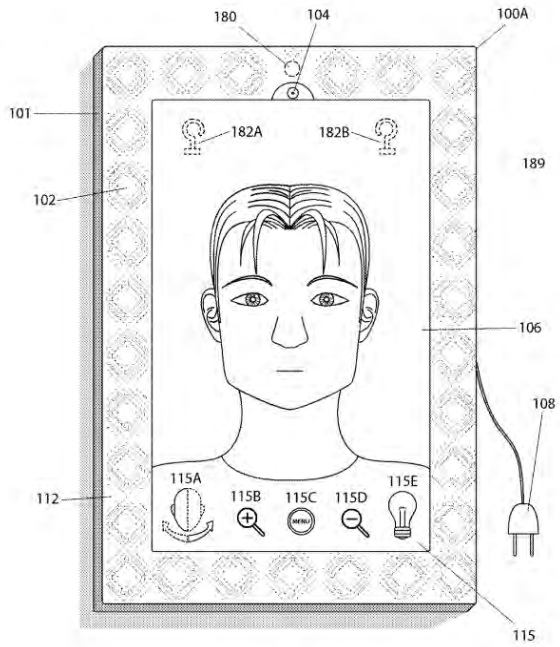
Asserted Claim of the '109 Patent	Exemplary Citations to Rowles
	 Fig. 5A  Fig. 5B "The lighting controller 616 can control the light intensity (brightness) of the lighting sources 102 in response to control signals received from the primary CPU. The type of light sources utilized may have different controllable features and characteristics. Different types of lighting controllers may be matched to the type of light sources being used. Alternatively, the lighting controller may execute algorithms to modify the illumination characteristics depending upon the type of light source 102 being controlled. Exemplary light sources include one or more of florescent, compact florescent, or light emitting diodes (LEDs)—the preferred embodiment of lighting source for the invention." *See* 16:12-23. "The camera module 104, also referred to as an image capture device, may include a lens system, an image sensor, and an optional external Image Signal Processor (ISP). The camera preferably has a high depth of field from any combination of decreased sensor

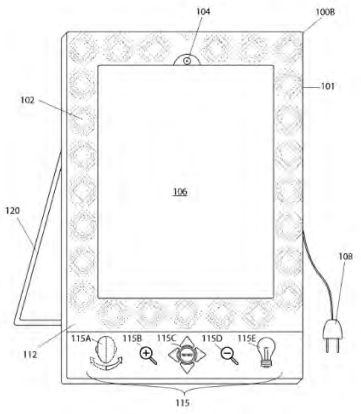
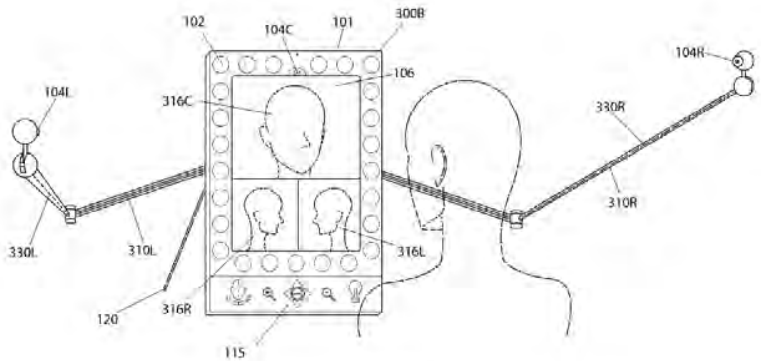
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	size, decreased aperture size, and/or an Extended Depth of Field technology within the sensor and image processing system. The image processing may be handled internally on a System-On-Chip (SOC) or on an external ISP." *See* 16:24-38. "The image processing and control system 600B illustrates the detachable camera module 304. The detachable camera module 304 may send data and receive control signals over a communication link established by the pairs of transmitter/ receivers 630,631. The detachable camera module 304 captures pixel data and may then process the pixel data or simply send it to the digital mirror base for storage or for display. The detachable camera module 304 may include its own light source 102 that is controlled by the primary CPU 612 to capture the pixel data. The detachable camera module 304 may include its own image signal processor and frame buffer memory. Otherwise, the pixel data may be sent over the communication link and through the primary CPU to the image signal processor 610 of the digital mirror base." *See* 17:20-33. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Rowles 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;	Rowles 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. "There are a number of different applications for a digital mirror. For example a wall mount digital mirror may be formed of different sizes depending on the user's discretion and interior design preferences. A large digital mirror may be desired for a user to view multiple views. A smaller digital mirror may be desired for smaller spaces and may offer a single view at a time for a quick view or reassurance.

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	The enclosure may also be integral in how the digital mirror may be configured to be compatible with the user's environment. The ability for a digital mirror to either be a focal point for the user's environment or an accessory to the user's environment may determine the style of the enclosure and thus the display size, lighting, number and size of camera as well as the resolution and focus of the camera sensor.” *See* 3:47-60. “Each camera may have its own lighting sources within its enclosure. Each camera may also provide a light sensor capability to sense the ambient light, the reflected light, and auto focus the camera's lenses, if any, in order to produce the user's desired displayed views.” *See* 5:2-6. “The digital mirror includes an image processor that allows the manipulation of captured images for display on the display device. The digital mirror may include a digital zoom to zoom in and zoom out of the captured image. The image processor can further adjust the image displayed by compensating for poor lighting, modifying the image displayed so that a user can make themselves look better or more realistic, or perform any number of digital modifications that are possible in the digital imaging field with an image processor.” *See* 6:7-15. “A digital camera, also referred to as an image capture device, may provide enhanced optics to capture images otherwise not seen by unaided eyes. The image capture device may include an optical lens or a combination of optical lenses with various properties such as: a telephoto lens for a closer view, a wide angle lens to allow a wider view, or an optical zoom lens to provide both. Utilizing a telephoto lens, an optical zoom view is possible without users having to readjust their face closer to the digital mirror. The optical zoom lens may optically zoom in and out on the user to select a frame of for captured images for display on the display device of the digital mirror. A wide-angle lens provides a wide view that can be displayed without the user moving away from the device. The camera may include an auto-focus system to provide

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	sharpness and or resolution, regardless of where the user is positioned relative to the device. The digital mirror is not limited to displaying only one full frame perspective view. Multiple cameras of a digital mirror can concurrently capture more than one perspective view of the user for display on a display device. The additional captured views can provide a more complete view of the user and or their surroundings. Alternatively, additional captured views may be used to provide a side-by-side perspective comparison. The digital camera can capture images for display full frame, side-by-side, picture in picture, or in a mosaic on the same display or on separate displays. With an optical mirror, the user previously had to move the mirror or position their own body in order to see a desired viewing angle. With multiple cameras, a user can capture different perspective views all at once." *See* 6:33-63. "The image capture device 104 may be an OMNIVISION™ OV3642 three megapixel CAMERACHIP™ sensor with a fixed focal length lens in one embodiment of the invention, for example. In this case, a digital zoom may be used to zoom in and/or zoom out on a portion of an image. Alternatively, a camera module with an optical zoom may be used that mechanically moves lenses in a linear manner back and forth, such as commonly found in point and shoot digital cameras, or a camera module with a more compact zoom may be used such as shown and described in U.S. Patent Application Publication 2006/0216018 filed by Jen Tsorng Chang on Mar. 20, 2006, incorporated herein by reference, for example." *See* 7:20-31. "The digital mirror 100A further includes a touchscreen user interface (UI) 115 mounted over the display device 106. The touchscreen UI 115 provides the user the ability to select the preferred image from a user interface menu. The touchscreen UI 115 may use capacitive sensing, surface acoustic wave (SAW), or resistive touchscreen technology. The user interface 115 may include a view mode button 115A, a zoom in button 115B to magnify a portion of the image, a menu selector button 115C, a zoom out button 115D to demagnify a portion of the image, and a light source dimmer/brightness button 115E to manually adjust the light intensity. The view mode button 115A allows a user to select

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	between a true view mode or a mirror view mode and the display of images as either true images or mirrored images, respectively. The menu selector button 115C initiates a menu to be displayed on the display device 106 from which a user can select different control functions, such as camera control functions, display control functions, lighting control functions, and power control functions. A user may pan the image through the touch screen user interface as well. A power on/off switch/button may be included as part of the interface. Alternatively, a sensor may be used to automatically power on and off the digital mirror. While the user interface 115 may be a touchscreen UI as described, other types of user interfaces may be used with a digital mirror such as a gesture recognition user interface, a voice recognition user interface (e.g., microphone, voice recognizer/decoder, speaker to question/acknowledge), an electro-mechanical user interface (e.g., buttons, switches, etc.), or a graphical user interface with a pointer, such as a mouse or stylus.” *See* 8:14-8:43.

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	 Fig. 1A “The user interface 115 provides the user the ability to select a desired view. The user interface 115 may be an electromechanical user interface and include a view mode button 115A, a zoom in button 115B, a menu selector button 115C, a zoom out button 115D, and a light source dimmer/brightness button 115E. The view mode button 115A selects between true view mode and mirror view mode to display images as a true image or a mirror image respectively. The menu selector button 115C initiates a menu to be displayed on the display device 106 from which a user can select different control functions, such as camera control functions, display control functions, lighting control functions, and power control functions. The menu also allows a user to select and save user preferred settings, such as for lighting, views etc.” *See* 9:4-9:17.

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	 Fig. 1B  Fig. 3B This limitation would have been obvious to a person of ordinary skill in the art based on (1) Rowles 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]. displaying the image on the monitor after performing the flipping, transformation mapping, and resizing;	Rowles 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. "In one embodiment of the invention, a digital mirror is disclosed including an enclosure; a display device mounted in the enclosure to display images at a front side of the enclosure; an image capture device mounted in the enclosure adjacent the display device to reduce parallax error; lights mounted in the enclosure adjacent the display device; and a light diffuser mounted to the enclosure around the display device over the one or more lights. The one or more lights provide lighting in front of the display device and the image capture device captures images in the field of view in the front. The light diffuser diffuses and softens the light emitted by the one or more lights. Alternatively, the image capture device may be mounted on an articulated arm that may be used to capture and display various angles in the filed of view of the digital mirror." *See* Abstract. "Typical optical mirrors composed of a reflective material and potentially, encapsulated in glass, have characteristics that may not satisfy a user's requirements. A digital mirror has the ability to improve the user's experience in providing extended views of the user's features. The digital mirror also has the ability to enhance displayed images through the using imaging electronic components and software. Additionally, the combination of a plurality of lighting sources with selectable intensity, a plurality of camera choices and mounting applications may also enhance the user's experience. There are a number of different applications for a digital mirror. For example a wall mount digital mirror may be formed of different sizes depending on the user's discretion and interior design preferences. A large digital mirror may be desired for a user to view multiple views. A smaller digital mirror may be desired for smaller spaces and may offer a single view at a time for a quick view or reassurance.

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	The enclosure may also be integral in how the digital mirror may be configured to be compatible with the user's environment. The ability for a digital mirror to either be a focal point for the user's environment or an accessory to the user's environment may determine the style of the enclosure and thus the display size, lighting, number and size of camera as well as the resolution and focus of the camera sensor. A self-supported digital mirror (DM) may be used as a vanity mirror. It may include means for capturing side views for left, right and center viewing. The angle of the display of the digital mirror may be adjusted by a stand. A user interface further enables the user to select lighting, images to be viewed, and mirrored images (transposed from left to right) or true images (non transposed). In other embodiments of the invention, multiple cameras may extend to the left and right of the user to capture left, right, and side images for displaying on a single center display. The additional cameras can be moved to capture or whatever angles the user desires to view. The user simply may select the desired view through a menu of a graphics user interface or buttons of an electromechanical user interface. Multiple images of different views may be concurrently displayed in a mosaic arrangement on a display. This is different with an optical mirror. The enclosure houses together one or more of the lighting capabilities and arrangements, the camera views, and the display device software executed by a process may further enhance the display of images on a digital mirror. The ability to alter digital images is a common technique used in digital photography. Software may interactive with the elemental components such that lighting can be automatically dimmed or made brighter depending on the user's preference settings, such as an auto brightness feature. The enclosure may house one or more lighting sources such as incandescent lights, florescent lights, compact florescent lights, or LED (light emitting diode) devices, may be used singularly or in any combination in order to facilitate the user's desired lighting. Light sources have well defined characteristics such as incandescent lights sources may be seen as having a yellow tint where as florescent lights may be seen to have a bluish tint. Lighting to display appropriate shades of images

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	provided by the digital mirror may also be responsive to the user's movement and ambient lighting conditions given the time of day.” *See* 3:37-4:30. “In another embodiment of the invention a portable, battery powered compact digital mirror would be very beneficial for travel or where AC powered accessories are not easily supported. In this case the camera, the lighting sources, and display device technology are selected to support battery-powered operation. Sensors may be used to prevent excessive battery-power drain and increase viewing time by adjusting the lighting intensity in response to the reflective light and ambient light. The cameras of each digital mirror may act as the light sensor for each. Sensors may adjust lighting intensity and color depending on the users preferred settings for a particular ambient environment. For example, a compact version of the digital mirror may be used in a dark setting. In this case a sensor setting may be used to prevent a bright display that may be distracting. The digital mirror also provides the ability to view a true non-transposed image of a user. Typical optical mirrors provide a transposed or mirrored image to the viewer such that the left side of an object/user is transposed to the right side of the image and the right side of an object/user is transposed to the left side of the image. A digital mirror can display either view depending on the user's selection through a GUI or an electromechanical user interface. Digital images can also be enhanced through software to change the user's appearance, such as remove wrinkles or age spots or any other variety of commonly undesired user appearance features. Digital imaging software may also manipulate the user's image to add features to the user's image. In another embodiment of the invention, the camera may be detachable or separate from the display. The camera may communicate wirelessly through a common wireless protocol, such as IEEE 802.11. The ability to eliminate wires between the camera and display provides additional flexibility in locating the camera. For example, a detachable camera may be positioned behind the user's head. Additionally, left and right side wired/wireless cameras may be used to communicate with the display base to produce a

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	plurality of images for the user to select from. Each camera may have its own lighting sources within its enclosure. Each camera may also provide a light sensor capability to sense the ambient light, the reflected light, and auto focus the camera's lenses, if any, in order to produce the user's desired displayed views. The digital mirror may also be used to store or archive pictures for future comparisons. The user may also select a number of stored images in the digital mirror to be shown in a continuous manner similar to a slide show. The growth or development of a user may be displayed by capturing facial changes over the years. The captured image frames may be correlated an displayed as a movie or video. The camera may be used to take individual pictures, single image frame, or record video (a plurality of image frames over a time period) depending on the amount of storage available. Subsequently, the user may elect to show pictures for the purpose of décor, such as a digital picture frame. A wireless interface allows a user to store pictures and or movies on a remote computer system and transmit them to the digital mirror in the form of a stream file. The digital mirror may also send pictures back to the remote computer system for archival and or further editing or manipulation. A built-in image signal processor allows the captured images on the digital mirror to be manipulated. This allows the user to enhance their characteristics, such as to reduce wrinkles or remove skin blemishes for example. Selective control of the lighting intensity can also improve the image quality captured by the digital mirror.” *See* 4:31-5:29. “Digital Mirror System A digital mirror is an apparatus that captures and displays an image to a user through the use of a digital electronic system. The digital mirror includes an image capture device and a display device on the same side to display the captured image to a user. A digital mirror further includes a user interface and an internal electronic control and image

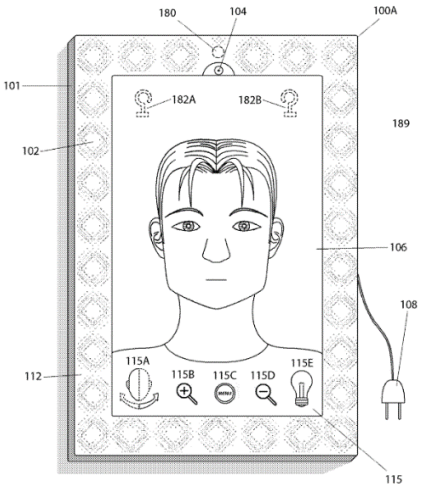
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	processing system to control the camera and the display device and process captured images for display on the display device. A digital mirror has a number of advantages over an optical mirror. A digital mirror provides a user with an improved mirror viewing experience compared to a conventional reflective optical mirror through the capabilities of digital imaging. A traditional optical mirror is limited by the ambient environment such as physical location, lighting, and viewing angle of the user. A poorly lit environment can significantly influence the image seen by a user. The user is also limited by their own vision being able to see only in a direct line of sight. A traditional optical mirror is limited in that it can only display to the user a mirrored or reflected image. A digital mirror can overcome one or more of these limitations. The influence of asymmetry in humans plays a large role in how we view ourselves and how the rest of the world views us. A digital mirror has an ability to show the user a true life image of how others see them, rather than a mirrored image. In one embodiment of the invention, a freeze frame capture or video replay in a true view mode is provided so that users may study themselves without having to remain fixed in one position. A digital mirror enables the captured image input to be separated from the displayed output. Because the image capture device (e.g., a camera) and the display device are separate devices, the image capture device may be positioned so that the user's desired view may be displayed without changing the users position. Furthermore, users are not limited to direct line of sight viewing or using multiple mirrors in order to view themselves from different perspectives. The camera or image capture device may include lighting proximately mounted to illuminate the subject. In order to secure the position of the camera without the user holding it, the camera may include a clamp or stand coupled to a flexible arm or an articulating arm. The digital mirror includes an image processor that allows the manipulation of captured images for display on the display device. The digital mirror may include a digital zoom to zoom in and zoom out of the captured image. The image processor can further adjust

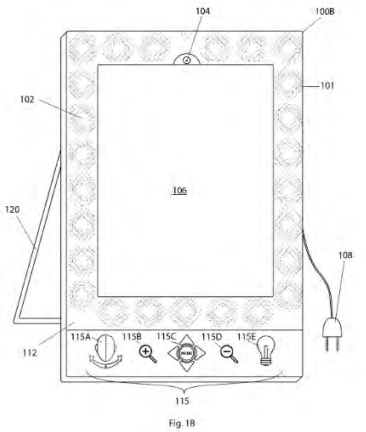
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	the image displayed by compensating for poor lighting, modifying the image displayed so that a user can make themselves look better or more realistic, or perform any number of digital modifications that are possible in the digital imaging field with an image processor. The digital mirror may provide substantially all the lighting a user needs to capture images. There is no need to adjust the environment to a digital mirror. The digital mirror can adapt to the user's environment. The digital mirror, along with a detachable camera if so equipped, includes or more light sources to illuminate the user within expected distances of use. Exposure and gain of the image capture device can be adjusted to improve image capture and or video displayed to the user. The digital mirror can store captured images to separate them from the image being displayed by the display device. A user can selectively freeze an image or replay a stored image to see themselves as they were in the past. Users no longer need to hold a position or expression, perform a motion over and over, or hold their eyes open to see themselves as the digital mirror can capture images for later display when a user's eyes are closed. A digital camera, also referred to as an image capture device, may provide enhanced optics to capture images otherwise not seen by unaided eyes. The image capture device may include an optical lens or a combination of optical lenses with various properties such as: a telephoto lens for a closer view, a wide angle lens to allow a wider view, or an optical zoom lens to provide both. Utilizing a telephoto lens, an optical zoom view is possible without users having to readjust their face closer to the digital mirror. The optical zoom lens may optically zoom in and out on the user to select a frame of for captured images for display on the display device of the digital mirror. A wide-angle lens provides a wide view that can be displayed without the user moving away from the device. The camera may include an auto-focus system to provide sharpness and or resolution, regardless of where the user is positioned relative to the device.

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	The digital mirror is not limited to displaying only one full frame perspective view. Multiple cameras of a digital mirror can concurrently capture more than one perspective view of the user for display on a display device. The additional captured views can provide a more complete view of the user and or their surroundings. Alternatively, additional captured views may be used to provide a side-by-side perspective comparison. The digital camera can capture images for display full frame, side-by-side, picture in picture, or in a mosaic on the same display or on separate displays. With an optical mirror, the user previously had to move the mirror or position their own body in order to see a desired viewing angle. With multiple cameras, a user can capture different perspective views all at once. A digital mirror can displace optical mirrors as a decoration in a home or office environment. Because the digital mirror provides its own illumination, it has the ability to capture and display an image, even in poor lighting conditions. The digital mirror can be used in poorly lit rooms within the home, a visor mirror in automobiles at night, or in a plurality of environments in its portable compact version.” *See* 5:31-7:3. “The image capture device 104 may be an OMNIVISION™ OV3642 three megapixel CAMERACHIP™ sensor with a fixed focal length lens in one embodiment of the invention, for example. In this case, a digital zoom may be used to zoom in and/or zoom out on a portion of an image. Alternatively, a camera module with an optical zoom may be used that mechanically moves lenses in a linear manner back and forth, such as commonly found in point and shoot digital cameras, or a camera module with a more compact zoom may be used such as shown and described in U.S. Patent Application Publication 2006/0216018 filed by Jen Tsorng Chang on Mar. 20, 2006, incorporated herein by reference, for example. The display device 106 may be a liquid crystal display (LCD) device or an organic light emitting diode (OLED) display device. The display device 106 provides the viewing medium for the user to observe one or more desired images captured by the camera 104. Surrounding the display device 106 is the selective light sources 102 that may be one or more of light emitting diodes (LED), incandescent, florescent, or any combination of

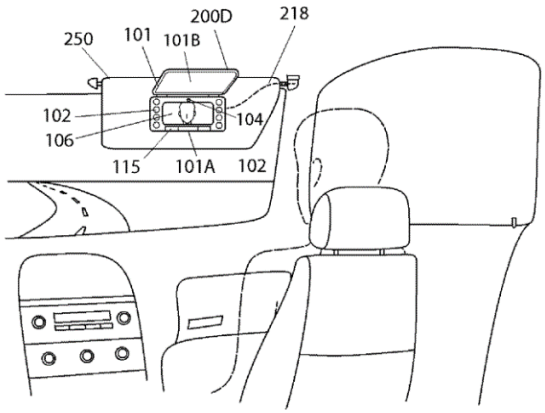
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	light source that can provide light and illuminate a user. The lighting provided by the light sources 102 of the digital mirror may be responsive to the environment (e.g., ambient lighting) and one or more user preferred settings (e.g., automatic light sensing, manual light control) that are stored and provided to the digital image processing control electronics." *See* 7:20-45. "The light diffuser 112 is mounted to the enclosure to cover over the light sources 102. The light diffuser 112 diffuses or scatters the light generated by the light sources 102 in order to produce a softer light for the object or user in the target viewing area. The light diffuser 112 minimizes glare and other lighting aberrations that may tend to wash out or distort images captured by the image capture device 104 (also referred to as a camera). The light diffuser 112 may be shaped similar to the enclosure 101 and has an opening 113 to be mounted around the shape of the display device 106. In one embodiment of the invention, the enclosure and the display device are rectangular in shape such that the light diffuser 112 has a frame shape with a rectangular opening 113 (see FIG. 1C). In another embodiment of the invention, the enclosure and display device are oval shaped such that the light diffuser 112 also has an oval frame shape with an oval opening. The light diffuser 112 may include an opening around the camera to allow the capture of images in the field of view of the front side of the digital mirror." *See* 7:46-64. "In FIG. 1A, the camera 104 can be located just above the display device 106 near a notched out area of the selective lighting 102 and light diffuser 112. To minimize parallax and ensure the user can obtain the desired angle of view, the camera 104 is mounted as close as possible to the display device or under/over the display device. For example, the camera 104 may be centered within the display device 106 in order to minimize parallax. The camera 104 may also be mounted over display device 106, such as shown in FIGS. 3E-3F for example. Alternatively, the camera 104 may be mounted under the display device, such as shown in FIG. 3G for example. Digital imaging software may be used to compensate for the pixels in the display device 106 that are covered or interrupted by the camera. The number of pixels covered by the camera may

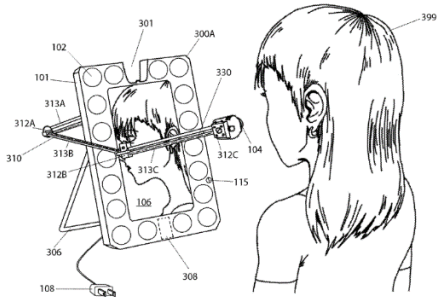
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	be determined from the size of the camera and depth of field required for the digital mirror 100A. The digital mirror 100A further includes a touchscreen user interface (UI) 115 mounted over the display device 106. The touchscreen UI 115 provides the user the ability to select the preferred image from a user interface menu. The touchscreen UI 115 may use capacitive sensing, surface acoustic wave (SAW), or resistive touchscreen technology. The user interface 115 may include a view mode button 115A, a zoom in button 115B to magnify a portion of the image, a menu selector button 115C, a zoom out button 115D to demagnify a portion of the image, and a light source dimmer/brightness button 115E to manually adjust the light intensity. The view mode button 115A allows a user to select between a true view mode or a mirror view mode and the display of images as either true images or mirrored images, respectively. The menu selector button 115C initiates a menu to be displayed on the display device 106 from which a user can select different control functions, such as camera control functions, display control functions, lighting control functions, and power control functions. A user may pan the image through the touch screen user interface as well. A power on/off switch/button may be included as part of the interface. Alternatively, a sensor may be used to automatically power on and off the digital mirror. While the user interface 115 may be a touchscreen UI as described, other types of user interfaces may be used with a digital mirror such as a gesture recognition user interface, a voice recognition user interface (e.g., microphone, voice recognizer/decoder, speaker to question/acknowledge), an electro-mechanical user interface (e.g., buttons, switches, etc.), or a graphical user interface with a pointer, such as a mouse or stylus." *See* 7:65-8:43.

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	 Fig. 1A “Referring now to FIG. 1B, a second digital mirror 100B is illustrated that stands up and is self-supported upon a vanity or desktop surface. The digital mirror 100B receives AC power for the lighting, the digital imaging electronics, and the display through the AC power cord 108. The digital mirror 100B includes an enclosure 101 that has a pivotal stand 120. The pivotal stand 120 stands the digital mirror up upon a surface. The pivotal stand 120 can pivot to adjust its angle with the enclosure to provide flexibility in adjusting the angle and height of the mirror to the user's position. The display device 106 is mounted in the enclosure 101. The display device 106 may be an LCD display, a plasma display, an OLED display, or any other type of image display medium. The camera 104 is located near the top and in front of the display to minimize parallax. The digital mirror 100B includes light diffuser 112 to scatter the light from the device light source 102 surrounding the display device 106. The enclosure 101 houses the display device 106.

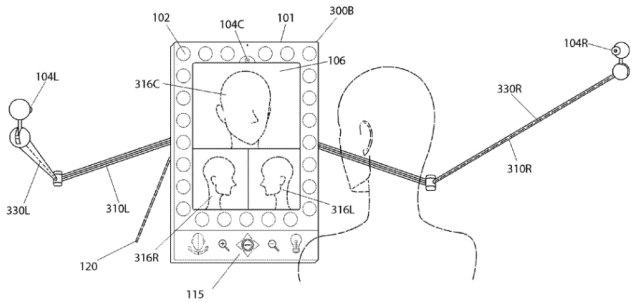
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	The user interface 115 provides the user the ability to select a desired view. The user interface 115 may be an electromechanical user interface and include a view mode button 115A, a zoom in button 115B, a menu selector button 115C, a zoom out button 115D, and a light source dimmer/brightness button 115E. The view mode button 115A selects between true view mode and mirror view mode to display images as a true view image or a mirror view image, respectively. The menu selector button 115C initiates a menu to be displayed on the display device 106 from which a user can select different control functions, such as camera control functions, display control functions, lighting control functions, and power control functions. The menu also allows a user to select and save user preferred settings, such as for lighting, views etc." *See* 8:53-9:17.  Fig. 1B "The user interface 115 for the portable digital mirror 200A may be a single electro-mechanical button that is responsive to the number of times the button is toggled. For example, depressing the button in rapid succession three times may execute a change in the rotation of the view angle. Alternatively, holding the button down may increase the LED lighting 102 brightness to a peak illumination and then start to decrease the

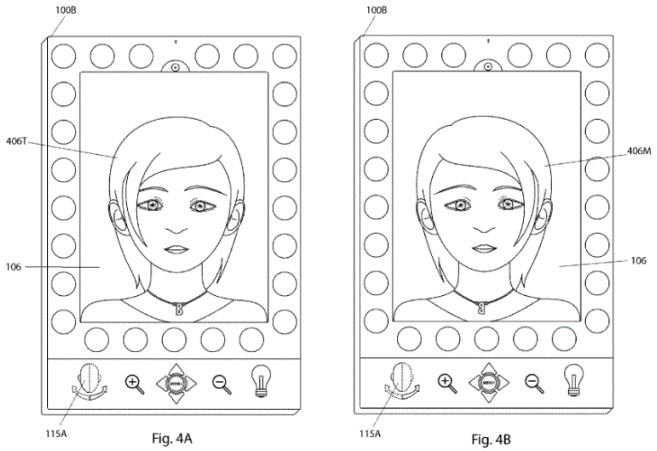
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	brightness. Once the desired level of brightness is achieved, the user can let go of the button." *See* 10:4-12. "Referring now to FIG. 2D, a visor digital mirror 200D is shown coupled to an automotive sun visor 250. The visor digital mirror 200D may include enclosure halves 101A-101B that flip open and closed like those of the digital mirror 200A or alternatively, a slideable cover that slides open and closed over the display device in the enclosure half 101A. In either case, the second enclosure half is moveably (e.g., pivotally or slidingly) coupled to the first enclosure half. The enclosure half 101A is mounted to the sun visor 250 and rests thereon when folded up away into the ceiling of the car. When enclosure half 101B is flipped open to reveal the display device 106, a switch may automatically power on the digital mirror. When flipped closed to cover over the display device 106 to protect it from dirt and whatever else, the switch may power off the digital mirror. The slideable cover may slide open to reveal the display device 106 and power on the digital mirror and slide closed to cover over the display device 106 and power off the digital mirror. The digital mirror 200D is powered through a wire cable 218 connected to the automobiles direct current power supply having a nominal twelve (12) volts DC. The digital mirror includes the display device 106 mounted in the first enclosure half 101A, a camera (also referred to as an image capture device) 104 mounted in the first enclosure half 101A, one or more light sources 102 mounted in the enclosure half 101A on the left and right sides of the display device 106, and the user interface 115 mounted in the first enclosure half 101A. The second enclosure half 101B protects the digital mirror 200D when not in use. The second enclosure half 101A houses the components of the digital mirror 200D and provides a means to mount it to the sun visor 250D." *See* 10:21-52.

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	 Fig. 2D “Referring now to FIG. 3A, a digital mirror 300A is now illustrated capturing an image of a user 399 that is displayed on the display device 106. The digital mirror 300A is a rechargeable, self standing digital mirror including a pivotal stand 306 and rechargeable batteries 308. The pivotal stand 306 is pivotally coupled to a back side of the enclosure 101 to support the digital mirror on surface. The digital mirror 300A further includes a detachable camera 104 that is coupled to the enclosure 101 by an articulating arm 310. The camera 104 is mounted at the distal end of the arm 310. The proximal end of the arm 310 is coupled to the enclosure 101. One or more lights 102 that may be mounted adjacent the camera 104 to provide lighting in front of the digital camera 104 to facilitate the capture of images, such as shown by FIG. 3D. A camera cable 330 may couple the camera 104 to the underlying image processing system (see FIG. 6A) to provide power and control signals and receive pixel data for each image frame captured. Alternatively, wireless transmitter/receivers may be used to

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	send the captured images to the underlying image processing system (see FIG. 6B) mounted in the enclosure 101.” *See* 10:53-11:6.  Fig. 3A “Referring now to FIG. 3B, a digital mirror 300B is illustrated that includes a plurality of cameras—a left camera 104L, a center camera 140C, and a right camera 104R. The digital mirror 300B is self-supporting including an optional stand 120 and/or means to be wall mounted (e.g. hole 180 or hooks 182A-182B shown in FIG. 1A) so that it can capture images hands-free, without the user having to hold any camera. One or more lights 102 may be mounted adjacent each of the left camera 104L and the right camera 104R, such as shown by FIG. 3D, to provide lighting in front of each and facilitate the capture of images. One or more lights 102 may also be mounted around the display device 106 to provide lighting in front of the display device to facilitate the capture of images. The digital mirror 300B includes additional cameras so that the user can concurrently capture and then display images of different views from various fields of view. A digital camera can capture images for display full frame, side-by-side, picture in picture, or in a mosaic on the same display. For example, the left camera 104L may capture a left side view of a user, the center camera 140C may capture a front side view of the user, and the right camera 104R may capture a right side view of the user concurrently. The digital

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	mirror 300B can also concurrently display left side images 316L captured by the left camera 104L, front side images 316C captured by the center camera 140C, and right side images 316R captured by the right camera 104R in a mosaic arrangement on the display device 106, in response to a selection by the user with the user interface 115. The digital mirror 300B can also display these images separately as full frame images on the display device 106, such as shown by FIGS. 1A, 2D, 3A, 4A-4B, and supported by FIGS. 5A-5B and the description thereof, in response to a selection by the user through the user interface 115. The left side images 316L, the front side images 316C, and the right side images 316R displayed in the mosaic arrangement may all be live images continuously captured by the cameras and displayed on the display device 106. Alternatively, one or more of the left side images 316L, the front side images 316C, and the right side images 316R displayed in the mosaic arrangement may be stored images previously captured by the cameras and read out from a storage device. For example, the front side images 316C may be live images while the left side images 316L and the right side images 316R may be stored images read out from the storage device and displayed on the display device. The center camera 104C is mounted to the enclosure 101 adjacent the display device 106 to reduce parallax. The center camera 104C captures a frontal view of the user or alternatively, a back view of the user if the user rotates himself/herself around so his back faces the center camera. For example, the user shown in FIG. 3B facing the camera 104C and the display 106 could turn around so that the back of their head is facing the camera 104C. After capturing and storing a few frames of images of the back of their head, the user can turn back around and select with the user interface 115 to recall the captured images of the back of their head for display on the display device 106. Similarly, frames of left and right side images may be captured with the left and right cameras 1041,104R respectively and stored in a storage device (e.g., see storage device 644 in FIGS. 6A-6B) of the digital mirror. The user can then select through the user interface 115 to recall the captured images of the one more sides of their head for separate or concurrent display on the display device 106 to provide a more complete view of them selves.

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	The left camera 104L and the right camera 104R are respectively mounted to the distal ends of a left articulating arm 310L and a right articulating arm 31 OR respectively. The proximal ends of the left articulating arm 310L and the right articulating arm 31 OR are coupled to the left and right of the enclosure 101 respectively. The left camera 104L and the right camera 104R are electrically coupled to the image processing system (See FIGS. 6A-6B) by cables 330 extending through the arms 310L,310R. The cables 330 may be electrical wire cables or optical fiber cables to couple the cameras 104L,104R and image processor system electronics together. In an alternate embodiment, the cameras 104L,104R may be wireless cameras and communicate with a wireless digital mirror base with a wireless communication protocol as described herein.” *See* 11:44-12:55.  Fig. 3B “The digital camera 104 can also be mounted under the display device 106 to reduce parallax. Provisional Patent Application No. 61/338,106 filed on Feb. 16, 2010 by John W. Rowles, et al., entitled TECHNIQUES FOR IMAGE CAPTURE THROUGH LIQUID CRYSTAL DISPLAYS, describes how to mount a camera under a liquid crystal display (LCD) device and capture images. The digital camera may be mounted between an LCD pixel panel and a backlighting panel. Alternatively, the camera may replace a few pixels and be interspersed between pixels of the LCD pixel panel. In another embodiment of the invention, the digital camera 104 can also be mounted under

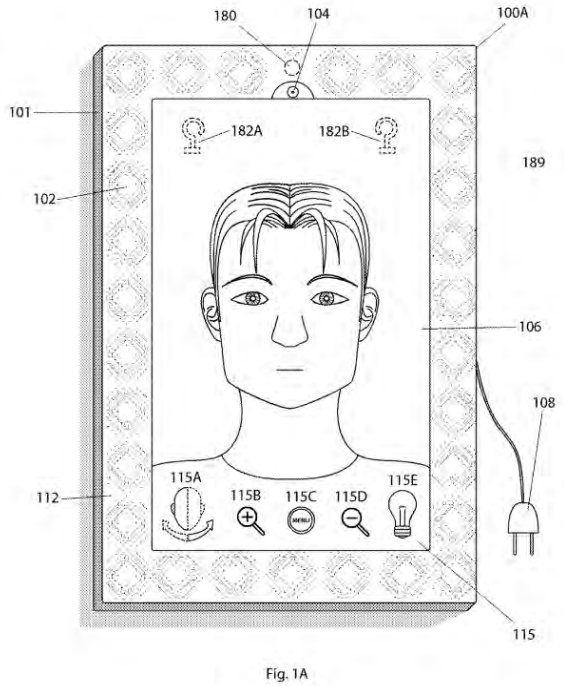
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	an organic light emitting diode (OLED) display device 106 to reduce parallax. Alternatively, the digital camera 104 may replace a few pixels and be interspersed between pixels of the organic light emitting diodes.” *See* 13:43-58. “Referring now to FIG. 4A, in response to true view mode being selected through the view mode selector 115A of the user interface, a true image 406T is displayed by the display device 106 of the digital mirror 100B. A conventional optical mirror does not display the true image 406T if a user stands in front of the optical mirror. The letter B on the necklace in the true image 406T has a proper orientation. FIG. 4B illustrates a mirrored image 406M being displayed in response to the mirror view mode being selected by the user interface view mode selector 115A. A conventional optical mirror may display an image similar to the mirrored image 406M.” *See* 14:6-17.  “Referring now to FIG. 5A, a representation of a single frame of pixel data configured into columns and rows is illustrated. A frame of pixel data is captured by the image

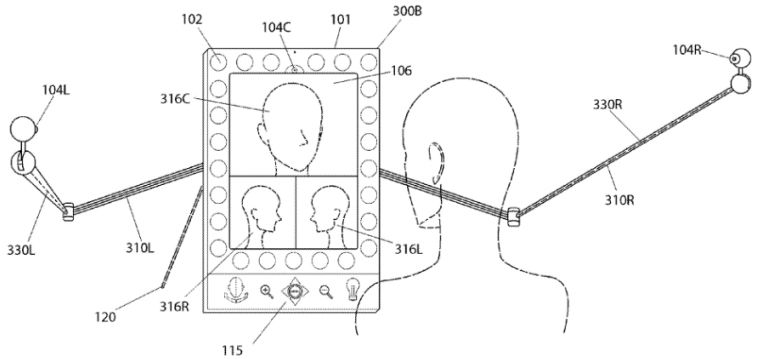
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	capture device 104 and stored in digital format into the memory locations of a frame buffer memory. A frame of data may written into the frame buffer memory and organized as illustrated in FIG. 5A, such as by writing from left to right (pixel P11 to pixel Pm1). In response to user selections (e.g., true view mode or mirror view mode), the pixel data stored in the frame buffer memory can be readily processed by an image signal processor as desired. In a true view mode, the frame of data may be read out similarly (e.g., from left to right—pixel P11 to pixel Pm1) and displayed on the display device as shown in FIG. 5A. Pixel P11 is displayed in the upper left corner, pixel Pm1 is displayed in the upper right corner, pixel P1n is displayed in the lower left corner, and pixel Pmn is displayed in the lower right corner. In this manner, the pixel data is displayed on the display device of the digital mirror as it was captured by the image capture device. The true view mode displays true images to the user as how third persons see the user, such as shown in FIG. 4A. In a mirror view mode, the frame of pixel data saved into the frame buffer memory is read out differently from how it was written by reversing the addressing of memory locations into the frame buffer memory. The arrangement of the pixel data in the rows and columns is read out of the memory locations in a reverse order (e.g., from right to left—Pm1 to P11) to transpose or horizontally flip the captured image into a horizontally mirrored image. FIG. 5B illustrates how the mirrored image is displayed on the display device 106 of the digital mirror in response to the mirror view mode. For example, pixel Pm1 is now displayed in the upper left corner of the display device, pixel P11 is displayed in the upper right corner of the display device, pixel Pmn is displayed in the lower left corner, and pixel P1n is displayed in the lower right corner. The mirror view mode displays mirror images on the display device to the user, such as shown in FIG. 4B, similar to how an optical mirror does." *See* 14:18-56. "The image processing and control system 600B illustrates the detachable camera module 304. The detachable camera module 304 may send data and receive control

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	signals over a communication link established by the pairs of transmitter/ receivers 630,631. The detachable camera module 304 captures pixel data and may then process the pixel data or simply send it to the digital mirror base for storage or for display. The detachable camera module 304 may include its own light source 102 that is controlled by the primary CPU 612 to capture the pixel data. The detachable camera module 304 may include its own image signal processor and frame buffer memory. Otherwise, the pixel data may be sent over the communication link and through the primary CPU to the image signal processor 610 of the digital mirror base." *See* 17:20-33. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Rowles 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;	Rowles 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. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Rowles 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	Rowles 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. "Each camera may have its own lighting sources within its enclosure. Each camera may also provide a light sensor capability to sense the ambient light, the reflected light, and auto focus the camera's lenses, if any, in order to produce the user's desired displayed views." *See* 5:2-6.

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	“The digital mirror includes an image processor that allows the manipulation of captured images for display on the display device. The digital mirror may include a digital zoom to zoom in and zoom out of the captured image. The image processor can further adjust the image displayed by compensating for poor lighting, modifying the image displayed so that a user can make themselves look better or more realistic, or perform any number of digital modifications that are possible in the digital imaging field with an image processor. The digital mirror may provide substantially all the lighting a user needs to capture images. There is no need to adjust the environment to a digital mirror. The digital mirror can adapt to the user's environment. The digital mirror, along with a detachable camera if so equipped, includes or more light sources to illuminate the user within expected distances of use. Exposure and gain of the image capture device can be adjusted to improve image capture and or video displayed to the user.” *See* 6:7-24. “A digital camera, also referred to as an image capture device, may provide enhanced optics to capture images otherwise not seen by unaided eyes. The image capture device may include an optical lens or a combination of optical lenses with various properties such as: a telephoto lens for a closer view, a wide angle lens to allow a wider view, or an optical zoom lens to provide both. Utilizing a telephoto lens, an optical zoom view is possible without users having to readjust their face closer to the digital mirror. The optical zoom lens may optically zoom in and out on the user to select a frame of for captured images for display on the display device of the digital mirror. A wide-angle lens provides a wide view that can be displayed without the user moving away from the device. The camera may include an auto-focus system to provide sharpness and or resolution, regardless of where the user is positioned relative to the device. The digital mirror is not limited to displaying only one full frame perspective view. Multiple cameras of a digital mirror can concurrently capture more than one perspective view of the user for display on a display device. The additional captured views can

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	provide a more complete view of the user and or their surroundings. Alternatively, additional captured views may be used to provide a side-by-side perspective comparison. The digital camera can capture images for display full frame, side-by-side, picture in picture, or in a mosaic on the same display or on separate displays. With an optical mirror, the user previously had to move the mirror or position their own body in order to see a desired viewing angle. With multiple cameras, a user can capture different perspective views all at once." *See* 6:33-63. "The image capture device 104 may be an OMNIVISION™ OV3642 three megapixel CAMERACHIP™ sensor with a fixed focal length lens in one embodiment of the invention, for example. In this case, a digital zoom may be used to zoom in and/or zoom out on a portion of an image. Alternatively, a camera module with an optical zoom may be used that mechanically moves lenses in a linear manner back and forth, such as commonly found in point and shoot digital cameras, or a camera module with a more compact zoom may be used such as shown and described in U.S. Patent Application Publication 2006/0216018 filed by Jen Tsorng Chang on Mar. 20, 2006, incorporated herein by reference, for example." *See* 7:20-31. "The digital mirror 100A further includes a touchscreen user interface (UI) 115 mounted over the display device 106. The touchscreen UI 115 provides the user the ability to select the preferred image from a user interface menu. The touchscreen UI 115 may use capacitive sensing, surface acoustic wave (SAW), or resistive touchscreen technology. The user interface 115 may include a view mode button 115A, a zoom in button 115B to magnify a portion of the image, a menu selector button 115C, a zoom out button 115D to demagnify a portion of the image, and a light source dimmer/brightness button 115E to manually adjust the light intensity. The view mode button 115A allows a user to select between a true view mode or a mirror view mode and the display of images as either true images or mirrored images, respectively. The menu selector button 115C initiates a menu to be displayed on the display device 106 from which a user can select different control functions, such as camera control functions, display control functions, lighting control functions, and power control functions. A user may pan the image through the touch screen user interface as well. A power on/off switch/button may be included as part of

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	the interface. Alternatively, a sensor may be used to automatically power on and off the digital mirror. While the user interface 115 may be a touchscreen UI as described, other types of user interfaces may be used with a digital mirror such as a gesture recognition user interface, a voice recognition user interface (e.g., microphone, voice recognizer/decoder, speaker to question/acknowledge), an electro-mechanical user interface (e.g., buttons, switches, etc.), or a graphical user interface with a pointer, such as a mouse or stylus.” *See* 8:14-8:43.  Fig. 1A “The user interface 115 provides the user the ability to select a desired view. The user interface 115 may be an electromechanical user interface and include a view mode button 115A, a zoom in button 115B, a menu selector button 115C, a zoom out button 115D,

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	and a light source dimmer/brightness button 115E. The view mode button 115A selects between true view mode and mirror view mode to display images as a true image or a mirror image respectively. The menu selector button 115C initiates a menu to be displayed on the display device 106 from which a user can select different control functions, such as camera control functions, display control functions, lighting control functions, and power control functions. The menu also allows a user to select and save user preferred settings, such as for lighting, views etc.” *See* 9:4-9:17.  Fig. 3B This limitation would have been obvious to a person of ordinary skill in the art based on (1) Rowles 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[h]. varying rate at which the non-ordered steps are performed on the series of images according to the distance.	Rowles 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. "Some sort of power supply 618 couples to each active device to supply power. The different types of power supplies 618 that may be used include rechargeable batteries, automobile DC power, AC power grid, or a solar panel. In one embodiment of the invention, the power supply 618 includes an auto sensing mechanism to automatically shut off power and/or enter a low power sleep mode after a predetermined period of inactivity and to automatically power on the digital mirror supplying power to the components in response to sensing the presence of a user." *See* 15:9-19. "The menu selector button 115C initiates a menu to be displayed on the display device 106 from which a user can select different control functions, such as camera control functions, display control functions, lighting control functions, and power control functions." *See* 8:27-32. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Rowles 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	Rowles 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.

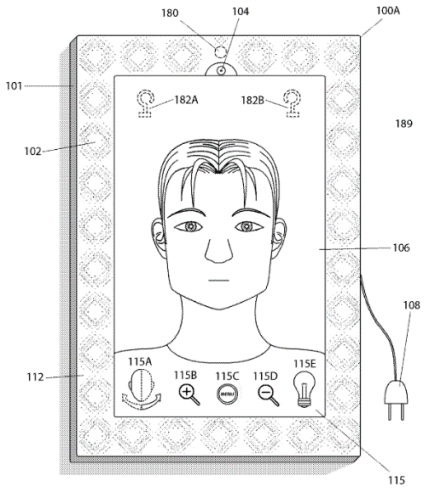
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camera positioned at eye-level height and pointing horizontally.	"In one embodiment of the invention, a digital mirror is disclosed including an enclosure; a display device mounted in the enclosure to display images at a front side of the enclosure; an image capture device mounted in the enclosure adjacent the display device to reduce parallax error; lights mounted in the enclosure adjacent the display device; and a light diffuser mounted to the enclosure around the display device over the one or more lights. The one or more lights provide lighting in front of the display device and the image capture device captures images in the field of view in the front. The light diffuser diffuses and softens the light emitted by the one or more lights. Alternatively, the image capture device may be mounted on an articulated arm that may be used to capture and display various angles in the filed of view of the digital mirror." *See* Abstract. "A self-supported digital mirror (DM) may be used as a vanity mirror. It may include means for capturing side views for left, right and center viewing. The angle of the display of the digital mirror may be adjusted by a stand. A user interface further enables the user to select lighting, images to be viewed, and mirrored images (transposed from left to right) or true images (non transposed). In other embodiments of the invention, multiple cameras may extend to the left and right of the user to capture left, right, and side images for displaying on a single center display. The additional cameras can be moved to capture or whatever angles the user desires to view. The user simply may select the desired view through a menu of a graphics user interface or buttons of an electromechanical user interface. Multiple images of different views may be concurrently displayed in a mosaic arrangement on a display. This is different with an optical mirror. The enclosure houses together one or more of the lighting capabilities and arrangements, the camera views, and the display device software executed by a process may further enhance the display of images on a digital mirror. The ability to alter digital images is a common technique used in digital photography. Software may interactive with the elemental components such that lighting can be automatically dimmed or made brighter depending on the user's preference settings, such as an auto brightness feature. The enclosure may house one or more lighting sources

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	such as incandescent lights, florescent lights, compact florescent lights, or LED (light emitting diode) devices, may be used singularly or in any combination in order to facilitate the user's desired lighting. Light sources have well defined characteristics such as incandescent lights sources may be seen as having a yellow tint where as florescent lights may be seen to have a bluish tint. Lighting to display appropriate shades of images provided by the digital mirror may also be responsive to the user's movement and ambient lighting conditions given the time of day.” *See* 3:61-4:30. “The digital mirror also provides the ability to view a true non-transposed image of a user. Typical optical mirrors provide a transposed or mirrored image to the viewer such that the left side of an object/user is transposed to the right side of the image and the right side of an object/user is transposed to the left side of the image. A digital mirror can display either view depending on the user's selection through a GUI or an electromechanical user interface. Digital images can also be enhanced through software to change the user's appearance, such as remove wrinkles or age spots or any other variety of commonly undesired user appearance features. Digital imaging software may also manipulate the user's image to add features to the user's image.” *See* 4:47-59. “A digital mirror has a number of advantages over an optical mirror. A digital mirror provides a user with an improved mirror viewing experience compared to a conventional reflective optical mirror through the capabilities of digital imaging. A traditional optical mirror is limited by the ambient environment such as physical location, lighting, and viewing angle of the user. A poorly lit environment can significantly influence the image seen by a user. The user is also limited by their own vision being able to see only in a direct line of sight. A traditional optical mirror is limited in that it can only display to the user a mirrored or reflected image. A digital mirror can overcome one or more of these limitations.” *See* 5:41-52. “A digital mirror enables the captured image input to be separated from the displayed output. Because the image capture device (e.g., a camera) and the display device are separate devices, the image capture device may be positioned so that the user's desired view may be displayed without changing the users position. Furthermore, users are not

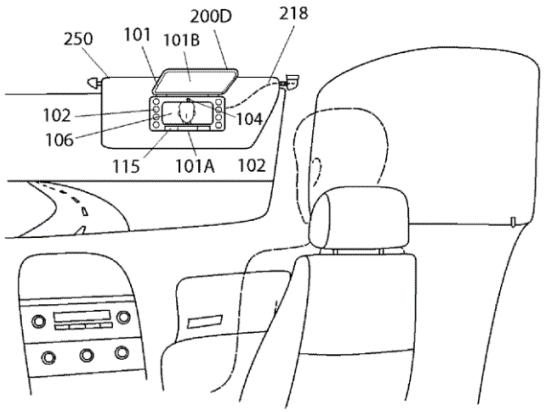
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	limited to direct line of sight viewing or using multiple mirrors in order to view themselves from different perspectives. The camera or image capture device may include lighting proximately mounted to illuminate the subject. In order to secure the position of the camera without the user holding it, the camera may include a clamp or stand coupled to a flexible arm or an articulating arm. The digital mirror includes an image processor that allows the manipulation of captured images for display on the display device. The digital mirror may include a digital zoom to zoom in and zoom out of the captured image. The image processor can further adjust the image displayed by compensating for poor lighting, modifying the image displayed so that a user can make themselves look better or more realistic, or perform any number of digital modifications that are possible in the digital imaging field with an image processor." *See* 5:61-6:15. "A digital camera, also referred to as an image capture device, may provide enhanced optics to capture images otherwise not seen by unaided eyes. The image capture device may include an optical lens or a combination of optical lenses with various properties such as: a telephoto lens for a closer view, a wide angle lens to allow a wider view, or an optical zoom lens to provide both. Utilizing a telephoto lens, an optical zoom view is possible without users having to readjust their face closer to the digital mirror. The optical zoom lens may optically zoom in and out on the user to select a frame of for captured images for display on the display device of the digital mirror. A wide-angle lens provides a wide view that can be displayed without the user moving away from the device. The camera may include an auto-focus system to provide sharpness and or resolution, regardless of where the user is positioned relative to the device. The digital mirror is not limited to displaying only one full frame perspective view. Multiple cameras of a digital mirror can concurrently capture more than one perspective view of the user for display on a display device. The additional captured views can provide a more complete view of the user and or their surroundings. Alternatively,

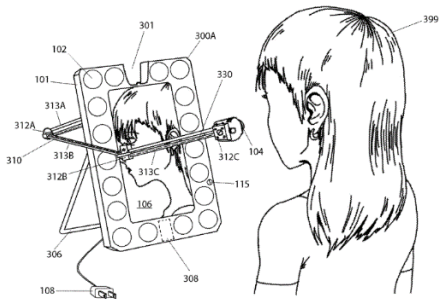
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	additional captured views may be used to provide a side-by-side perspective comparison. The digital camera can capture images for display full frame, side-by-side, picture in picture, or in a mosaic on the same display or on separate displays. With an optical mirror, the user previously had to move the mirror or position their own body in order to see a desired viewing angle. With multiple cameras, a user can capture different perspective views all at once." *See* 6:33-63. "The image capture device 104 may be an OMNIVISION™ OV3642 three megapixel CAMERACHIP™ sensor with a fixed focal length lens in one embodiment of the invention, for example. In this case, a digital zoom may be used to zoom in and/or zoom out on a portion of an image. Alternatively, a camera module with an optical zoom may be used that mechanically moves lenses in a linear manner back and forth, such as commonly found in point and shoot digital cameras, or a camera module with a more compact zoom may be used such as shown and described in U.S. Patent Application Publication 2006/0216018 filed by Jen Tsorng Chang on Mar. 20, 2006, incorporated herein by reference, for example." *See* 7:20-31. "In FIG. 1A, the camera 104 can be located just above the display device 106 near a notched out area of the selective lighting 102 and light diffuser 112. To minimize parallax and ensure the user can obtain the desired angle of view, the camera 104 is mounted as close as possible to the display device or under/over the display device. For example, the camera 104 may be centered within the display device 106 in order to minimize parallax. The camera 104 may also be mounted over display device 106, such as shown in FIGS. 3E-3F for example. Alternatively, the camera 104 may be mounted under the display device, such as shown in FIG. 3G for example. Digital imaging software may be used to compensate for the pixels in the display device 106 that are covered or interrupted by the camera. The number of pixels covered by the camera may be determined from the size of the camera and depth of field required for the digital mirror 100A. The digital mirror 100A further includes a touchscreen user interface (UI) 115 mounted over the display device 106. The touchscreen UI 115 provides the user the ability to

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	select the preferred image from a user interface menu. The touchscreen UI 115 may use capacitive sensing, surface acoustic wave (SAW), or resistive touchscreen technology. The user interface 115 may include a view mode button 115A, a zoom in button 115B to magnify a portion of the image, a menu selector button 115C, a zoom out button 115D to demagnify a portion of the image, and a light source dimmer/brightness button 115E to manually adjust the light intensity. The view mode button 115A allows a user to select between a true view mode or a mirror view mode and the display of images as either true images or mirrored images, respectively. The menu selector button 115C initiates a menu to be displayed on the display device 106 from which a user can select different control functions, such as camera control functions, display control functions, lighting control functions, and power control functions. A user may pan the image through the touch screen user interface as well. A power on/off switch/button may be included as part of the interface. Alternatively, a sensor may be used to automatically power on and off the digital mirror. While the user interface 115 may be a touchscreen UI as described, other types of user interfaces may be used with a digital mirror such as a gesture recognition user interface, a voice recognition user interface (e.g., microphone, voice recognizer/decoder, speaker to question/acknowledge), an electro-mechanical user interface (e.g., buttons, switches, etc.), or a graphical user interface with a pointer, such as a mouse or stylus." *See* 7:65-8:43.

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	 Fig. 1A “Referring now to FIG. 1B, a second digital mirror 100B is illustrated that stands up and is self-supported upon a vanity or desktop surface. The digital mirror 100B receives AC power for the lighting, the digital imaging electronics, and the display through the AC power cord 108. The digital mirror 100B includes an enclosure 101 that has a pivotal stand 120. The pivotal stand 120 stands the digital mirror up upon a surface. The pivotal stand 120 can pivot to adjust its angle with the enclosure to provide flexibility in adjusting the angle and height of the mirror to the user's position. The display device 106 is mounted in the enclosure 101. The display device 106 may be an LCD display, a plasma display, an OLED display, or any other type of image display medium. The camera 104 is located near the top and in front of the display to minimize parallax. The digital mirror 100B includes light diffuser 112 to scatter the light from the device light source 102 surrounding the display device 106. The enclosure 101 houses the display device 106.

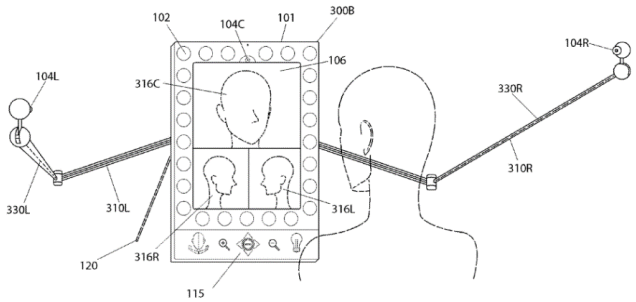
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	The user interface 115 provides the user the ability to select a desired view. The user interface 115 may be an electromechanical user interface and include a view mode button 115A, a zoom in button 115B, a menu selector button 115C, a zoom out button 115D, and a light source dimmer/brightness button 115E. The view mode button 115A selects between true view mode and mirror view mode to display images as a true view image or a mirror view image, respectively. The menu selector button 115C initiates a menu to be displayed on the display device 106 from which a user can select different control functions, such as camera control functions, display control functions, lighting control functions, and power control functions. The menu also allows a user to select and save user preferred settings, such as for lighting, views etc." *See* 8:53-9:17. "The user interface 115 for the portable digital mirror 200A may be a single electro-mechanical button that is responsive to the number of times the button is toggled. For example, depressing the button in rapid succession three times may execute a change in the rotation of the view angle. Alternatively, holding the button down may increase the LED lighting 102 brightness to a peak illumination and then start to decrease the brightness. Once the desired level of brightness is achieved, the user can let go of the button." *See* 10:4-12. "Referring now to FIG. 2D, a visor digital mirror 200D is shown coupled to an automotive sun visor 250. The visor digital mirror 200D may include enclosure halves 101A-101B that flip open and closed like those of the digital mirror 200A or alternatively, a slideable cover that slides open and closed over the display device in the enclosure half 101A. In either case, the second enclosure half is moveably (e.g., pivotally or slidingly) coupled to the first enclosure half. The enclosure half 101A is mounted to the sun visor 250 and rests thereon when folded up away into the ceiling of the car. When enclosure half 101B is flipped open to reveal the display device 106, a switch may automatically power on the digital mirror. When flipped closed to cover over the display device 106 to protect it from dirt and whatever else, the switch may power off the digital mirror. The slideable cover may slide open to reveal the display device 106 and power on the digital mirror and slide closed to cover over the display device 106 and power off

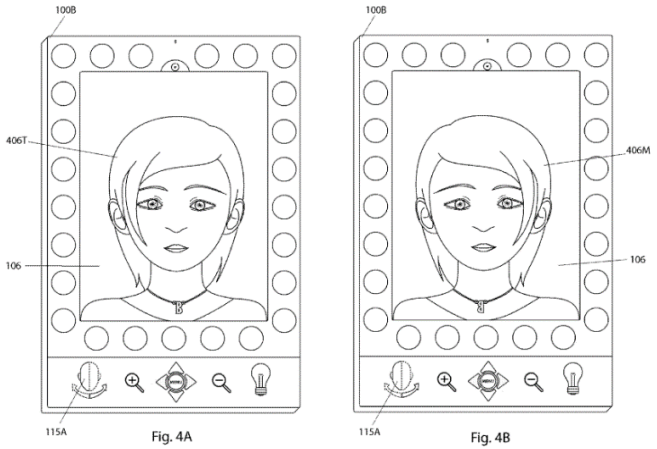
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	the digital mirror. The digital mirror 200D is powered through a wire cable 218 connected to the automobiles direct current power supply having a nominal twelve (12) volts DC. The digital mirror includes the display device 106 mounted in the first enclosure half 101A, a camera (also referred to as an image capture device) 104 mounted in the first enclosure half 101A, one or more light sources 102 mounted in the enclosure half 101A on the left and right sides of the display device 106, and the user interface 115 mounted in the first enclosure half 101A. The second enclosure half 101B protects the digital mirror 200D when not in use. The second enclosure half 101A houses the components of the digital mirror 200D and provides a means to mount it to the sun visor 250D.” *See* 10:21-52.  Fig. 2D “Referring now to FIG. 3A, a digital mirror 300A is now illustrated capturing an image of a user 399 that is displayed on the display device 106. The digital mirror 300A is a rechargeable, self standing digital mirror including a pivotal stand 306 and rechargeable

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	batteries 308. The pivotal stand 306 is pivotally coupled to a back side of the enclosure 101 to support the digital mirror on surface. The digital mirror 300A further includes a detachable camera 104 that is coupled to the enclosure 101 by an articulating arm 310. The camera 104 is mounted at the distal end of the arm 310. The proximal end of the arm 310 is coupled to the enclosure 101. One or more lights 102 that may be mounted adjacent the camera 104 to provide lighting in front of the digital camera 104 to facilitate the capture of images, such as shown by FIG. 3D. A camera cable 330 may couple the camera 104 to the underlying image processing system (see FIG. 6A) to provide power and control signals and receive pixel data for each image frame captured. Alternatively, wireless transmitter/receivers may be used to send the captured images to the underlying image processing system (see FIG. 6B) mounted in the enclosure 101.” *See* 10:53-11:6.  Fig. 3A “Referring now to FIG. 3B, a digital mirror 300B is illustrated that includes a plurality of cameras—a left camera 104L, a center camera 140C, and a right camera 104R. The digital mirror 300B is self-supporting including an optional stand 120 and/or means to be wall mounted (e.g. hole 180 or hooks 182A-182B shown in FIG. 1A) so that it can capture images hands-free, without the user having to hold any camera. One or more lights 102 may be mounted adjacent each of the left camera 104L and the right camera

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	104R, such as shown by FIG. 3D, to provide lighting in front of each and facilitate the capture of images. One or more lights 102 may also be mounted around the display device 106 to provide lighting in front of the display device to facilitate the capture of images. The digital mirror 300B includes additional cameras so that the user can concurrently capture and then display images of different views from various fields of view. A digital camera can capture images for display full frame, side-by-side, picture in picture, or in a mosaic on the same display. For example, the left camera 104L may capture a left side view of a user, the center camera 140C may capture a front side view of the user, and the right camera 104R may capture a right side view of the user concurrently. The digital mirror 300B can also concurrently display left side images 316L captured by the left camera 104L, front side images 316C captured by the center camera 140C, and right side images 316R captured by the right camera 104R in a mosaic arrangement on the display device 106, in response to a selection by the user with the user interface 115. The digital mirror 300B can also display these images separately as full frame images on the display device 106, such as shown by FIGS. 1A, 2D, 3A, 4A-4B, and supported by FIGS. 5A-5B and the description thereof, in response to a selection by the user through the user interface 115. The left side images 316L, the front side images 316C, and the right side images 316R displayed in the mosaic arrangement may all be live images continuously captured by the cameras and displayed on the display device 106. Alternatively, one or more of the left side images 316L, the front side images 316C, and the right side images 316R displayed in the mosaic arrangement may be stored images previously captured by the cameras and read out from a storage device. For example, the front side images 316C may be live images while the left side images 316L and the right side images 316R may be stored images read out from the storage device and displayed on the display device. The center camera 104C is mounted to the enclosure 101 adjacent the display device 106 to reduce parallax. The center camera 104C captures a frontal view of the user or alternatively, a back view of the user if the user rotates himself/herself around so his back faces the center camera. For example, the user shown in FIG. 3B facing the camera 104C and the display 106 could turn around so that the back of their head is facing the

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	camera 104C. After capturing and storing a few frames of images of the back of their head, the user can turn back around and select with the user interface 115 to recall the captured images of the back of their head for display on the display device 106. Similarly, frames of left and right side images may be captured with the left and right cameras 1041,104R respectively and stored in a storage device (e.g., see storage device 644 in FIGS. 6A-6B) of the digital mirror. The user can then select through the user interface 115 to recall the captured images of the one more sides of their head for separate or concurrent display on the display device 106 to provide a more complete view of them selves. The left camera 104L and the right camera 104R are respectively mounted to the distal ends of a left articulating arm 310L and a right articulating arm 31 OR respectively. The proximal ends of the left articulating arm 310L and the right articulating arm 31 OR are coupled to the left and right of the enclosure 101 respectively. The left camera 104L and the right camera 104R are electrically coupled to the image processing system (See FIGS. 6A-6B) by cables 330 extending through the arms 310L,310R. The cables 330 may be electrical wire cables or optical fiber cables to couple the cameras 104L,104R and image processor system electronics together. In an alternate embodiment, the cameras 104L,104R may be wireless cameras and communicate with a wireless digital mirror base with a wireless communication protocol as described herein." *See* 11:44-12:55.

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	 Fig. 3B “Referring now to FIG. 4A, in response to true view mode being selected through the view mode selector 115A of the user interface, a true image 406T is displayed by the display device 106 of the digital mirror 100B. A conventional optical mirror does not display the true image 406T if a user stands in front of the optical mirror. The letter B on the necklace in the true image 406T has a proper orientation. FIG. 4B illustrates a mirrored image 406M being displayed in response to the mirror view mode being selected by the user interface view mode selector 115A. A conventional optical mirror may display an image similar to the mirrored image 406M.” *See* 14:6-17.

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	 Fig. 4A Fig. 4B “Referring now to FIG. 5A, a representation of a single frame of pixel data configured into columns and rows is illustrated. A frame of pixel data is captured by the image capture device 104 and stored in digital format into the memory locations of a frame buffer memory. A frame of data may written into the frame buffer memory and organized as illustrated in FIG. 5A, such as by writing from left to right (pixel P11 to pixel Pm1). In response to user selections (e.g., true view mode or mirror view mode), the pixel data stored in the frame buffer memory can be readily processed by an image signal processor as desired. In a true view mode, the frame of data may be read out similarly (e.g., from left to right—pixel P11 to pixel Pm1) and displayed on the display device as shown in FIG. 5A. Pixel P11 is displayed in the upper left corner, pixel Pm1 is displayed in the upper right corner, pixel P1n is displayed in the lower left corner, and pixel Pmn is displayed in the lower right corner. In this manner, the pixel data is displayed on the display device of the digital mirror as it was captured by the image capture device. The true view mode displays true images to the user as how third persons see the user, such as shown in FIG. 4A.

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	In a mirror view mode, the frame of pixel data saved into the frame buffer memory is read out differently from how it was written by reversing the addressing of memory locations into the frame buffer memory. The arrangement of the pixel data in the rows and columns is read out of the memory locations in a reverse order (e.g., from right to left—Pm1 to P11) to transpose or horizontally flip the captured image into a horizontally mirrored image. FIG. 5B illustrates how the mirrored image is displayed on the display device 106 of the digital mirror in response to the mirror view mode. For example, pixel Pm1 is now displayed in the upper left corner of the display device, pixel P11 is displayed in the upper right corner of the display device, pixel Pmn is displayed in the lower left corner, and pixel P1n is displayed in the lower right corner. The mirror view mode displays mirror images on the display device to the user, such as shown in FIG. 4B, similar to how an optical mirror does.” *See* 14:18-56. “The image processing and control system 600B illustrates the detachable camera module 304. The detachable camera module 304 may send data and receive control signals over a communication link established by the pairs of transmitter/ receivers 630,631. The detachable camera module 304 captures pixel data and may then process the pixel data or simply send it to the digital mirror base for storage or for display. The detachable camera module 304 may include its own light source 102 that is controlled by the primary CPU 612 to capture the pixel data. The detachable camera module 304 may include its own image signal processor and frame buffer memory. Otherwise, the pixel data may be sent over the communication link and through the primary CPU to the image signal processor 610 of the digital mirror base.” *See* 17:20-33. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Rowles 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 7	
7[pre]. The method of claim 1, further comprising the steps:	To the extent the preamble is limiting, Rowles 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) Rowles 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;	Rowles expressly and/or inherently discloses and/or renders obvious obtaining a reference image. *See, e.g.*, disclosures below. "In one embodiment of the invention, a digital mirror is disclosed including an enclosure; a display device mounted in the enclosure to display images at a front side of the enclosure; an image capture device mounted in the enclosure adjacent the display device to reduce parallax error; lights mounted in the enclosure adjacent the display device; and a light diffuser mounted to the enclosure around the display device over the one or more lights. The one or more lights provide lighting in front of the display device and the image capture device captures images in the field of view in the front. The light diffuser diffuses and softens the light emitted by the one or more lights. Alternatively, the image capture device may be mounted on an articulated arm that may be used to capture and display various angles in the filed of view of the digital mirror." *See* Abstract. "The embodiments of the invention generally relate to digital cameras, digital picture frames, and mirrors." *See* 1:24-25.

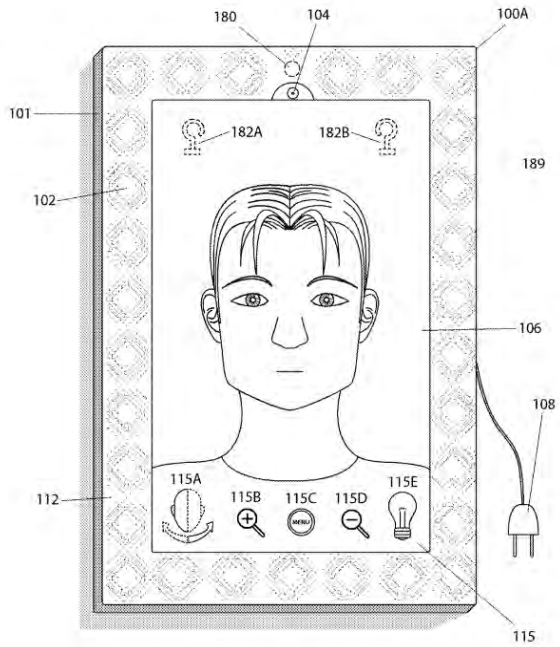
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	“Typical optical mirrors composed of a reflective material and potentially, encapsulated in glass, have characteristics that may not satisfy a user's requirements. A digital mirror has the ability to improve the user's experience in providing extended views of the user's features. The digital mirror also has the ability to enhance displayed images through the using imaging electronic components and software. Additionally, the combination of a plurality of lighting sources with selectable intensity, a plurality of camera choices and mounting applications may also enhance the user's experience.” *See* 3:37-46. “The enclosure may also be integral in how the digital mirror may be configured to be compatible with the user's environment. The ability for a digital mirror to either be a focal point for the user's environment or an accessory to the user's environment may determine the style of the enclosure and thus the display size, lighting, number and size of camera as well as the resolution and focus of the camera sensor.” *See* 3:54-60. “In other embodiments of the invention, multiple cameras may extend to the left and right of the user to capture left, right, and side images for displaying on a single center display. The additional cameras can be moved to capture or whatever angles the user desires to view. The user simply may select the desired view through a menu of a graphics user interface or buttons of an electromechanical user interface. Multiple images of different views may be concurrently displayed in a mosaic arrangement on a display. This is different with an optical mirror. The enclosure houses together one or more of the lighting capabilities and arrangements, the camera views, and the display device software executed by a process may further enhance the display of images on a digital mirror.” *See* 4:1-14. “Sensors may be used to prevent excessive battery-power drain and increase viewing time by adjusting the lighting intensity in response to the reflective light and ambient light. The cameras of each digital mirror may act as the light sensor for each. Sensors may adjust lighting intensity and color depending on the users preferred settings for a particular ambient environment. For example, a compact version of the digital mirror

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	may be used in a dark setting. In this case a sensor setting may be used to prevent a bright display that may be distracting.” *See* 4:37-46. “In another embodiment of the invention, the camera may be detachable or separate from the display. The camera may communicate wirelessly through a common wireless protocol, such as IEEE 802.11. The ability to eliminate wires between the camera and display provides additional flexibility in locating the camera. For example, a detachable camera may be positioned behind the user's head. Additionally, left and right side wired/wireless cameras may be used to communicate with the display base to produce a plurality of images for the user to select from. Each camera may have its own lighting sources within its enclosure. Each camera may also provide a light sensor capability to sense the ambient light, the reflected light, and auto focus the camera's lenses, if any, in order to produce the user's desired displayed views. The digital mirror may also be used to store or archive pictures for future comparisons. The user may also select a number of stored images in the digital mirror to be shown in a continuous manner similar to a slide show. The growth or development of a user may be displayed by capturing facial changes over the years. The captured image frames may be correlated an displayed as a movie or video. The camera may be used to take individual pictures, single image frame, or record video (a plurality of image frames over a time period) depending on the amount of storage available. Subsequently, the user may elect to show pictures for the purpose of décor, such as a digital picture frame.” *See* 4:60-5:18. “A digital mirror is an apparatus that captures and displays an image to a user through the use of a digital electronic system. The digital mirror includes an image capture device and a display device on the same side to display the captured image to a user. A digital mirror further includes a user interface and an internal electronic control and image processing system to control the camera and the display device and process captured images for display on the display device.” *See* 5:33-40.

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	"A digital mirror enables the captured image input to be separated from the displayed output. Because the image capture device (e.g., a camera) and the display device are separate devices, the image capture device may be positioned so that the user's desired view may be displayed without changing the users position. Furthermore, users are not limited to direct line of sight viewing or using multiple mirrors in order to view themselves from different perspectives. The camera or image capture device may include lighting proximately mounted to illuminate the subject. In order to secure the position of the camera without the user holding it, the camera may include a clamp or stand coupled to a flexible arm or an articulating arm." *See* 5:61-6:6. "A digital camera, also referred to as an image capture device, may provide enhanced optics to capture images otherwise not seen by unaided eyes. The image capture device may include an optical lens or a combination of optical lenses with various properties such as: a telephoto lens for a closer view, a wide angle lens to allow a wider view, or an optical zoom lens to provide both. Utilizing a telephoto lens, an optical zoom view is possible without users having to readjust their face closer to the digital mirror. The optical zoom lens may optically zoom in and out on the user to select a frame of for captured images for display on the display device of the digital mirror." *See* 6:33-44. "The digital mirror is not limited to displaying only one full frame perspective view. Multiple cameras of a digital mirror can concurrently capture more than one perspective view of the user for display on a display device. The additional captured views can provide a more complete view of the user and or their surroundings. Alternatively, additional captured views may be used to provide a side-by-side perspective comparison. The digital camera can capture images for display full frame, side-by-side, picture in picture, or in a mosaic on the same display or on separate displays. With an optical mirror, the user previously had to move the mirror or position their own body in order to see a desired viewing angle. With multiple cameras, a user can capture different perspective views all at once." *See* 6:50-63. "Referring now to FIG. 1A, a first digital mirror 100A is illustrated that is wall mountable. The digital mirror 100A includes an enclosure 101 with at least one mounting

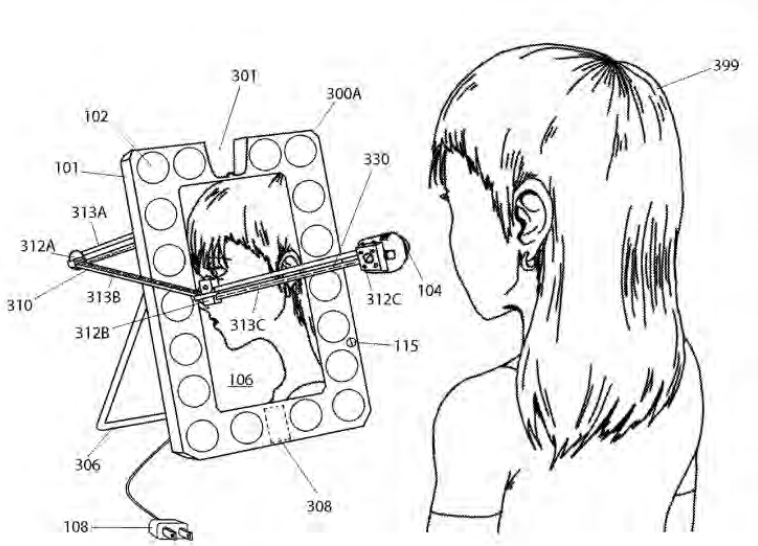
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	device, a hole 180 or hooks 182A-182B in its backside, so that the digital mirror can be mounted to a wall 189. The digital mirror 100A further includes one or more selective light sources 102, an image capture device 104 (also referred to as a camera), a display device 106, a light diffuser 112, a user interface 115, and an image processing and control system (see the control systems 600A-600B illustrated in FIGS. 6A-6B) mounted in or to the enclosure 101. The digital mirror 100A may further include an alternating current (AC) power cord 108 to receive power from an AC power source. The alternating current (AC) power is provided for the lights, camera and imaging electronics through the AC power cord 108. The image capture device 104 may be an OMNIVISION™ OV3642 three megapixel CAMERACHIP™ sensor with a fixed focal length lens in one embodiment of the invention, for example. In this case, a digital zoom may be used to zoom in and/or zoom out on a portion of an image. Alternatively, a camera module with an optical zoom may be used that mechanically moves lenses in a linear manner back and forth, such as commonly found in point and shoot digital cameras, or a camera module with a more compact zoom may be used such as shown and described in U.S. Patent Application Publication 2006/0216018 filed by Jen Tsorng Chang on Mar. 20, 2006, incorporated herein by reference, for example. The display device 106 may be a liquid crystal display (LCD) device or an organic light emitting diode (OLED) display device. The display device 106 provides the viewing medium for the user to observe one or more desired images captured by the camera 104. Surrounding the display device 106 is the selective light sources 102 that may be one or more of light emitting diodes (LED), incandescent, florescent, or any combination of light source that can provide light and illuminate a user. The lighting provided by the light sources 102 of the digital mirror may be responsive to the environment (e.g., ambient lighting) and one or more user preferred settings (e.g., automatic light sensing, manual light control) that are stored and provided to the digital image processing control electronics.

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	The light diffuser 112 is mounted to the enclosure to cover over the light sources 102. The light diffuser 112 diffuses or scatters the light generated by the light sources 102 in order to produce a softer light for the object or user in the target viewing area. The light diffuser 112 minimizes glare and other lighting aberrations that may tend to wash out or distort images captured by the image capture device 104 (also referred to as a camera). The light diffuser 112 may be shaped similar to the enclosure 101 and has an opening 113 to be mounted around the shape of the display device 106. In one embodiment of the invention, the enclosure and the display device are rectangular in shape such that the light diffuser 112 has a frame shape with a rectangular opening 113 (see FIG. 1C). In another embodiment of the invention, the enclosure and display device are oval shaped such that the light diffuser 112 also has an oval frame shape with an oval opening. The light diffuser 112 may include an opening around the camera to allow the capture of images in the field of view of the front side of the digital mirror. In FIG. 1A, the camera 104 can be located just above the display device 106 near a notched out area of the selective lighting 102 and light diffuser 112. To minimize parallax and ensure the user can obtain the desired angle of view, the camera 104 is mounted as close as possible to the display device or under/over the display device. For example, the camera 104 may be centered within the display device 106 in order to minimize parallax. The camera 104 may also be mounted over display device 106, such as shown in FIGS. 3E-3F for example. Alternatively, the camera 104 may be mounted under the display device, such as shown in FIG. 3G for example. Digital imaging software may be used to compensate for the pixels in the display device 106 that are covered or interrupted by the camera. The number of pixels covered by the camera may be determined from the size of the camera and depth of field required for the digital mirror 100A." *See* 7:4-8:13.

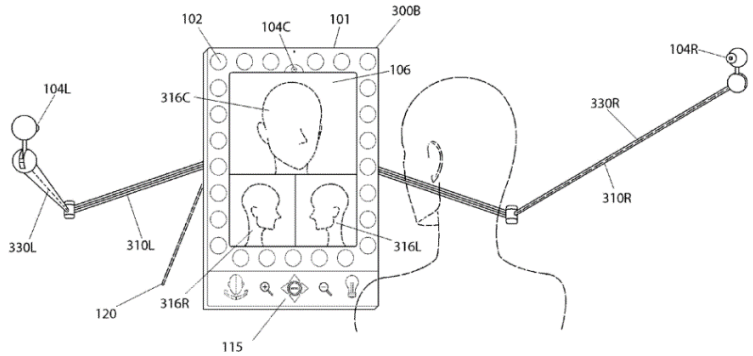
Asserted Claim of the ’109 Patent	Exemplary Citations to Rowles
	 Fig. 1A “The camera 104 is located near the top and in front of the display to minimize parallax. The digital mirror 100B includes light diffuser 112 to scatter the light from the device light source 102 surrounding the display device 106. The enclosure 101 houses the display device 106.” *See* 8:66-9:3. “The display device 106 is an LCD display with LCD backlighting 116. The image capture device 104 is shown separate from the enclosure. The display device 106 and camera or image capture device 104 are connected to the electronics board 175 via ribbon cable. Covering the enclosure is the light diffuser 112 with an opening 113. The light

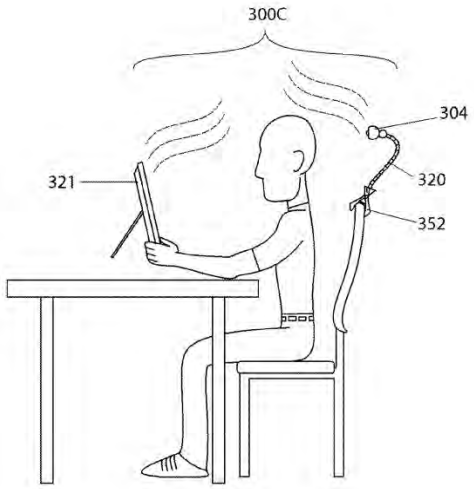
Asserted Claim of the '109 Patent	Exemplary Citations to Rowles
	diffuser 112 is mounted over light source 102. The user interface bezel 125 includes icons that mount over and protect the user interface buttons 115." *See* 9:30-38. "The compact portable digital mirror 200A further includes the enclosure 101, a display device 106 mounted in the first enclosure half 101A, one or more light sources mounted in the first enclosure half 101A around the display device; a camera 140 (also referred to as an image capture device) mounted in the first enclosure half adjacent the display device 106; and a user interface 115 mounted in the enclosure. In one embodiment of the invention, the display device 106 is a liquid crystal display (LCD device and the one or more light sources are light emitting diodes (LEDs). The camera 104 is located near the top of the first enclosure half 101A to be in the field of view of a user looking into the display device. The enclosure 101 includes a hinge 210 coupled to the upper and lower half of the enclosure to allow it to pivot open and closed. The first enclosure half 101A includes a catch 221 and the second enclosure half 101B includes a latch 220 to receive the catch 221. When engaged, the latch and catch releasably keep the two enclosure halves 101A-101B pivotally coupled together when the digital mirror is not in use." *See* 9:51-10:3. "The digital mirror includes the display device 106 mounted in the first enclosure half 101A, a camera (also referred to as an image capture device) 104 mounted in the first enclosure half 101A, one or more light sources 102 mounted in the enclosure half 101A on the left and right sides of the display device 106, and the user interface 115 mounted in the first enclosure half 101A. The second enclosure half 101B protects the digital mirror 200D when not in use. The second enclosure half 101A houses the components of the digital mirror 200D and provides a means to mount it to the sun visor 250D. Referring now to FIG. 3A, a digital mirror 300A is now illustrated capturing an image of a user 399 that is displayed on the display device 106. The digital mirror 300A is a rechargeable, self standing digital mirror including a pivotal stand 306 and rechargeable

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	batteries 308. The pivotal stand 306 is pivotally coupled to a back side of the enclosure 101 to support the digital mirror on surface. The digital mirror 300A further includes a detachable camera 104 that is coupled to the enclosure 101 by an articulating arm 310. The camera 104 is mounted at the distal end of the arm 310. The proximal end of the arm 310 is coupled to the enclosure 101. One or more lights 102 that may be mounted adjacent the camera 104 to provide lighting in front of the digital camera 104 to facilitate the capture of images, such as shown by FIG. 3D. A camera cable 330 may couple the camera 104 to the underlying image processing system (see FIG. 6A) to provide power and control signals and receive pixel data for each image frame captured. Alternatively, wireless transmitter/receivers may be used to send the captured images to the underlying image processing system (see FIG. 6B) mounted in the enclosure 101.” *See* 10:60-11:6.

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	 Fig. 3A “Referring now to FIG. 3B, a digital mirror 300B is illustrated that includes a plurality of cameras—a left camera 104L, a center camera 140C, and a right camera 104R. The digital mirror 300B is self-supporting including an optional stand 120 and/or means to be wall mounted (e.g. hole 180 or hooks 182A-182B shown in FIG. 1A) so that it can capture images hands-free, without the user having to hold any camera. One or more lights 102 may be mounted adjacent each of the left camera 104L and the right camera 104R, such as shown by FIG. 3D, to provide lighting in front of each and facilitate the capture of images. One or more lights 102 may also be mounted around the display device 106 to provide lighting in front of the display device to facilitate the capture of images. The digital mirror 300B includes additional cameras so that the user can concurrently capture and then display images of different views from various fields of view. A digital

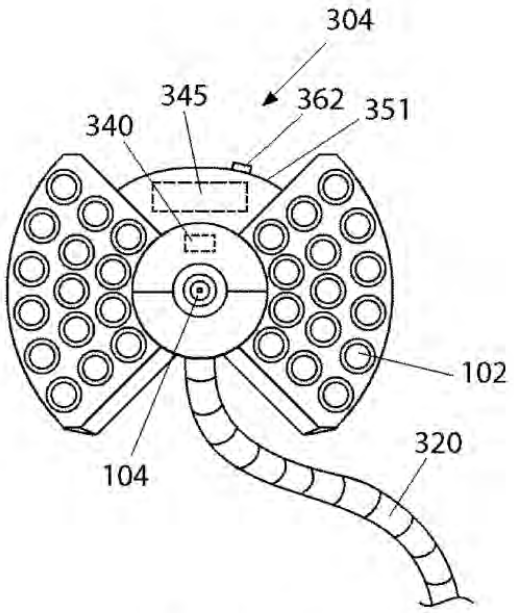
Asserted Claim of the '109 Patent	Exemplary Citations to Rowles
	camera can capture images for display full frame, side-by-side, picture in picture, or in a mosaic on the same display. For example, the left camera 104L may capture a left side view of a user, the center camera 140C may capture a front side view of the user, and the right camera 104R may capture a right side view of the user concurrently. The digital mirror 300B can also concurrently display left side images 316L captured by the left camera 104L, front side images 316C captured by the center camera 140C, and right side images 316R captured by the right camera 104R in a mosaic arrangement on the display device 106, in response to a selection by the user with the user interface 115. The digital mirror 300B can also display these images separately as full frame images on the display device 106, such as shown by FIGS. 1A, 2D, 3A, 4A-4B, and supported by FIGS. 5A-5B and the description thereof, in response to a selection by the user through the user interface 115. The left side images 316L, the front side images 316C, and the right side images 316R displayed in the mosaic arrangement may all be live images continuously captured by the cameras and displayed on the display device 106. Alternatively, one or more of the left side images 316L, the front side images 316C, and the right side images 316R displayed in the mosaic arrangement may be stored images previously captured by the cameras and read out from a storage device. For example, the front side images 316C may be live images while the left side images 316L and the right side images 316R may be stored images read out from the storage device and displayed on the display device. The center camera 104C is mounted to the enclosure 101 adjacent the display device 106 to reduce parallax. The center camera 104C captures a frontal view of the user or alternatively, a back view of the user if the user rotates himself/herself around so his back faces the center camera. For example, the user shown in FIG. 3B facing the camera 104C and the display 106 could turn around so that the back of their head is facing the camera 104C. After capturing and storing a few frames of images of the back of their head, the user can turn back around and select with the user interface 115 to recall the captured images of the back of their head for display on the display device 106. Similarly, frames of left and right side images may be captured with the left and right cameras 1041,104R respectively and stored in a storage device (e.g., see storage device 644 in FIGS. 6A-6B) of the digital mirror. The user can then select through the user interface 115 to recall the captured images of the one more sides of their head for separate

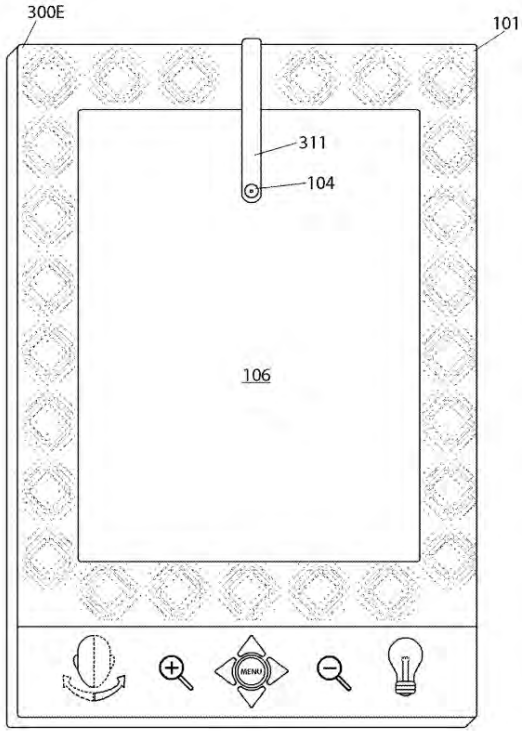
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	or concurrent display on the display device 106 to provide a more complete view of them selves. The left camera 104L and the right camera 104R are respectively mounted to the distal ends of a left articulating arm 310L and a right articulating arm 31 OR respectively. The proximal ends of the left articulating arm 310L and the right articulating arm 31 OR are coupled to the left and right of the enclosure 101 respectively. The left camera 104L and the right camera 104R are electrically coupled to the image processing system (See FIGS. 6A-6B) by cables 330 extending through the arms 310L,310R. The cables 330 may be electrical wire cables or optical fiber cables to couple the cameras 104L,104R and image processor system electronics together. In an alternate embodiment, the cameras 104L,104R may be wireless cameras and communicate with a wireless digital mirror base with a wireless communication protocol as described herein.” *See* 11:44-12:55.  Fig. 3B “Referring now to FIG. 3C, a wireless digital mirror 300C is illustrated. The wireless digital mirror 300C has a wireless digital mirror base 321 and the wireless detachable camera 304. The wireless digital camera 304 may be tethered to the wireless digital

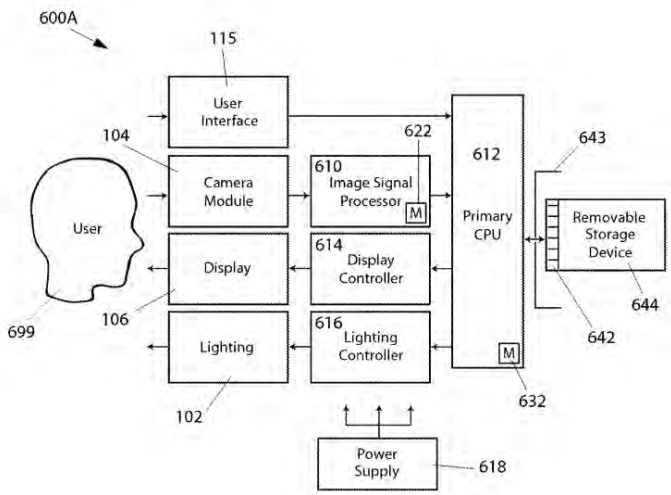
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	mirror base 321 through a wireless protocol such as the common I.E.E.E. 802.11 industry standard. This allows the detachable camera to be placed anywhere without being coupled to the enclosure 101 by an arm. However, the camera 304 may connect to a flexible arm 320 with a stand or clamp 352 to couple to and support the camera above a surface. A user can position the camera 304 when supported by the clamp/stand 352 for a desired viewing angle. The wireless digital mirror base 321 may communicate wirelessly with a remote computer system to upload captured images through a similar wireless protocol. Pictures and/or video may be transmitted to/or received from the remote computer system by the wireless digital mirror base 321. The wireless digital mirror base 321 may then be used as a picture frame so that pictures and or video may be displayed at the users discretion. The digital mirror may serve a dual purpose; one for viewing oneself, one of a digital picture frame, and one for saved pictures.” *See* 12:56-13:10.  Fig. 3C

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	"Referring now to FIG. 3D, a magnified view of the wireless digital camera 304 is illustrated. The wireless digital camera 104 includes, an image capture device or camera, one or more adjacent light sources 102, a wireless transmitter 340, and one or more batteries 345 mounted in a housing or enclosure 351. The one or more lights 102 that are mounted adjacent the camera provide lighting in front of the wireless digital camera 104 to facilitate the capture of images. The wireless digital camera 304 is mounted to a flexible arm 320 to flexibly move the position of the camera. The wireless transmitter 340 may include an on/off switch 362 to selectively power on/off the battery 345 power drain when not in use. Alternatively, the wireless transmitter may have a sleep mode that sleeps the digital camera 304 until activated upon receipt of a signal to turn on from the wireless digital mirror base 321. While the camera 304 has been described as being a wireless digital camera, it may instead be tethered to and in communication with the digital mirror base 321 by a wire cable including a plurality of wires. Referring now to FIGS. 3E-3F, a digital mirror 300E is shown. The digital mirror 300E includes a digital camera 104 mounted over the display device 106 to reduce parallax. The enclosure 101 may include a protrusion or arm 311 to support the camera 104 over the display device 106. The mounting of the camera 104 over the display device can be seen more clearly in the magnified side view shown in FIG. 3F. In FIG. 3F, the camera 104 is mounted to the protrusion 311. The protrusion 311 is molded as part of the enclosure 101 to support the camera 104 over the display device 106. Portions of the display device 106 and the light diffuser 112 are shown in FIG. 3F to illustrate the relative positioning of the elements in the digital mirror 300E. The digital camera 104 can also be mounted under the display device 106 to reduce parallax. Provisional Patent Application No. 61/338,106 filed on Feb. 16, 2010 by John W. Rowles, et al., entitled TECHNIQUES FOR IMAGE CAPTURE THROUGH LIQUID CRYSTAL DISPLAYS, describes how to mount a camera under a liquid crystal display (LCD) device and capture images. The digital camera may be mounted between an LCD pixel panel and a backlighting panel. Alternatively, the camera may replace a few pixels and be interspersed between pixels of the LCD pixel panel. In

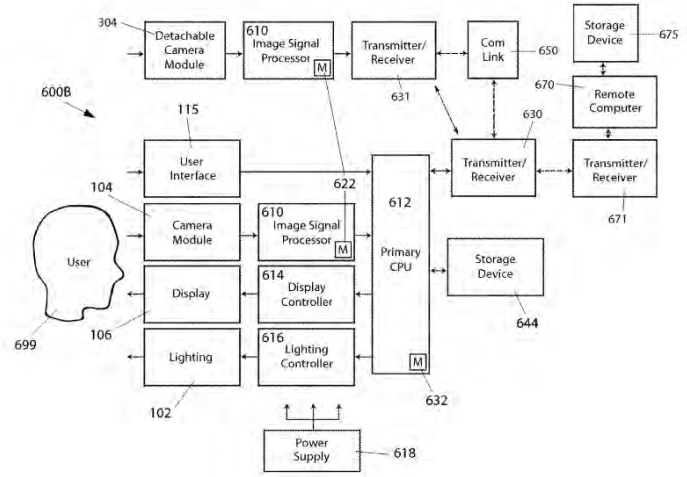
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	another embodiment of the invention, the digital camera 104 can also be mounted under an organic light emitting diode (OLED) display device 106 to reduce parallax. Alternatively, the digital camera 104 may replace a few pixels and be interspersed between pixels of the organic light emitting diodes. Referring now to FIG. 3G, a magnified side view of a portion of a display device 106G for an alternate embodiment of a digital mirror is shown. The display device 106G is an organic light emitting diode (OLED) display device. The digital mirror includes an image capture device 104G. In this case, the image capture 104G device may be a camera mounted behind the OLED display device 106G. Referring now to FIG. 3H, a magnified top view of a portion of the OLED display device 106G is shown. The display device 106G, being an OLED display device, includes an array of M by N OLED pixels 370. The display device 106G includes a lens 374 mounted over the camera 104G that is positioned between OLED pixels 370 of the OLED display device 106G." *See* 13:11-14:5.

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	 Fig. 3D

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	 Fig. 3E “Referring now to FIG. 6A, a first block diagram an image processing and control system 600A for the digital mirrors is shown. FIG. 6A illustrates a user 699 in front of the camera module 104 to have his/her image captured and displayed by the display device 106 after the captured images have undergone further processing by the image processing and control system 600A. The block diagram shown in FIG. 6A illustrate basic data flow in the system by arrows illustrated between the blocks. The image processing and control system 600A includes one or more of the user interface 115, the lighting sources 102 coupled to a lighting controller 616, an image signal processor 610 coupled to the camera module 104, the display controller 614 coupled to the display

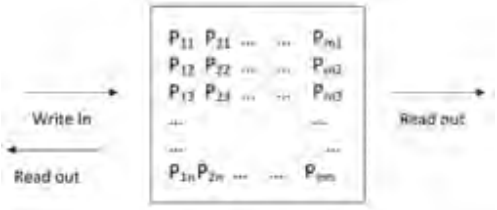
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	device 106, a storage device 644, a power supply 618, and a primary central processing unit (CPU) 612 coupled together as shown.” *See* 14:61-15:8.  Fig. 6A “The user interface 115 of the digital mirror receives a user's requests and sends commands or instructions to the primary CPU 612 for processing. The user interface 115 may be used by a user to control a plurality of functions of the digital mirror through the primary CPU 612. For example, the user interface 115 can be used to control the display controller 614, the lighting controller 616, the image signal processor, and in some cases, the camera module 104, through the primary CPU 612. The user interface 115 may be an electro-mechanical user interface, a graphical user interface, a voice command user interface, a visual command interface or a touchscreen user interface that can be managed through the use of buttons, a microphone and voice recognition, or through a

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	touch-screen system over the display device for example. The primary CPU 612 receives the requests from the user interface and performs the requested tasks.” *See* 15:43-58. “The image signal processor 610 includes a frame buffer memory 622 to store pixel data of one or more frames of images. Like the primary CPU, the image signal process can perform image processing operations on the pixel data stored in the frame buffer memory in response to software instructions. Additionally, the image signal processor may be used to control the camera module 104 and any sensors mounted in the camera module 104. It is desirable that the image single processor be of sufficient speed/data bandwidth to manage a video stream of a plurality of frames of pixel data in order to capture video images and display video on the display device. The image signal processor 610 may process image data on its own or in conjunction with the primary CPU 612 before it is displayed on the display device 106 by the display controller 614. The camera module 104, also referred to as an image capture device, may include a lens system, an image sensor, and an optional external Image Signal Processor (ISP). The camera preferably has a high depth of field from any combination of decreased sensor size, decreased aperture size, and/or an Extended Depth of Field technology within the sensor and image processing system. The image processing may be handled internally on a System-On-Chip (SOC) or on an external ISP. Referring now to FIG. 6B, a second block diagram of an image processing and control system 600B for digital mirrors is shown. The image processing and control system 600B is similar to the image processing and control system 600A illustrated in FIG. 6A but includes a communication link 650 (e.g., wireless router) for a digital mirror base unit to communicate with a detachable camera 304 and/or a remote computer system 670. The description of the common numbered blocks that were described previously are incorporated here by reference.” *See* 16:24-57.

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	 Fig. 6B This limitation would have been obvious to a person of ordinary skill in the art based on (1) Rowles 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;	Rowles 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 digital mirror may also be used to store or archive pictures for future comparisons. The user may also select a number of stored images in the digital mirror to be shown in a continuous manner similar to a slide show. The growth or development of a user may be displayed by capturing facial changes over the years. The captured image frames may be correlated an displayed as a movie or video. The camera may be used to take individual pictures, single image frame, or record video (a plurality of image frames over

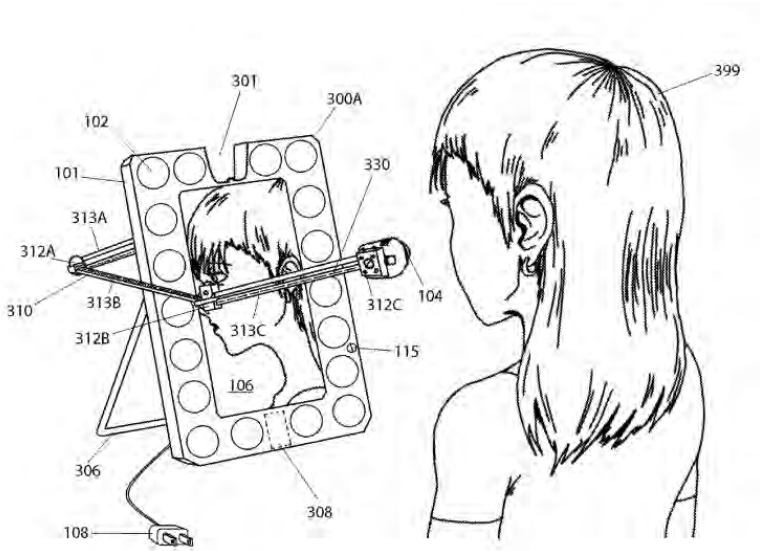
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	a time period) depending on the amount of storage available. Subsequently, the user may elect to show pictures for the purpose of décor, such as a digital picture frame. A wireless interface allows a user to store pictures and or movies on a remote computer system and transmit them to the digital mirror in the form of a stream file. The digital mirror may also send pictures back to the remote computer system for archival and or further editing or manipulation." *See* 5:7-23. "The display device 106 may be a liquid crystal display (LCD) device or an organic light emitting diode (OLED) display device. The display device 106 provides the viewing medium for the user to observe one or more desired images captured by the camera 104. Surrounding the display device 106 is the selective light sources 102 that may be one or more of light emitting diodes (LED), incandescent, florescent, or any combination of light source that can provide light and illuminate a user. The lighting provided by the light sources 102 of the digital mirror may be responsive to the environment (e.g., ambient lighting) and one or more user preferred settings (e.g., automatic light sensing, manual light control) that are stored and provided to the digital image processing control electronics." *See* 7:32-45. "The user interface 115 for the portable digital mirror 200A may be a single electro-mechanical button that is responsive to the number of times the button is toggled. For example, depressing the button in rapid succession three times may execute a change in the rotation of the view angle. Alternatively, holding the button down may increase the LED lighting 102 brightness to a peak illumination and then start to decrease the brightness. Once the desired level of brightness is achieved, the user can let go of the button." *See* 10:4-12. "Referring now to FIG. 5A, a representation of a single frame of pixel data configured into columns and rows is illustrated. A frame of pixel data is captured by the image capture device 104 and stored in digital format into the memory locations of a frame buffer memory. A frame of data may written into the frame buffer memory and organized as illustrated in FIG. 5A, such as by writing from left to right (pixel P11 to pixel Pm1).

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	In response to user selections (e.g., true view mode or mirror view mode), the pixel data stored in the frame buffer memory can be readily processed by an image signal processor as desired. In a true view mode, the frame of data may be read out similarly (e.g., from left to right—pixel P11 to pixel Pm1) and displayed on the display device as shown in FIG. 5A. Pixel P11 is displayed in the upper left corner, pixel Pm1 is displayed in the upper right corner, pixel P1n is displayed in the lower left corner, and pixel Pmn is displayed in the lower right corner. In this manner, the pixel data is displayed on the display device of the digital mirror as it was captured by the image capture device. The true view mode displays true images to the user as how third persons see the user, such as shown in FIG. 4A. In a mirror view mode, the frame of pixel data saved into the frame buffer memory is read out differently from how it was written by reversing the addressing of memory locations into the frame buffer memory. The arrangement of the pixel data in the rows and columns is read out of the memory locations in a reverse order (e.g., from right to left—Pm1 to P11) to transpose or horizontally flip the captured image into a horizontally mirrored image. FIG. 5B illustrates how the mirrored image is displayed on the display device 106 of the digital mirror in response to the mirror view mode. For example, pixel Pm1 is now displayed in the upper left corner of the display device, pixel P11 is displayed in the upper right corner of the display device, pixel Pmn is displayed in the lower left corner, and pixel P1n is displayed in the lower right corner. The mirror view mode displays mirror images on the display device to the user, such as shown in FIG. 4B, similar to how an optical mirror does." *See* 14:18-56.

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	 Fig. 5A  Fig. 5B “The primary CPU 612 controls substantially all of the functions and sub functions of a digital mirror. The primary CPU 612 may include a frame buffer memory 632 to store one or more frames of pixel data representing an image. The stored data in the frame buffer memory may be ready to or undergoing image processing performed by the primary CPU. A removable storage device 644 having an edge connector 642 may be coupled to the CPU 612 by means of a socket connector 643. The frame buffer 632 may read image pixel data out from or write image pixel data into the removable storage device 644. In another embodiment of the invention, the removeable storage device may be a fixed storage device to provide additional data storage capacity for the system. Regardless, the storage device 644 may be one or more of different types of computer readable mediums including memory devices, flash drives, or semiconductor storage devices (SSD).

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	The primary CPU 612 may include one or more processor cores and associated memory required for operation. The processor cores may include microprocessors, microcontrollers, reduced instruction set computer (RISC) processors, networked computer systems, etc. that are capable of executing instructions of software programs." *See* 15:19-42. "The image signal processor 610 includes a frame buffer memory 622 to store pixel data of one or more frames of images. Like the primary CPU, the image signal process can perform image processing operations on the pixel data stored in the frame buffer memory in response to software instructions. Additionally, the image signal processor may be used to control the camera module 104 and any sensors mounted in the camera module 104. It is desirable that the image single processor be of sufficient speed/data bandwidth to manage a video stream of a plurality of frames of pixel data in order to capture video images and display video on the display device. The image signal processor 610 may process image data on its own or in conjunction with the primary CPU 612 before it is displayed on the display device 106 by the display controller 614. The camera module 104, also referred to as an image capture device, may include a lens system, an image sensor, and an optional external Image Signal Processor (ISP). The camera preferably has a high depth of field from any combination of decreased sensor size, decreased aperture size, and/or an Extended Depth of Field technology within the sensor and image processing system. The image processing may be handled internally on a System-On-Chip (SOC) or on an external ISP. Referring now to FIG. 6B, a second block diagram of an image processing and control system 600B for digital mirrors is shown. The image processing and control system 600B is similar to the image processing and control system 600A illustrated in FIG. 6A but includes a communication link 650 (e.g., wireless router) for a digital mirror base unit to communicate with a detachable camera 304 and/or a remote computer system 670. The description of the common numbered blocks that were described previously are incorporated here by reference.

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	The primary CPU 612 can store data in the storage device 644. The storage device 644 may be removable or fixed within a digital mirror base. In either case the storage device may be one or more different types of storage mediums including a semiconductor type of storage medium (e.g., flash memory, a solid state storage device.) to name one. If removeable, the storage device 644 may be a Secure Data (SD) card, a Compact Flash (CF) card, or a flash USB memory stick. Alternatively, the primary CPU 612 may connect to a remote computer system 670 to store data at its location. In one embodiment, a digital mirror base may communication wirelessly with the remote computer system or the detachable camera through a transmitter/receiver 630. The remoter computer system 670 includes a transmitter/receiver module 671 to communicate with the digital mirror base or other mobile devices. The remote computer system 670 includes one or more storage devices 675 to provide a significantly larger data capacity to store data. The primary CPU 612 may send data to the remote computer system for storage in its storage devices 675 over a wireless communication link established by the pairs of transmitter/ receivers 630,671. The remote computer system 670 may send/receive instructions and or data from the primary CPU 612 to facilitate the data transfer. Alternatively, the primary CPU 612 may send data to the remote computer system 670 by a wire cable, such as a Universal Serial Bus (USB) cable coupled between USB transmitter/receivers using a USB communication protocol. The image processing and control system 600B illustrates the detachable camera module 304. The detachable camera module 304 may send data and receive control signals over a communication link established by the pairs of transmitter/ receivers 630,631. The detachable camera module 304 captures pixel data and may then process the pixel data or simply send it to the digital mirror base for storage or for display. The detachable camera module 304 may include its own light source 102 that is controlled by the primary CPU 612 to capture the pixel data. The detachable camera module 304 may include its own image signal processor and frame buffer memory. Otherwise, the pixel

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	data may be sent over the communication link and through the primary CPU to the image signal processor 610 of the digital mirror base." *See* 16:24-17:33.  Fig. 3A This limitation would have been obvious to a person of ordinary skill in the art based on (1) Rowles 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.	Rowles 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.

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	“In one embodiment of the invention, a digital mirror is disclosed including an enclosure; a display device mounted in the enclosure to display images at a front side of the enclosure; an image capture device mounted in the enclosure adjacent the display device to reduce parallax error; lights mounted in the enclosure adjacent the display device; and a light diffuser mounted to the enclosure around the display device over the one or more lights. The one or more lights provide lighting in front of the display device and the image capture device captures images in the field of view in the front. The light diffuser diffuses and softens the light emitted by the one or more lights. Alternatively, the image capture device may be mounted on an articulated arm that may be used to capture and display various angles in the filed of view of the digital mirror.” *See* Abstract. “Typical optical mirrors composed of a reflective material and potentially, encapsulated in glass, have characteristics that may not satisfy a user's requirements. A digital mirror has the ability to improve the user's experience in providing extended views of the user's features. The digital mirror also has the ability to enhance displayed images through the using imaging electronic components and software. Additionally, the combination of a plurality of lighting sources with selectable intensity, a plurality of camera choices and mounting applications may also enhance the user's experience. There are a number of different applications for a digital mirror. For example a wall mount digital mirror may be formed of different sizes depending on the user's discretion and interior design preferences. A large digital mirror may be desired for a user to view multiple views. A smaller digital mirror may be desired for smaller spaces and may offer a single view at a time for a quick view or reassurance. The enclosure may also be integral in how the digital mirror may be configured to be compatible with the user's environment. The ability for a digital mirror to either be a focal point for the user's environment or an accessory to the user's environment may determine the style of the enclosure and thus the display size, lighting, number and size of camera as well as the resolution and focus of the camera sensor.

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	A self-supported digital mirror (DM) may be used as a vanity mirror. It may include means for capturing side views for left, right and center viewing. The angle of the display of the digital mirror may be adjusted by a stand. A user interface further enables the user to select lighting, images to be viewed, and mirrored images (transposed from left to right) or true images (non transposed). In other embodiments of the invention, multiple cameras may extend to the left and right of the user to capture left, right, and side images for displaying on a single center display. The additional cameras can be moved to capture or whatever angles the user desires to view. The user simply may select the desired view through a menu of a graphics user interface or buttons of an electromechanical user interface. Multiple images of different views may be concurrently displayed in a mosaic arrangement on a display. This is different with an optical mirror. The enclosure houses together one or more of the lighting capabilities and arrangements, the camera views, and the display device software executed by a process may further enhance the display of images on a digital mirror. The ability to alter digital images is a common technique used in digital photography. Software may interactive with the elemental components such that lighting can be automatically dimmed or made brighter depending on the user's preference settings, such as an auto brightness feature. The enclosure may house one or more lighting sources such as incandescent lights, florescent lights, compact florescent lights, or LED (light emitting diode) devices, may be used singularly or in any combination in order to facilitate the user's desired lighting. Light sources have well defined characteristics such as incandescent lights sources may be seen as having a yellow tint where as florescent lights may be seen to have a bluish tint. Lighting to display appropriate shades of images provided by the digital mirror may also be responsive to the user's movement and ambient lighting conditions given the time of day.” *See* 3:37-4:30. “In another embodiment of the invention a portable, battery powered compact digital mirror would be very beneficial for travel or where AC powered accessories are not

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	easily supported. In this case the camera, the lighting sources, and display device technology are selected to support battery-powered operation. Sensors may be used to prevent excessive battery-power drain and increase viewing time by adjusting the lighting intensity in response to the reflective light and ambient light. The cameras of each digital mirror may act as the light sensor for each. Sensors may adjust lighting intensity and color depending on the users preferred settings for a particular ambient environment. For example, a compact version of the digital mirror may be used in a dark setting. In this case a sensor setting may be used to prevent a bright display that may be distracting. The digital mirror also provides the ability to view a true non-transposed image of a user. Typical optical mirrors provide a transposed or mirrored image to the viewer such that the left side of an object/user is transposed to the right side of the image and the right side of an object/user is transposed to the left side of the image. A digital mirror can display either view depending on the user's selection through a GUI or an electromechanical user interface. Digital images can also be enhanced through software to change the user's appearance, such as remove wrinkles or age spots or any other variety of commonly undesired user appearance features. Digital imaging software may also manipulate the user's image to add features to the user's image. In another embodiment of the invention, the camera may be detachable or separate from the display. The camera may communicate wirelessly through a common wireless protocol, such as IEEE 802.11. The ability to eliminate wires between the camera and display provides additional flexibility in locating the camera. For example, a detachable camera may be positioned behind the user's head. Additionally, left and right side wired/wireless cameras may be used to communicate with the display base to produce a plurality of images for the user to select from. Each camera may have its own lighting sources within its enclosure. Each camera may also provide a light sensor capability to sense the ambient light, the reflected light, and auto focus the camera's lenses, if any, in order to produce the user's desired displayed views.

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	The digital mirror may also be used to store or archive pictures for future comparisons. The user may also select a number of stored images in the digital mirror to be shown in a continuous manner similar to a slide show. The growth or development of a user may be displayed by capturing facial changes over the years. The captured image frames may be correlated an displayed as a movie or video. The camera may be used to take individual pictures, single image frame, or record video (a plurality of image frames over a time period) depending on the amount of storage available. Subsequently, the user may elect to show pictures for the purpose of décor, such as a digital picture frame. A wireless interface allows a user to store pictures and or movies on a remote computer system and transmit them to the digital mirror in the form of a stream file. The digital mirror may also send pictures back to the remote computer system for archival and or further editing or manipulation. A built-in image signal processor allows the captured images on the digital mirror to be manipulated. This allows the user to enhance their characteristics, such as to reduce wrinkles or remove skin blemishes for example. Selective control of the lighting intensity can also improve the image quality captured by the digital mirror." *See* 4:31-5:29. "Digital Mirror System A digital mirror is an apparatus that captures and displays an image to a user through the use of a digital electronic system. The digital mirror includes an image capture device and a display device on the same side to display the captured image to a user. A digital mirror further includes a user interface and an internal electronic control and image processing system to control the camera and the display device and process captured images for display on the display device. A digital mirror has a number of advantages over an optical mirror. A digital mirror provides a user with an improved mirror viewing experience compared to a conventional reflective optical mirror through the capabilities of digital imaging. A traditional optical

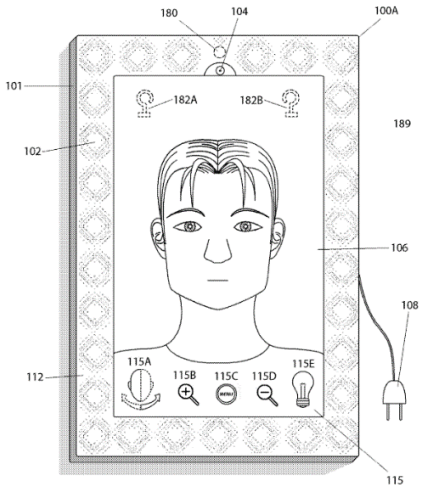
Asserted Claim of the ’109 Patent	Exemplary Citations to Rowles
	mirror is limited by the ambient environment such as physical location, lighting, and viewing angle of the user. A poorly lit environment can significantly influence the image seen by a user. The user is also limited by their own vision being able to see only in a direct line of sight. A traditional optical mirror is limited in that it can only display to the user a mirrored or reflected image. A digital mirror can overcome one or more of these limitations. The influence of asymmetry in humans plays a large role in how we view ourselves and how the rest of the world views us. A digital mirror has an ability to show the user a true life image of how others see them, rather than a mirrored image. In one embodiment of the invention, a freeze frame capture or video replay in a true view mode is provided so that users may study themselves without having to remain fixed in one position. A digital mirror enables the captured image input to be separated from the displayed output. Because the image capture device (e.g., a camera) and the display device are separate devices, the image capture device may be positioned so that the user's desired view may be displayed without changing the users position. Furthermore, users are not limited to direct line of sight viewing or using multiple mirrors in order to view themselves from different perspectives. The camera or image capture device may include lighting proximately mounted to illuminate the subject. In order to secure the position of the camera without the user holding it, the camera may include a clamp or stand coupled to a flexible arm or an articulating arm. The digital mirror includes an image processor that allows the manipulation of captured images for display on the display device. The digital mirror may include a digital zoom to zoom in and zoom out of the captured image. The image processor can further adjust the image displayed by compensating for poor lighting, modifying the image displayed so that a user can make themselves look better or more realistic, or perform any number of digital modifications that are possible in the digital imaging field with an image processor.

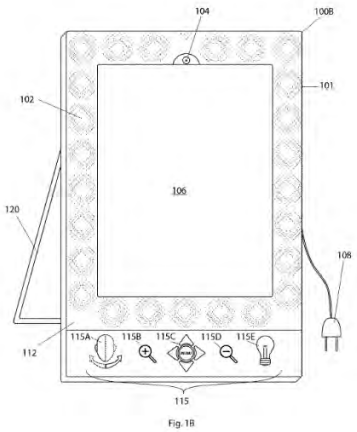
Asserted Claim of the ’109 Patent	Exemplary Citations to Rowles
	The digital mirror may provide substantially all the lighting a user needs to capture images. There is no need to adjust the environment to a digital mirror. The digital mirror can adapt to the user's environment. The digital mirror, along with a detachable camera if so equipped, includes or more light sources to illuminate the user within expected distances of use. Exposure and gain of the image capture device can be adjusted to improve image capture and or video displayed to the user. The digital mirror can store captured images to separate them from the image being displayed by the display device. A user can selectively freeze an image or replay a stored image to see themselves as they were in the past. Users no longer need to hold a position or expression, perform a motion over and over, or hold their eyes open to see themselves as the digital mirror can capture images for later display when a user's eyes are closed. A digital camera, also referred to as an image capture device, may provide enhanced optics to capture images otherwise not seen by unaided eyes. The image capture device may include an optical lens or a combination of optical lenses with various properties such as: a telephoto lens for a closer view, a wide angle lens to allow a wider view, or an optical zoom lens to provide both. Utilizing a telephoto lens, an optical zoom view is possible without users having to readjust their face closer to the digital mirror. The optical zoom lens may optically zoom in and out on the user to select a frame of for captured images for display on the display device of the digital mirror. A wide-angle lens provides a wide view that can be displayed without the user moving away from the device. The camera may include an auto-focus system to provide sharpness and or resolution, regardless of where the user is positioned relative to the device. The digital mirror is not limited to displaying only one full frame perspective view. Multiple cameras of a digital mirror can concurrently capture more than one perspective view of the user for display on a display device. The additional captured views can provide a more complete view of the user and or their surroundings. Alternatively, additional captured views may be used to provide a side-by-side perspective comparison.

Asserted Claim of the '109 Patent	Exemplary Citations to Rowles
	The digital camera can capture images for display full frame, side-by-side, picture in picture, or in a mosaic on the same display or on separate displays. With an optical mirror, the user previously had to move the mirror or position their own body in order to see a desired viewing angle. With multiple cameras, a user can capture different perspective views all at once. A digital mirror can displace optical mirrors as a decoration in a home or office environment. Because the digital mirror provides its own illumination, it has the ability to capture and display an image, even in poor lighting conditions. The digital mirror can be used in poorly lit rooms within the home, a visor mirror in automobiles at night, or in a plurality of environments in its portable compact version." *See* 5:31-7:3. "The image capture device 104 may be an OMNIVISION™ OV3642 three megapixel CAMERACHIP™ sensor with a fixed focal length lens in one embodiment of the invention, for example. In this case, a digital zoom may be used to zoom in and/or zoom out on a portion of an image. Alternatively, a camera module with an optical zoom may be used that mechanically moves lenses in a linear manner back and forth, such as commonly found in point and shoot digital cameras, or a camera module with a more compact zoom may be used such as shown and described in U.S. Patent Application Publication 2006/0216018 filed by Jen Tsorng Chang on Mar. 20, 2006, incorporated herein by reference, for example. The display device 106 may be a liquid crystal display (LCD) device or an organic light emitting diode (OLED) display device. The display device 106 provides the viewing medium for the user to observe one or more desired images captured by the camera 104. Surrounding the display device 106 is the selective light sources 102 that may be one or more of light emitting diodes (LED), incandescent, florescent, or any combination of light source that can provide light and illuminate a user. The lighting provided by the light sources 102 of the digital mirror may be responsive to the environment (e.g., ambient lighting) and one or more user preferred settings (e.g., automatic light sensing,

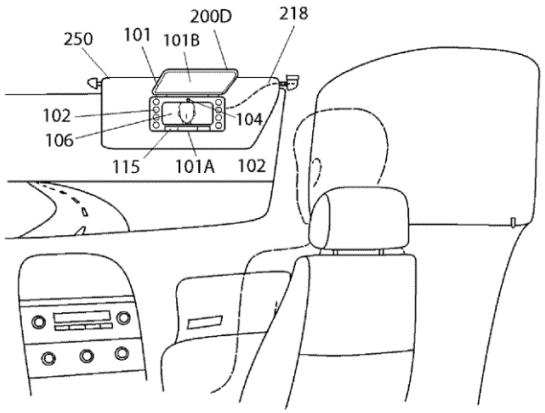
Asserted Claim of the '109 Patent	Exemplary Citations to Rowles
	manual light control) that are stored and provided to the digital image processing control electronics." *See* 7:20-45. "The light diffuser 112 is mounted to the enclosure to cover over the light sources 102. The light diffuser 112 diffuses or scatters the light generated by the light sources 102 in order to produce a softer light for the object or user in the target viewing area. The light diffuser 112 minimizes glare and other lighting aberrations that may tend to wash out or distort images captured by the image capture device 104 (also referred to as a camera). The light diffuser 112 may be shaped similar to the enclosure 101 and has an opening 113 to be mounted around the shape of the display device 106. In one embodiment of the invention, the enclosure and the display device are rectangular in shape such that the light diffuser 112 has a frame shape with a rectangular opening 113 (see FIG. 1C). In another embodiment of the invention, the enclosure and display device are oval shaped such that the light diffuser 112 also has an oval frame shape with an oval opening. The light diffuser 112 may include an opening around the camera to allow the capture of images in the field of view of the front side of the digital mirror." *See* 7:46-64. "In FIG. 1A, the camera 104 can be located just above the display device 106 near a notched out area of the selective lighting 102 and light diffuser 112. To minimize parallax and ensure the user can obtain the desired angle of view, the camera 104 is mounted as close as possible to the display device or under/over the display device. For example, the camera 104 may be centered within the display device 106 in order to minimize parallax. The camera 104 may also be mounted over display device 106, such as shown in FIGS. 3E-3F for example. Alternatively, the camera 104 may be mounted under the display device, such as shown in FIG. 3G for example. Digital imaging software may be used to compensate for the pixels in the display device 106 that are covered or interrupted by the camera. The number of pixels covered by the camera may be determined from the size of the camera and depth of field required for the digital mirror 100A. The digital mirror 100A further includes a touchscreen user interface (UI) 115 mounted over the display device 106. The touchscreen UI 115 provides the user the ability to

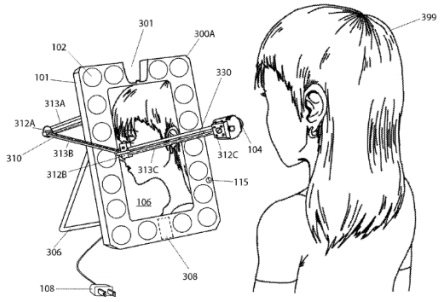
Asserted Claim of the ’109 Patent	Exemplary Citations to Rowles
	select the preferred image from a user interface menu. The touchscreen UI 115 may use capacitive sensing, surface acoustic wave (SAW), or resistive touchscreen technology. The user interface 115 may include a view mode button 115A, a zoom in button 115B to magnify a portion of the image, a menu selector button 115C, a zoom out button 115D to demagnify a portion of the image, and a light source dimmer/brightness button 115E to manually adjust the light intensity. The view mode button 115A allows a user to select between a true view mode or a mirror view mode and the display of images as either true images or mirrored images, respectively. The menu selector button 115C initiates a menu to be displayed on the display device 106 from which a user can select different control functions, such as camera control functions, display control functions, lighting control functions, and power control functions. A user may pan the image through the touch screen user interface as well. A power on/off switch/button may be included as part of the interface. Alternatively, a sensor may be used to automatically power on and off the digital mirror. While the user interface 115 may be a touchscreen UI as described, other types of user interfaces may be used with a digital mirror such as a gesture recognition user interface, a voice recognition user interface (e.g., microphone, voice recognizer/decoder, speaker to question/acknowledge), an electro-mechanical user interface (e.g., buttons, switches, etc.), or a graphical user interface with a pointer, such as a mouse or stylus.” *See* 7:65-8:43.

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	 Fig. 1A “Referring now to FIG. 1B, a second digital mirror 100B is illustrated that stands up and is self-supported upon a vanity or desktop surface. The digital mirror 100B receives AC power for the lighting, the digital imaging electronics, and the display through the AC power cord 108. The digital mirror 100B includes an enclosure 101 that has a pivotal stand 120. The pivotal stand 120 stands the digital mirror up upon a surface. The pivotal stand 120 can pivot to adjust its angle with the enclosure to provide flexibility in adjusting the angle and height of the mirror to the user's position. The display device 106 is mounted in the enclosure 101. The display device 106 may be an LCD display, a plasma display, an OLED display, or any other type of image display medium. The camera 104 is located near the top and in front of the display to minimize parallax. The digital mirror 100B includes light diffuser 112 to scatter the light from the device light source 102 surrounding the display device 106. The enclosure 101 houses the display device 106.

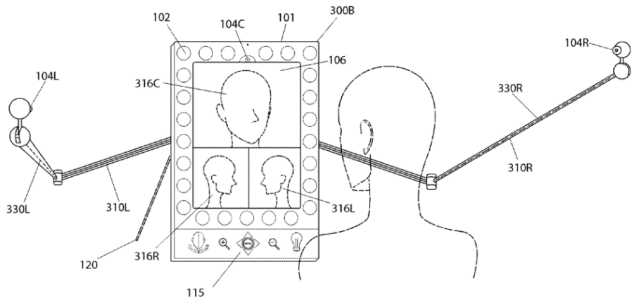
Asserted Claim of the '109 Patent	Exemplary Citations to Rowles
	The user interface 115 provides the user the ability to select a desired view. The user interface 115 may be an electromechanical user interface and include a view mode button 115A, a zoom in button 115B, a menu selector button 115C, a zoom out button 115D, and a light source dimmer/brightness button 115E. The view mode button 115A selects between true view mode and mirror view mode to display images as a true view image or a mirror view image, respectively. The menu selector button 115C initiates a menu to be displayed on the display device 106 from which a user can select different control functions, such as camera control functions, display control functions, lighting control functions, and power control functions. The menu also allows a user to select and save user preferred settings, such as for lighting, views etc." *See* 8:53-9:17.  Fig.1B "The user interface 115 for the portable digital mirror 200A may be a single electro-mechanical button that is responsive to the number of times the button is toggled. For example, depressing the button in rapid succession three times may execute a change in the rotation of the view angle. Alternatively, holding the button down may increase the LED lighting 102 brightness to a peak illumination and then start to decrease the

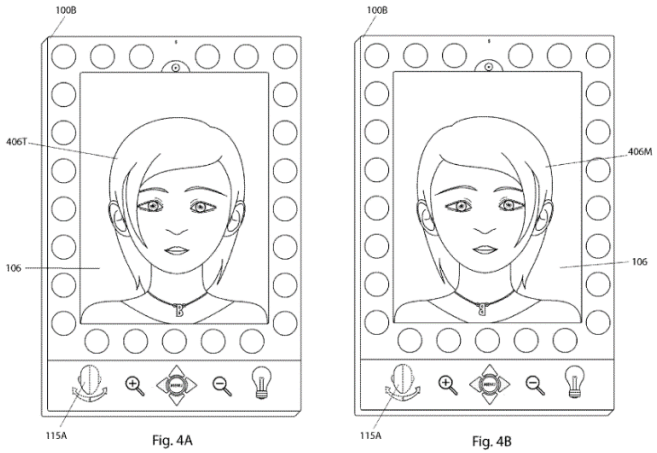
Asserted Claim of the '109 Patent	Exemplary Citations to Rowles
	brightness. Once the desired level of brightness is achieved, the user can let go of the button." *See* 10:4-12. "Referring now to FIG. 2D, a visor digital mirror 200D is shown coupled to an automotive sun visor 250. The visor digital mirror 200D may include enclosure halves 101A-101B that flip open and closed like those of the digital mirror 200A or alternatively, a slideable cover that slides open and closed over the display device in the enclosure half 101A. In either case, the second enclosure half is moveably (e.g., pivotally or slidingly) coupled to the first enclosure half. The enclosure half 101A is mounted to the sun visor 250 and rests thereon when folded up away into the ceiling of the car. When enclosure half 101B is flipped open to reveal the display device 106, a switch may automatically power on the digital mirror. When flipped closed to cover over the display device 106 to protect it from dirt and whatever else, the switch may power off the digital mirror. The slideable cover may slide open to reveal the display device 106 and power on the digital mirror and slide closed to cover over the display device 106 and power off the digital mirror. The digital mirror 200D is powered through a wire cable 218 connected to the automobiles direct current power supply having a nominal twelve (12) volts DC. The digital mirror includes the display device 106 mounted in the first enclosure half 101A, a camera (also referred to as an image capture device) 104 mounted in the first enclosure half 101A, one or more light sources 102 mounted in the enclosure half 101A on the left and right sides of the display device 106, and the user interface 115 mounted in the first enclosure half 101A. The second enclosure half 101B protects the digital mirror 200D when not in use. The second enclosure half 101A houses the components of the digital mirror 200D and provides a means to mount it to the sun visor 250D." *See* 10:21-52.

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	 Fig. 2D “Referring now to FIG. 3A, a digital mirror 300A is now illustrated capturing an image of a user 399 that is displayed on the display device 106. The digital mirror 300A is a rechargeable, self standing digital mirror including a pivotal stand 306 and rechargeable batteries 308. The pivotal stand 306 is pivotally coupled to a back side of the enclosure 101 to support the digital mirror on surface. The digital mirror 300A further includes a detachable camera 104 that is coupled to the enclosure 101 by an articulating arm 310. The camera 104 is mounted at the distal end of the arm 310. The proximal end of the arm 310 is coupled to the enclosure 101. One or more lights 102 that may be mounted adjacent the camera 104 to provide lighting in front of the digital camera 104 to facilitate the capture of images, such as shown by FIG. 3D. A camera cable 330 may couple the camera 104 to the underlying image processing system (see FIG. 6A) to provide power and control signals and receive pixel data for each image frame captured. Alternatively, wireless transmitter/receivers may be used to

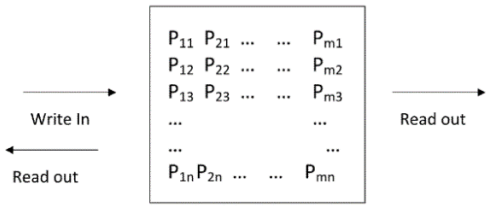
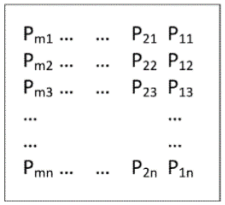
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	send the captured images to the underlying image processing system (see FIG. 6B) mounted in the enclosure 101.” *See* 10:53-11:6.  Fig. 3A “Referring now to FIG. 3B, a digital mirror 300B is illustrated that includes a plurality of cameras—a left camera 104L, a center camera 140C, and a right camera 104R. The digital mirror 300B is self-supporting including an optional stand 120 and/or means to be wall mounted (e.g. hole 180 or hooks 182A-182B shown in FIG. 1A) so that it can capture images hands-free, without the user having to hold any camera. One or more lights 102 may be mounted adjacent each of the left camera 104L and the right camera 104R, such as shown by FIG. 3D, to provide lighting in front of each and facilitate the capture of images. One or more lights 102 may also be mounted around the display device 106 to provide lighting in front of the display device to facilitate the capture of images. The digital mirror 300B includes additional cameras so that the user can concurrently capture and then display images of different views from various fields of view. A digital camera can capture images for display full frame, side-by-side, picture in picture, or in a mosaic on the same display. For example, the left camera 104L may capture a left side view of a user, the center camera 140C may capture a front side view of the user, and the right camera 104R may capture a right side view of the user concurrently. The digital

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	mirror 300B can also concurrently display left side images 316L captured by the left camera 104L, front side images 316C captured by the center camera 140C, and right side images 316R captured by the right camera 104R in a mosaic arrangement on the display device 106, in response to a selection by the user with the user interface 115. The digital mirror 300B can also display these images separately as full frame images on the display device 106, such as shown by FIGS. 1A, 2D, 3A, 4A-4B, and supported by FIGS. 5A-5B and the description thereof, in response to a selection by the user through the user interface 115. The left side images 316L, the front side images 316C, and the right side images 316R displayed in the mosaic arrangement may all be live images continuously captured by the cameras and displayed on the display device 106. Alternatively, one or more of the left side images 316L, the front side images 316C, and the right side images 316R displayed in the mosaic arrangement may be stored images previously captured by the cameras and read out from a storage device. For example, the front side images 316C may be live images while the left side images 316L and the right side images 316R may be stored images read out from the storage device and displayed on the display device. The center camera 104C is mounted to the enclosure 101 adjacent the display device 106 to reduce parallax. The center camera 104C captures a frontal view of the user or alternatively, a back view of the user if the user rotates himself/herself around so his back faces the center camera. For example, the user shown in FIG. 3B facing the camera 104C and the display 106 could turn around so that the back of their head is facing the camera 104C. After capturing and storing a few frames of images of the back of their head, the user can turn back around and select with the user interface 115 to recall the captured images of the back of their head for display on the display device 106. Similarly, frames of left and right side images may be captured with the left and right cameras 1041,104R respectively and stored in a storage device (e.g., see storage device 644 in FIGS. 6A-6B) of the digital mirror. The user can then select through the user interface 115 to recall the captured images of the one more sides of their head for separate or concurrent display on the display device 106 to provide a more complete view of them selves.

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	The left camera 104L and the right camera 104R are respectively mounted to the distal ends of a left articulating arm 310L and a right articulating arm 31 OR respectively. The proximal ends of the left articulating arm 310L and the right articulating arm 31 OR are coupled to the left and right of the enclosure 101 respectively. The left camera 104L and the right camera 104R are electrically coupled to the image processing system (See FIGS. 6A-6B) by cables 330 extending through the arms 310L,310R. The cables 330 may be electrical wire cables or optical fiber cables to couple the cameras 104L,104R and image processor system electronics together. In an alternate embodiment, the cameras 104L,104R may be wireless cameras and communicate with a wireless digital mirror base with a wireless communication protocol as described herein.” *See* 11:44-12:55.  Fig. 3B “The digital camera 104 can also be mounted under the display device 106 to reduce parallax. Provisional Patent Application No. 61/338,106 filed on Feb. 16, 2010 by John W. Rowles, et al., entitled TECHNIQUES FOR IMAGE CAPTURE THROUGH LIQUID CRYSTAL DISPLAYS, describes how to mount a camera under a liquid crystal display (LCD) device and capture images. The digital camera may be mounted between an LCD pixel panel and a backlighting panel. Alternatively, the camera may replace a few pixels and be interspersed between pixels of the LCD pixel panel. In another embodiment of the invention, the digital camera 104 can also be mounted under

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	an organic light emitting diode (OLED) display device 106 to reduce parallax. Alternatively, the digital camera 104 may replace a few pixels and be interspersed between pixels of the organic light emitting diodes.” *See* 13:43-58. “Referring now to FIG. 4A, in response to true view mode being selected through the view mode selector 115A of the user interface, a true image 406T is displayed by the display device 106 of the digital mirror 100B. A conventional optical mirror does not display the true image 406T if a user stands in front of the optical mirror. The letter B on the necklace in the true image 406T has a proper orientation. FIG. 4B illustrates a mirrored image 406M being displayed in response to the mirror view mode being selected by the user interface view mode selector 115A. A conventional optical mirror may display an image similar to the mirrored image 406M.” *See* 14:6-17.  “Referring now to FIG. 5A, a representation of a single frame of pixel data configured into columns and rows is illustrated. A frame of pixel data is captured by the image

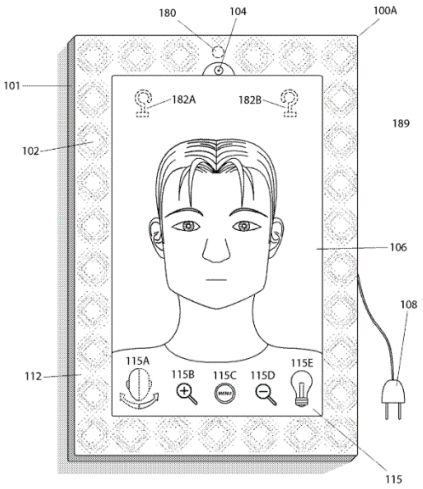
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	capture device 104 and stored in digital format into the memory locations of a frame buffer memory. A frame of data may written into the frame buffer memory and organized as illustrated in FIG. 5A, such as by writing from left to right (pixel P11 to pixel Pm1). In response to user selections (e.g., true view mode or mirror view mode), the pixel data stored in the frame buffer memory can be readily processed by an image signal processor as desired. In a true view mode, the frame of data may be read out similarly (e.g., from left to right—pixel P11 to pixel Pm1) and displayed on the display device as shown in FIG. 5A. Pixel P11 is displayed in the upper left corner, pixel Pm1 is displayed in the upper right corner, pixel P1n is displayed in the lower left corner, and pixel Pmn is displayed in the lower right corner. In this manner, the pixel data is displayed on the display device of the digital mirror as it was captured by the image capture device. The true view mode displays true images to the user as how third persons see the user, such as shown in FIG. 4A. In a mirror view mode, the frame of pixel data saved into the frame buffer memory is read out differently from how it was written by reversing the addressing of memory locations into the frame buffer memory. The arrangement of the pixel data in the rows and columns is read out of the memory locations in a reverse order (e.g., from right to left—Pm1 to P11) to transpose or horizontally flip the captured image into a horizontally mirrored image. FIG. 5B illustrates how the mirrored image is displayed on the display device 106 of the digital mirror in response to the mirror view mode. For example, pixel Pm1 is now displayed in the upper left corner of the display device, pixel P11 is displayed in the upper right corner of the display device, pixel Pmn is displayed in the lower left corner, and pixel P1n is displayed in the lower right corner. The mirror view mode displays mirror images on the display device to the user, such as shown in FIG. 4B, similar to how an optical mirror does." *See* 14:18-56.

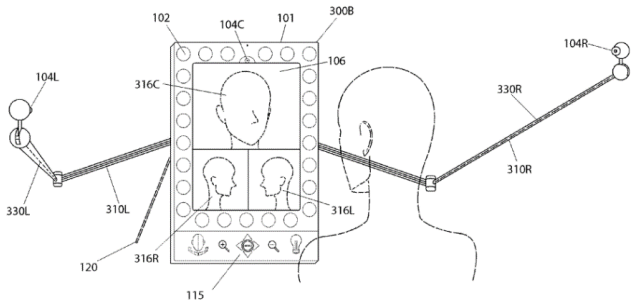
Asserted Claim of the ’109 Patent	Exemplary Citations to Rowles
	 Fig. 5A  Fig. 5B “The lighting controller 616 can control the light intensity (brightness) of the lighting sources 102 in response to control signals received from the primary CPU. The type of light sources utilized may have different controllable features and characteristics. Different types of lighting controllers may be matched to the type of light sources being used. Alternatively, the lighting controller may execute algorithms to modify the illumination characteristics depending upon the type of light source 102 being controlled. Exemplary light sources include one or more of florescent, compact florescent, or light emitting diodes (LEDs)—the preferred embodiment of lighting source for the invention.” *See* 16:12-23. “The camera module 104, also referred to as an image capture device, may include a lens system, an image sensor, and an optional external Image Signal Processor (ISP). The camera preferably has a high depth of field from any combination of decreased sensor

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	size, decreased aperture size, and/or an Extended Depth of Field technology within the sensor and image processing system. The image processing may be handled internally on a System-On-Chip (SOC) or on an external ISP." *See* 16:24-38. "The image processing and control system 600B illustrates the detachable camera module 304. The detachable camera module 304 may send data and receive control signals over a communication link established by the pairs of transmitter/ receivers 630,631. The detachable camera module 304 captures pixel data and may then process the pixel data or simply send it to the digital mirror base for storage or for display. The detachable camera module 304 may include its own light source 102 that is controlled by the primary CPU 612 to capture the pixel data. The detachable camera module 304 may include its own image signal processor and frame buffer memory. Otherwise, the pixel data may be sent over the communication link and through the primary CPU to the image signal processor 610 of the digital mirror base." *See* 17:20-33. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Rowles 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 8	
8. The method of claim 1, further comprising applying a translation transformation to move the image within display area of the monitor.	Rowles 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 other embodiments of the invention, multiple cameras may extend to the left and right of the user to capture left, right, and side images for displaying on a single center

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	display. The additional cameras can be moved to capture or whatever angles the user desires to view. The user simply may select the desired view through a menu of a graphics user interface or buttons of an electromechanical user interface. Multiple images of different views may be concurrently displayed in a mosaic arrangement on a display. This is different with an optical mirror. The enclosure houses together one or more of the lighting capabilities and arrangements, the camera views, and the display device software executed by a process may further enhance the display of images on a digital mirror." *See* 4:1-14. "The digital mirror is not limited to displaying only one full frame perspective view. Multiple cameras of a digital mirror can concurrently capture more than one perspective view of the user for display on a display device. The additional captured views can provide a more complete view of the user and or their surroundings. Alternatively, additional captured views may be used to provide a side-by-side perspective comparison. The digital camera can capture images for display full frame, side-by-side, picture in picture, or in a mosaic on the same display or on separate displays. With an optical mirror, the user previously had to move the mirror or position their own body in order to see a desired viewing angle. With multiple cameras, a user can capture different perspective views all at once." *See* 6:50-63. "The digital mirror 300B includes additional cameras so that the user can concurrently capture and then display images of different views from various fields of view. A digital camera can capture images for display full frame, side-by-side, picture in picture, or in a mosaic on the same display. For example, the left camera 104L may capture a left side view of a user, the center camera 140C may capture a front side view of the user, and the right camera 104R may capture a right side view of the user concurrently. The digital mirror 300B can also concurrently display left side images 316L captured by the left camera 104L, front side images 316C captured by the center camera 140C, and right side images 316R captured by the right camera 104R in a mosaic arrangement on the display device 106, in response to a selection by the user with the user interface 115. The digital mirror 300B can also display these images separately as full frame images on the display device 106, such as shown by FIGS. 1A, 2D, 3A, 4A-4B, and supported by FIGS. 5A-

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	5B and the description thereof, in response to a selection by the user through the user interface 115. The left side images 316L, the front side images 316C, and the right side images 316R displayed in the mosaic arrangement may all be live images continuously captured by the cameras and displayed on the display device 106. Alternatively, one or more of the left side images 316L, the front side images 316C, and the right side images 316R displayed in the mosaic arrangement may be stored images previously captured by the cameras and read out from a storage device. For example, the front side images 316C may be live images while the left side images 316L and the right side images 316R may be stored images read out from the storage device and displayed on the display device.” *See* 11:58-12:21.  Fig. 1A

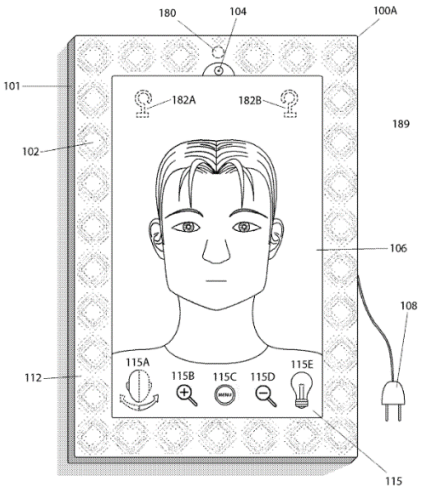
Asserted Claim of the ’109 Patent	Exemplary Citations to Rowles
	 Fig. 3B This limitation would have been obvious to a person of ordinary skill in the art based on (1) Rowles alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect to this claim element as 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 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.	Rowles 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. “The ability to alter digital images is a common technique used in digital photography. Software may interactive with the elemental components such that lighting can be automatically dimmed or made brighter depending on the user's preference settings, such as an auto brightness feature. The enclosure may house one or more lighting sources

Asserted Claim of the ’109 Patent	Exemplary Citations to Rowles
	such as incandescent lights, florescent lights, compact florescent lights, or LED (light emitting diode) devices, may be used singularly or in any combination in order to facilitate the user's desired lighting. Light sources have well defined characteristics such as incandescent lights sources may be seen as having a yellow tint where as florescent lights may be seen to have a bluish tint. Lighting to display appropriate shades of images provided by the digital mirror may also be responsive to the user's movement and ambient lighting conditions given the time of day.” *See* 4:15-30. “Sensors may be used to prevent excessive battery-power drain and increase viewing time by adjusting the lighting intensity in response to the reflective light and ambient light. The cameras of each digital mirror may act as the light sensor for each. Sensors may adjust lighting intensity and color depending on the users preferred settings for a particular ambient environment. For example, a compact version of the digital mirror may be used in a dark setting. In this case a sensor setting may be used to prevent a bright display that may be distracting.” *See* 4:37-46. “In another embodiment of the invention, the camera may be detachable or separate from the display. The camera may communicate wirelessly through a common wireless protocol, such as IEEE 802.11. The ability to eliminate wires between the camera and display provides additional flexibility in locating the camera. For example, a detachable camera may be positioned behind the user's head. Additionally, left and right side wired/wireless cameras may be used to communicate with the display base to produce a plurality of images for the user to select from. Each camera may have its own lighting sources within its enclosure. Each camera may also provide a light sensor capability to sense the ambient light, the reflected light, and auto focus the camera's lenses, if any, in order to produce the user's desired displayed views.” *See* 4:60-5:6. “The image processor can further adjust the image displayed by compensating for poor lighting, modifying the image displayed so that a user can make themselves look better or more realistic, or perform any number of digital modifications that are possible in the digital imaging field with an image processor.” *See* 6:10-6:15.

Asserted Claim of the '109 Patent	Exemplary Citations to Rowles
	"A digital mirror can displace optical mirrors as a decoration in a home or office environment. Because the digital mirror provides its own illumination, it has the ability to capture and display an image, even in poor lighting conditions. The digital mirror can be used in poorly lit rooms within the home, a visor mirror in automobiles at night, or in a plurality of environments in its portable compact version." *See* 6:64-7:3. "The display device 106 may be a liquid crystal display (LCD) device or an organic light emitting diode (OLED) display device. The display device 106 provides the viewing medium for the user to observe one or more desired images captured by the camera 104. Surrounding the display device 106 is the selective light sources 102 that may be one or more of light emitting diodes (LED), incandescent, florescent, or any combination of light source that can provide light and illuminate a user. The lighting provided by the light sources 102 of the digital mirror may be responsive to the environment (e.g., ambient lighting) and one or more user preferred settings (e.g., automatic light sensing, manual light control) that are stored and provided to the digital image processing control electronics." *See* 7:32-8:45. "The digital mirror 100A further includes a touchscreen user interface (UI) 115 mounted over the display device 106. The touchscreen UI 115 provides the user the ability to select the preferred image from a user interface menu. The touchscreen UI 115 may use capacitive sensing, surface acoustic wave (SAW), or resistive touchscreen technology. The user interface 115 may include a view mode button 115A, a zoom in button 115B to magnify a portion of the image, a menu selector button 115C, a zoom out button 115D to demagnify a portion of the image, and a light source dimmer/brightness button 115E to manually adjust the light intensity. The view mode button 115A allows a user to select between a true view mode or a mirror view mode and the display of images as either true images or mirrored images, respectively. The menu selector button 115C initiates a menu to be displayed on the display device 106 from which a user can select different control functions, such as camera control functions, display control functions, lighting control functions, and power control functions. A user may pan the image through the touch screen user interface as well. A power on/off switch/button may be included as part of the interface. Alternatively, a sensor may be used to automatically power on and off the

Asserted Claim of the '109 Patent	Exemplary Citations to Rowles
	digital mirror. While the user interface 115 may be a touchscreen UI as described, other types of user interfaces may be used with a digital mirror such as a gesture recognition user interface, a voice recognition user interface (e.g., microphone, voice recognizer/decoder, speaker to question/acknowledge), an electro-mechanical user interface (e.g., buttons, switches, etc.), or a graphical user interface with a pointer, such as a mouse or stylus." *See* 8:14-8:43. "The user interface 115 for the portable digital mirror 200A may be a single electro-mechanical button that is responsive to the number of times the button is toggled. For example, depressing the button in rapid succession three times may execute a change in the rotation of the view angle. Alternatively, holding the button down may increase the LED lighting 102 brightness to a peak illumination and then start to decrease the brightness. Once the desired level of brightness is achieved, the user can let go of the button." *See* 10:4-12. "The lighting controller 616 can control the light intensity (brightness) of the lighting sources 102 in response to control signals received from the primary CPU. The type of light sources utilized may have different controllable features and characteristics. Different types of lighting controllers may be matched to the type of light sources being used. Alternatively, the lighting controller may execute algorithms to modify the illumination characteristics depending upon the type of light source 102 being controlled. Exemplary light sources include one or more of florescent, compact florescent, or light emitting diodes (LEDs)—the preferred embodiment of lighting source for the invention." *See* 16:12-23.

Asserted Claim of the ’109 Patent	Exemplary Citations to Rowles
	 Fig. 1A This limitation would have been obvious to a person of ordinary skill in the art based on (1) Rowles 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 Rowles
Claim 11	
11[pre]. The method of claim 1, further comprising:	To the extent the preamble is limiting, Rowles 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 Rowles
	This limitation would have been obvious to a person of ordinary skill in the art based on (1) Rowles 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,	Rowles 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]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Rowles 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.	Rowles expressly and/or inherently discloses and/or renders obvious varying resolution of the image according to the distance. *See, e.g.*, disclosures below. "The enclosure may also be integral in how the digital mirror may be configured to be compatible with the user's environment. The ability for a digital mirror to either be a focal point for the user's environment or an accessory to the user's environment may determine the style of the enclosure and thus the display size, lighting, number and size of camera as well as the resolution and focus of the camera sensor." *See* 3:54-60. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Rowles 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-24: Invalidity of U.S. Patent No. 8,982,109 in view of U.S. Patent Pub. No. 2010/0226531 ("Goto")

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.

Goto was originally filed January 15, 2007 and published on September 9, 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(a), (b), and (e).

Goto anticipates the Asserted Claims of the '109 Patent. To the extent it is found Goto 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 Goto does not anticipate the Asserted Claims, Goto 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 Goto
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, Goto expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. "According to the present invention, in order to solve the above-described problems, a makeup simulation system applying makeup to a video having an image of the face of a user captured thereon is characterized by image capturing means for capturing the image of the face of the user and outputting the video, control means for receiving the video output from the image capturing means, performing image processing on the video, and outputting the video; and display means for displaying the video output from the control means, wherein the control means includes face recognition means for recognizing the face of the user from the video based on predetermined tracking points; and makeup processing means for applying a predetermined makeup on the face of the user included in the video based on the tracking points and outputting the video to the display means." *See* Goto at para. [0007]. "The camera 2 captures an image of a user standing in front of the makeup simulator 1 and outputs a video." *See* Goto at para. [0085]. "The makeup simulator 1 of FIG. 1 and FIG.2, which is based on a mirror, an item indispensable for makeup, as a concept, has the function of interacting with a user. That is, the makeup simulator 1 has the characteristic of giving a user a natural feeling as if the user were putting on makeup, looking at a mirror." *See* Goto at para. [0088]. "The makeup simulator 1 performs image processing on a video output from the camera 2 in the control part 8, thereby applying makeup on a user's face included in the image, and displays the video on the monitor 7, which is a digital mirror. The makeup simulator 1 is capable of displaying various merchandise and cosmetic information items and the imaginary image of a user's face with makeup applied on it on the monitor 7." *See* Goto at para. [0104].

Asserted Claim of the '109 Patent	Exemplary Citations to Goto
	"Proceeding to step S3, the control part 8 starts a makeup simulation based on the Software activated in step S2. At this point, the control part 8 displays the screen image 102 on the monitor 7 and displays the screen image 202 on the operations panel 4. The screen image 102 shows the case of displaying the video of the user's face captured with the camera 2 with a magic mirror-like effect on it. The screen image 202 shows the case of displaying a WELCOME message that moves laterally the same as the screen image 201." *See* Goto at [0129]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Goto 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;	Goto expressly and/or inherently discloses and/or renders obvious obtaining a digital image from a camera. *See*, *e.g.*, disclosures below. "According to the present invention, in order to solve the above-described problems, a makeup simulation system applying makeup to a video having an image of the face of a user captured thereon is characterized by image capturing means for capturing the image of the face of the user and outputting the video, control means for receiving the video output from the image capturing means, performing image processing on the video, and outputting the video; and display means for displaying the video output from the control means, wherein the control means includes face recognition means for recognizing the face of the user from the video based on predetermined tracking points; and makeup processing means for applying a predetermined makeup on the face of the user included in the video based on the tracking points and outputting the video to the display means." *See* Goto at para. [0007].

Asserted Claim of the ’109 Patent	Exemplary Citations to Goto
	“The camera 2 captures an image of a user standing in front of the makeup simulator 1 and outputs a video.” *See* Goto at para. [0085]. “The makeup simulator 1 of FIG. 1 and FIG.2, which is based on a mirror, an item indispensable for makeup, as a concept, has the function of interacting with a user. That is, the makeup simulator 1 has the characteristic of giving a user a natural feeling as if the user were putting on makeup, looking at a mirror.” *See* Goto at para. [0088]. “The makeup simulator 1 performs image processing on a video output from the camera 2 in the control part 8, thereby applying makeup on a user's face included in the image, and displays the video on the monitor 7, which is a digital mirror. The makeup simulator 1 is capable of displaying various merchandise and cosmetic information items and the imaginary image of a user's face with makeup applied on it on the monitor 7.” *See* Goto at para. [0104]. “Proceeding to step S3, the control part 8 starts a makeup simulation based on the Software activated in step S2. At this point, the control part 8 displays the screen image 102 on the monitor 7 and displays the screen image 202 on the operations panel 4. The screen image 102 shows the case of displaying the video of the user's face captured with the camera 2 with a magic mirror-like effect on it. The screen image 202 shows the case of displaying a WELCOME message that moves laterally the same as the screen image 201.” *See* Goto at [0129]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Goto 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 Goto
1[b]. flipping the image about a vertical axis so as to reverse right and left sides of the image;	Goto 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. "The makeup simulator 1 of FIG. 5 and FIG. 6, which is based on a mirror, an item indispensable for makeup, as a concept, has the function of interacting with a user. That is, the makeup simulator 1 has the characteristic of giving a user a natural feeling as if the user were putting on makeup, looking at a mirror. The makeup simulator 1 performs image processing on a video output from the camera 2 in the control part 8, thereby applying makeup on a user's face included in the image, and displays the video on the monitor 7, which is a digital mirror. The makeup simulator 1 is capable of displaying various merchandise and cosmetic information items and the imaginary image of a user's face with makeup applied on it on the monitor 7." *See* Goto at para. [0103]-[0104]. "The makeup simulator 1 of FIG. 7 and FIG. 8, which is based on a mirror, an item indispensable for makeup, as a concept, has the function of interacting with a user. That is, the makeup simulator 1 has the characteristic of giving a user a natural feeling as if the user were putting on makeup, looking at a mirror. The makeup simulator 1 performs image processing on a video output from the camera 2 in the control part 8, thereby applying makeup on a user's face included in the image, and displays the video on the touch panel monitor 15, which is a digital mirror. The makeup simulator 1 is capable of displaying various merchandise and cosmetic information items and the imaginary image of a user's face with makeup applied on it on the touch panel monitor 15." *See* Goto at paras. [0108]-[0109]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Goto 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 Goto
	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;	Goto 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 makeup simulator 1 of FIG. 5 and FIG. 6, which is based on a mirror, an item indispensable for makeup, as a concept, has the function of interacting with a user. That is, the makeup simulator 1 has the characteristic of giving a user a natural feeling as if the user were putting on makeup, looking at a mirror. The makeup simulator 1 performs image processing on a video output from the camera 2 in the control part 8, thereby applying makeup on a user's face included in the image, and displays the video on the monitor 7, which is a digital mirror. The makeup simulator 1 is capable of displaying various merchandise and cosmetic information items and the imaginary image of a user's face with makeup applied on it on the monitor 7." *See* Goto at para. [0103]-[0104]. "The makeup simulator 1 of FIG. 7 and FIG. 8, which is based on a mirror, an item indispensable for makeup, as a concept, has the function of interacting with a user. That is, the makeup simulator 1 has the characteristic of giving a user a natural feeling as if the user were putting on makeup, looking at a mirror. The makeup simulator 1 performs image processing on a video output from the camera 2 in the control part 8, thereby applying makeup on a user's face included in the image, and displays the video on the touch panel monitor 15, which is a digital mirror. The makeup simulator 1 is capable of displaying various merchandise and cosmetic information items and the imaginary image of a user's face with makeup applied on it on the touch panel monitor 15." *See* Goto at paras. [0108]-[0109].

Asserted Claim of the '109 Patent	Exemplary Citations to Goto
	This limitation would have been obvious to a person of ordinary skill in the art based on (1) Goto 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;	Goto 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. "The makeup simulator 1 of FIG. 5 and FIG. 6, which is based on a mirror, an item indispensable for makeup, as a concept, has the function of interacting with a user. That is, the makeup simulator 1 has the characteristic of giving a user a natural feeling as if the user were putting on makeup, looking at a mirror. The makeup simulator 1 performs image processing on a video output from the camera 2 in the control part 8, thereby applying makeup on a user's face included in the image, and displays the video on the monitor 7, which is a digital mirror. The makeup simulator 1 is capable of displaying various merchandise and cosmetic information items and the imaginary image of a user's face with makeup applied on it on the monitor 7." *See* Goto at para. [0103]-[0104]. "The makeup simulator 1 of FIG. 7 and FIG. 8, which is based on a mirror, an item indispensable for makeup, as a concept, has the function of interacting with a user. That is, the makeup simulator 1 has the characteristic of giving a user a natural feeling as if the user were putting on makeup, looking at a mirror. The makeup simulator 1 performs image processing on a video output from the camera 2 in the control part 8, thereby applying makeup on a user's face included in the image, and displays the video on the touch panel monitor 15, which is a digital mirror. The makeup simulator 1 is capable of displaying various merchandise and cosmetic

Asserted Claim of the '109 Patent	Exemplary Citations to Goto
	information items and the imaginary image of a user's face with makeup applied on it on the touch panel monitor 15." *See* Goto at paras. [0108]-[0109]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Goto 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;	Goto 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. "According to the present invention, in order to solve the above-described problems, a makeup simulation system applying makeup to a video having an image of the face of a user captured thereon is characterized by image capturing means for capturing the image of the face of the user and outputting the video, control means for receiving the video output from the image capturing means, performing image processing on the video, and outputting the video; and display means for displaying the video output from the control means, wherein the control means includes face recognition means for recognizing the face of the user from the video based on predetermined tracking points; and makeup processing means for applying a predetermined makeup on the face of the user included in the video based on the tracking points and outputting the video to the display means." *See* Goto at para. [0007]. "The camera 2 captures an image of a user standing in front of the makeup simulator 1 and outputs a video." *See* Goto at para. [0085]. "The makeup simulator 1 of FIG. 1 and FIG.2, which is based on a mirror, an item indispensable for makeup, as a concept, has the function of interacting with a user. That

Asserted Claim of the '109 Patent	Exemplary Citations to Goto
	is, the makeup simulator 1 has the characteristic of giving a user a natural feeling as if the user were putting on makeup, looking at a mirror." *See* Goto at para. [0088]. "The makeup simulator 1 performs image processing on a video output from the camera 2 in the control part 8, thereby applying makeup on a user's face included in the image, and displays the video on the monitor 7, which is a digital mirror. The makeup simulator 1 is capable of displaying various merchandise and cosmetic information items and the imaginary image of a user's face with makeup applied on it on the monitor 7." *See* Goto at para. [0104]. "Proceeding to step S3, the control part 8 starts a makeup simulation based on the Software activated in step S2. At this point, the control part 8 displays the screen image 102 on the monitor 7 and displays the screen image 202 on the operations panel 4. The screen image 102 shows the case of displaying the video of the user's face captured with the camera 2 with a magic mirror-like effect on it. The screen image 202 shows the case of displaying a WELCOME message that moves laterally the same as the screen image 201." *See* Goto at [0129]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Goto 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;	Goto 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. "The control part 8 is continuously receiving a video captured by the camera 2. At this point, the control part 8 displays the screen image 100 on the monitor 7 and the screen

Asserted Claim of the '109 Patent	Exemplary Citations to Goto
	image 200 on the operations panel 4. The screen images 100 and 200 show the case of displaying screen savers." *See* Goto at para. [0125]. "Unlike those based on still images or the conventional makeup simulator 1, the makeup simulator 1 of the present invention, which performs a real-time simulation, is capable of instantaneously recognizing tracking points of a face and performing simulation based on the tracking points. Therefore, the makeup simulator 1 enables the following that have not been possible so far. The makeup simulator 1 of the present invention is capable of a real-time simulation. The makeup simulator 1 of the present invention is capable of simulation not only from a full face as conventionally but also from a face in profile. Accordingly, it is easy to view the simulation effect or technique of blusher or the like." *See* Goto at paras. [0123]-[0124]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Goto 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	Goto 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. "The simulator main application 28 trims and reduces the still image of the resolution for still images obtained from the video input using the dedicated API 32. The simulator main application 28 trims the still image of the resolution for still images. Further, the simulator main application 28 reduces the still image of the resolution for still images, thereby obtaining an image for face recognition. A face recognition part 43 obtains tracking points 44 as described below for recognizing the user's face from the image for face recognition.

Asserted Claim of the '109 Patent	Exemplary Citations to Goto
	The simulator main application 28 extracts specific regions from the user's face included in the trimmed video based on the tracking points 44, obtains additional information to be used for a features diagnosis and a skin color diagnosis, such as a type and a skin color, from the specific regions, and outputs tracking points 45, which are the tracking points 44 plus the additional information, and the still image of the resolution for still images obtained from the video input using the dedicated API 32 to the still image system 25." *See* Goto at paras. [0156]-[0157]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Goto 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.	Goto 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. "The simulator main application 28 trims and reduces the still image of the resolution for still images obtained from the video input using the dedicated API 32. The simulator main application 28 trims the still image of the resolution for still images. Further, the simulator main application 28 reduces the still image of the resolution for still images, thereby obtaining an image for face recognition. A face recognition part 43 obtains tracking points 44 as described below for recognizing the user's face from the image for face recognition. The simulator main application 28 extracts specific regions from the user's face included in the trimmed video based on the tracking points 44, obtains additional information to be used for a features diagnosis and a skin color diagnosis, such as a type and a skin color, from the specific regions, and outputs tracking points 45, which are the tracking points 44 plus the additional information, and the still image of the resolution for still

Asserted Claim of the '109 Patent	Exemplary Citations to Goto
	images obtained from the video input using the dedicated API 32 to the still image system 25." *See* Goto at paras. [0156]-[0157]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Goto 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 Goto
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.	Goto 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. "The makeup simulator 1 of FIG. 5 and FIG. 6, which is based on a mirror, an item indispensable for makeup, as a concept, has the function of interacting with a user. That is, the makeup simulator 1 has the characteristic of giving a user a natural feeling as if the user were putting on makeup, looking at a mirror. The makeup simulator 1 performs image processing on a video output from the camera 2 in the control part 8, thereby applying makeup on a user's face included in the image, and displays the video on the monitor 7, which is a digital mirror. The makeup simulator 1 is capable of displaying various merchandise and cosmetic information items and the imaginary image of a user's face with makeup applied on it on the monitor 7." *See* Goto at para. [0103]-[0104]. "The makeup simulator 1 of FIG. 7 and FIG. 8, which is based on a mirror, an item indispensable for makeup, as a concept, has the function of interacting with a user. That

Asserted Claim of the '109 Patent	Exemplary Citations to Goto
	is, the makeup simulator 1 has the characteristic of giving a user a natural feeling as if the user were putting on makeup, looking at a mirror. The makeup simulator 1 performs image processing on a video output from the camera 2 in the control part 8, thereby applying makeup on a user's face included in the image, and displays the video on the touch panel monitor 15, which is a digital mirror. The makeup simulator 1 is capable of displaying various merchandise and cosmetic information items and the imaginary image of a user's face with makeup applied on it on the touch panel monitor 15." *See* Goto at paras. [0108]-[0109]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Goto 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 Goto
Claim 7	
7[pre]. The method of claim 1, further comprising the steps:	To the extent the preamble is limiting, Goto 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) Goto 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 Goto
7[a]. obtaining a reference image;	Goto expressly and/or inherently discloses and/or renders obvious obtaining a reference image. *See*, *e.g.*, disclosures below. "FIG. 17 is the imaginary image of a user's face included in a pre-makeup image. FIG. 18 is an image diagram showing tracking points. The face recognition part 33 of the simulator main application 28 obtains 45 tracking points 34 for recognizing a user's face as in FIG. 18 from an imaginary image like FIG. 17. The tracking points 34 of FIG. 18 are an example, and may be adjusted in accordance with the processing capability of the control part 8 or the definition of the monitor 7. By thus obtaining the tracking points 34 from a user's face included in the pre-makeup image, the makeup processing part 35 can set how to apply makeup and color in correlation with the tracking points 34 in a makeup processing parameter file as in FIG. 19." *See* Goto at paras. [0162]-[0163]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Goto 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;	Goto expressly and/or inherently discloses and/or renders obvious performing registration of the digital image with the reference image. *See, e.g.*, disclosures below. "FIG. 17 is the imaginary image of a user's face included in a pre-makeup image. FIG. 18 is an image diagram showing tracking points. The face recognition part 33 of the simulator main application 28 obtains 45 tracking points 34 for recognizing a user's face as in FIG. 18 from an imaginary image like FIG. 17. The tracking points 34 of FIG. 18 are an example, and may be adjusted in accordance with the processing capability of the control part 8 or the definition of the monitor 7.

Asserted Claim of the '109 Patent	Exemplary Citations to Goto
	By thus obtaining the tracking points 34 from a user's face included in the pre-makeup image, the makeup processing part 35 can set how to apply makeup and color in correlation with the tracking points 34 in a makeup processing parameter file as in FIG. 19." *See* Goto at paras. [0162]-[0163]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Goto 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.	Goto 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. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Goto 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 Goto
Claim 8	
8. The method of claim 1, further comprising applying a translation transformation to move the image within display area of the monitor.	Goto expressly and/or inherently discloses and/or renders obvious applying a translation transformation to move the image within display area of the monitor. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Goto 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 Goto
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.	Goto 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) Goto 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 Goto
Claim 11	
11[pre]. The method of claim 1, further comprising:	To the extent the preamble is limiting, Goto 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) Goto 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,	Goto expressly and/or inherently discloses and/or renders obvious determining distance to a user appearing in the image. *See*, *e.g.*, disclosures below.

Asserted Claim of the '109 Patent	Exemplary Citations to Goto
	See Claim Limitation 1[g]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Goto 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.	Goto expressly and/or inherently discloses and/or renders obvious varying resolution of the image according to the distance. *See, e.g.*, disclosures below. "The simulator main application 28 trims and reduces the still image of the resolution for still images obtained from the video input using the dedicated API 32. The simulator main application 28 trims the still image of the resolution for still images. Further, the simulator main application 28 reduces the still image of the resolution for still images, thereby obtaining an image for face recognition. A face recognition part 43 obtains tracking points 44 as described below for recognizing the user's face from the image for face recognition. The simulator main application 28 extracts specific regions from the user's face included in the trimmed video based on the tracking points 44, obtains additional information to be used for a features diagnosis and a skin color diagnosis, such as a type and a skin color, from the specific regions, and outputs tracking points 45, which are the tracking points 44 plus the additional information, and the still image of the resolution for still images obtained from the video input using the dedicated API 32 to the still image system 25." *See* Goto at paras. [0156]-[0157]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Goto 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 Goto
	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-25: Invalidity of U.S. Patent No. 8,982,109 in view of Shiseido Augmented Reality Cosmetic Mirror System Art ("Shiseido")

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.

The Shiseido System expressly and/or inherently discloses and/or renders obvious the Asserted Claims of U.S. Patent No. 8,982,109 (the "'109 Patent"), as set forth in the chart below. On information and belief, Shiseido is described at least in the following documents:

- U.S. Patent Pub. No. 2010/0226531 to Yasuo Goto ("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").

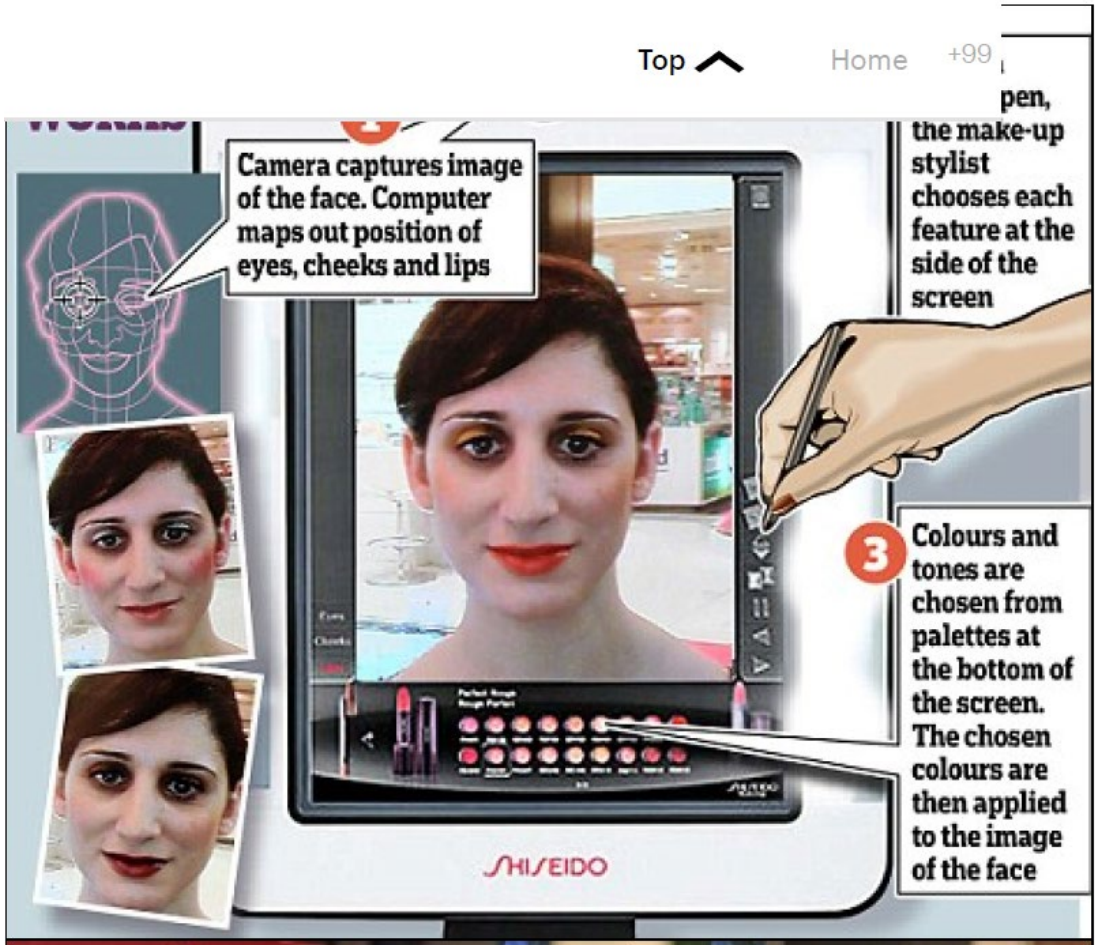
Shiseido anticipates the Asserted Claims of the '109 Patent. To the extent it is found Shiseido does not expressly disclose certain limitations in the Asserted Claims, such limitations are at least implicitly or inherently disclosed. Moreover, to the extent it is found that Shiseido does not anticipate the Asserted Claims, Shiseido 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.

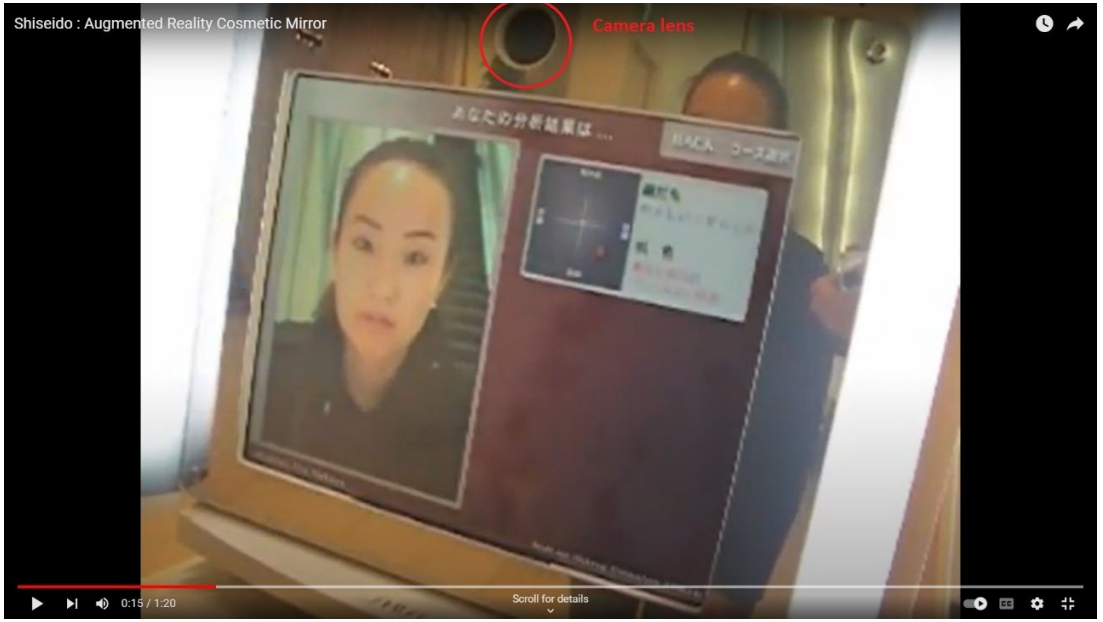
In these contentions, Defendants have relied in part on Plaintiff's Infringement Contentions. In those contentions, Plaintiff appears to pursue overly broad claim constructions in an effort to assert infringement where none exists, and to accuse products that do not infringe the claims. Defendants' assertion 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 Shiseido
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, Shiseido expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below. "According to the present invention, in order to solve the above-described problems, a makeup simulation system applying makeup to a video having an image of the face of a user captured thereon is characterized by image capturing means for capturing the image of the face of the user and outputting the video, control means for receiving the video output from the image capturing means, performing image processing on the video, and outputting the video; and display means for displaying the video output from the control means, wherein the control means includes face recognition means for recognizing the face of the user from the video based on predetermined tracking points; and makeup processing means for applying a predetermined makeup on the face of the user included in the video based on the tracking points and outputting the video to the display means." *See* Goto at para. [0007]. "The camera 2 captures an image of a user standing in front of the makeup simulator 1 and outputs a video." *See* Goto at para. [0085]. "The makeup simulator 1 of FIG. 1 and FIG.2, which is based on a mirror, an item indispensable for makeup, as a concept, has the function of interacting with a user. That is, the makeup simulator 1 has the characteristic of giving a user a natural feeling as if the user were putting on makeup, looking at a mirror." *See* Goto at para. [0088]. "The makeup simulator 1 performs image processing on a video output from the camera 2 in the control part 8, thereby applying makeup on a user's face included in the image, and displays the video on the monitor 7, which is a digital mirror. The makeup simulator 1 is capable of displaying various merchandise and cosmetic information items and the imaginary image of a user's face with makeup applied on it on the monitor 7." *See* Goto at para. [0104].

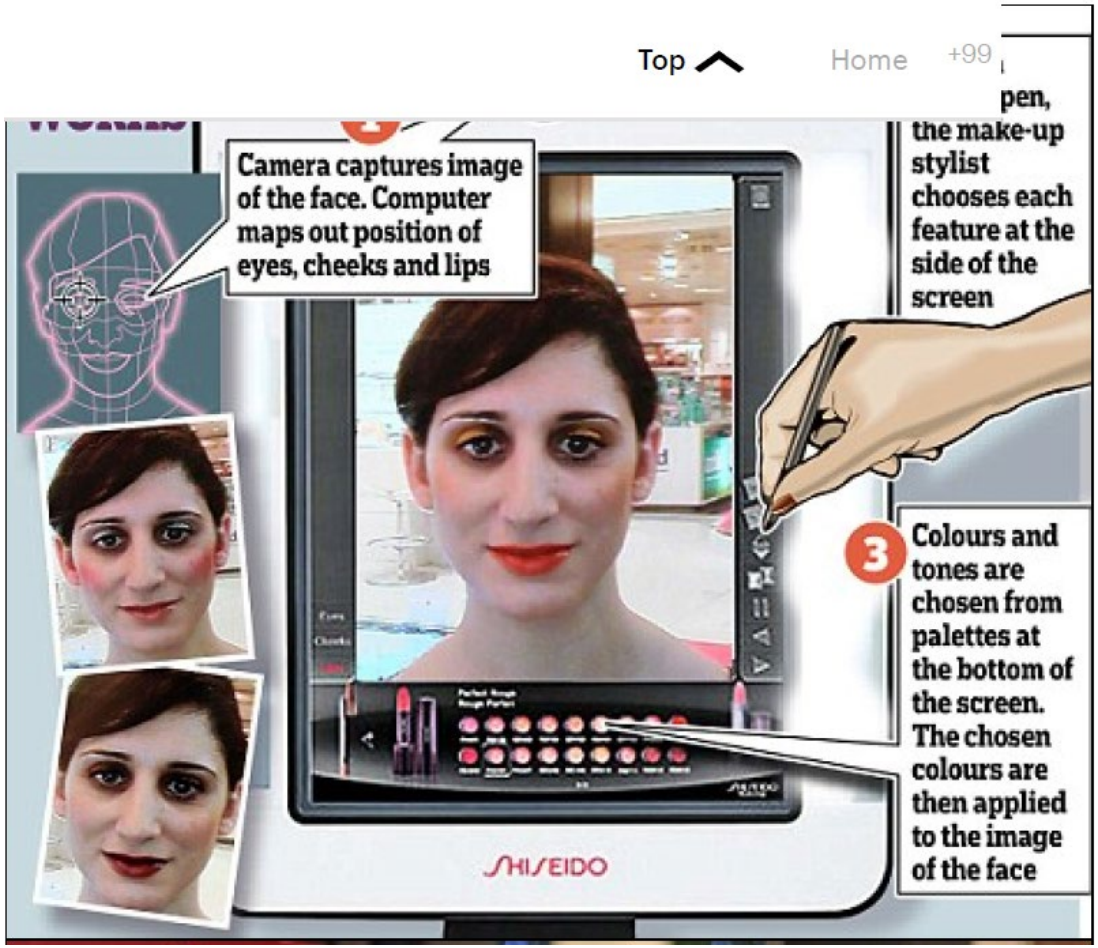
Asserted Claim of the ’109 Patent	Exemplary Citations to Shiseido
	“Proceeding to step S3, the control part 8 starts a makeup simulation based on the Software activated in step S2. At this point, the control part 8 displays the screen image 102 on the monitor 7 and displays the screen image 202 on the operations panel 4. The screen image 102 shows the case of displaying the video of the user's face captured with the camera 2 with a magic mirror-like effect on it. The screen image 202 shows the case of displaying a WELCOME message that moves laterally the same as the screen image 201.” *See* Goto at [0129]. “Created by Japanese beauty brand Shiseido, the simulator allows users to virtually apply make-up to eyes, lips and cheeks. . . . A camera on the device captures your face and works out where your eyes, nose and mouth are. . . . The image you see is a perfect mirror image. If you squint to take a closer look at the eyeshadow you just 'applied', you’ll see it on the screen; turn your head slightly to see how that blusher looks and your mirror image will do likewise.” *See* Daily Mail at 2.

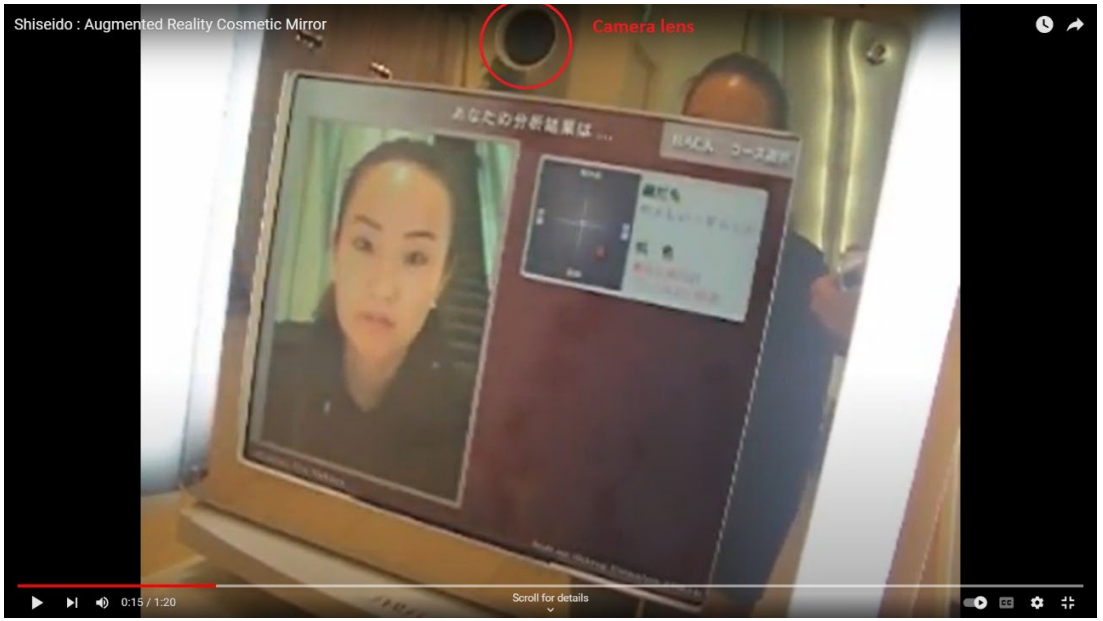
Asserted Claim of the '109 Patent	Exemplary Citations to Shiseido
	 *See* Daily Mail at 3.

Asserted Claim of the '109 Patent	Exemplary Citations to Shiseido
	"If I was a woman or a man who wore makeup, I would flip over this augmented reality Shiseido makeup mirror. . . . The augmented reality Shiseido makeup mirror is pretty simple. Just sit down in front of the mirror and let the camera take a picture of your face. After that, you can easily see what the latest cosmetic products would look on your face." *See* Trend Hunter at 2.  *See* YouTube at 0:015. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Shiseido 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 Shiseido
	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;	Shiseido expressly and/or inherently discloses and/or renders obvious obtaining a digital image from a camera. *See*, *e.g.*, disclosures below. "According to the present invention, in order to solve the above-described problems, a makeup simulation system applying makeup to a video having an image of the face of a user captured thereon is characterized by image capturing means for capturing the image of the face of the user and outputting the video, control means for receiving the video output from the image capturing means, performing image processing on the video, and outputting the video; and display means for displaying the video output from the control means, wherein the control means includes face recognition means for recognizing the face of the user from the video based on predetermined tracking points; and makeup processing means for applying a predetermined makeup on the face of the user included in the video based on the tracking points and outputting the video to the display means." *See* Goto at para. [0007]. "The camera 2 captures an image of a user standing in front of the makeup simulator 1 and outputs a video." *See* Goto at para. [0085]. "The makeup simulator 1 of FIG. 1 and FIG.2, which is based on a mirror, an item indispensable for makeup, as a concept, has the function of interacting with a user. That is, the makeup simulator 1 has the characteristic of giving a user a natural feeling as if the user were putting on makeup, looking at a mirror." *See* Goto at para. [0088]. "The makeup simulator 1 performs image processing on a video output from the camera 2 in the control part 8, thereby applying makeup on a user's face included in the image, and displays the video on the monitor 7, which is a digital mirror. The makeup simulator 1 is capable of displaying various merchandise and cosmetic information items and the

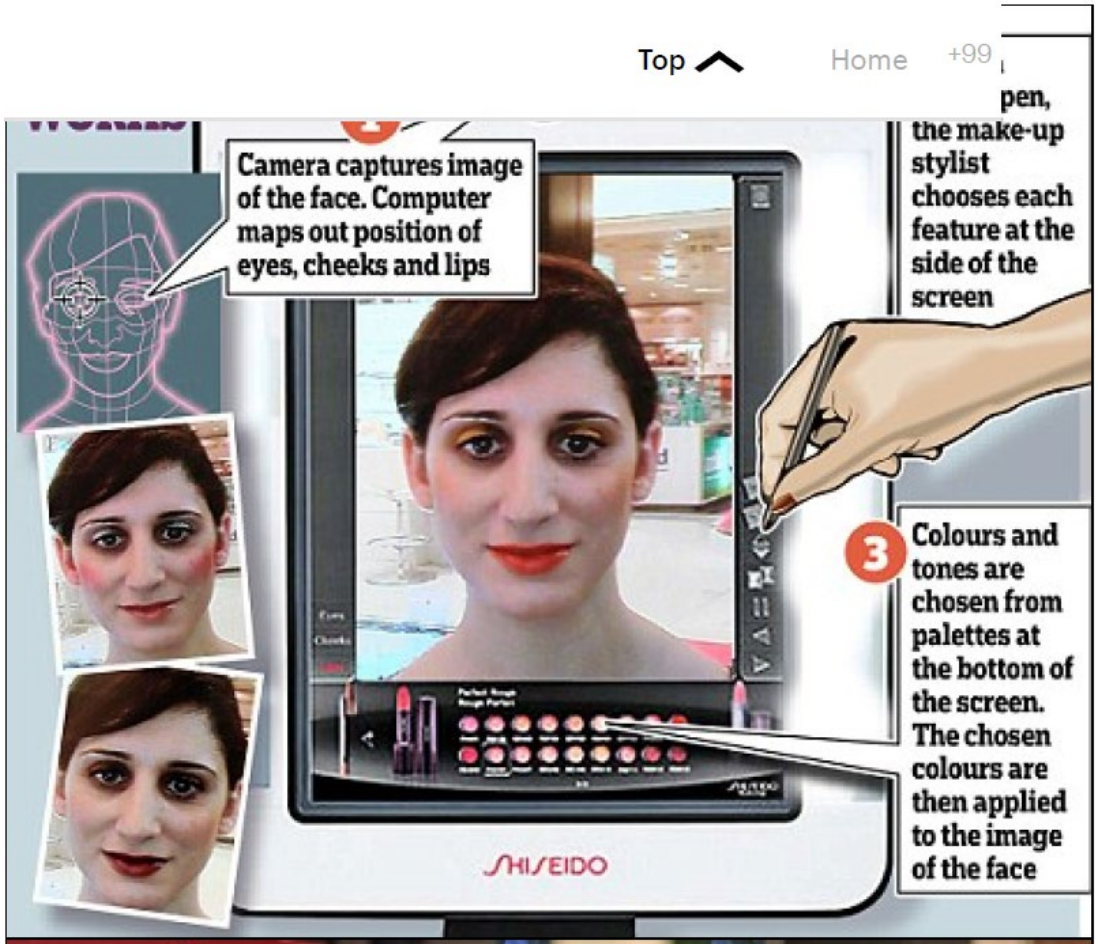
Asserted Claim of the ’109 Patent	Exemplary Citations to Shiseido
	imaginary image of a user's face with makeup applied on it on the monitor 7.” *See* Goto at para. [0104]. “Proceeding to step S3, the control part 8 starts a makeup simulation based on the Software activated in step S2. At this point, the control part 8 displays the screen image 102 on the monitor 7 and displays the screen image 202 on the operations panel 4. The screen image 102 shows the case of displaying the video of the user's face captured with the camera 2 with a magic mirror-like effect on it. The screen image 202 shows the case of displaying a WELCOME message that moves laterally the same as the screen image 201.” *See* Goto at [0129]. “A camera on the device captures your face and works out where your eyes, nose and mouth are.” *See* Daily Mail at 2. “Once you find a look you like, you can take a still image. The machine can store a few of these, giving you an opportunity to compare different looks.” *See* Daily Mail at 3.

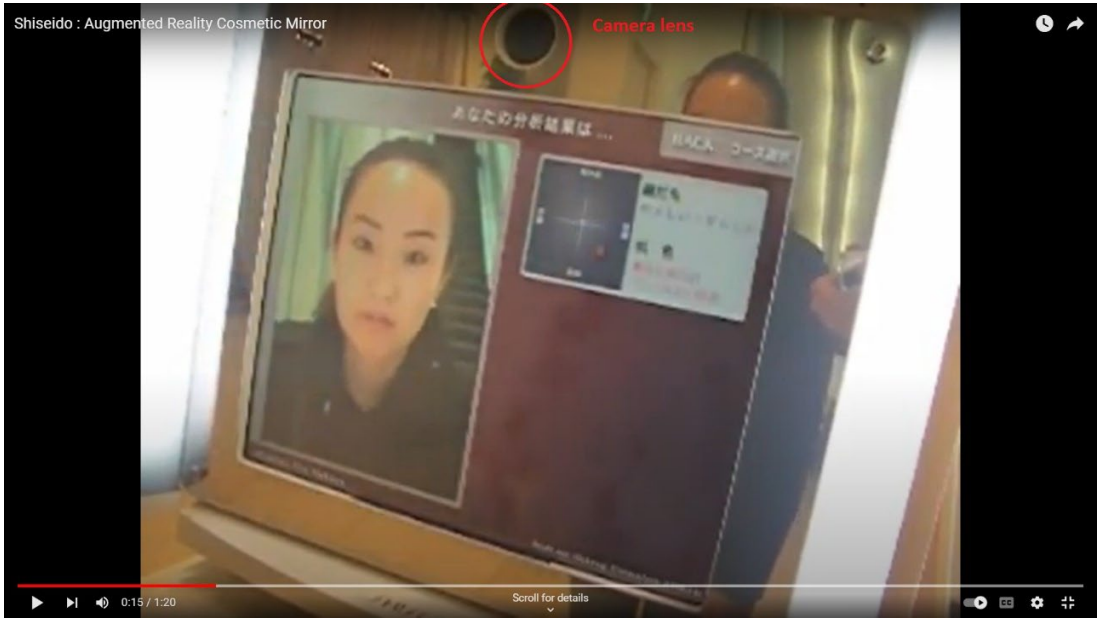
Asserted Claim of the '109 Patent	Exemplary Citations to Shiseido
	 *See* Daily Mail at 3.

Asserted Claim of the '109 Patent	Exemplary Citations to Shiseido
	"The augmented reality Shiseido makeup mirror is pretty simple. Just sit down in front of the mirror and let the camera take a picture of your face. After that, you can easily see what the latest cosmetic products would look on your face." *See* Trend Hunter at 2.  *See* YouTube at 0:015. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Shiseido 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 Shiseido
1[b]. flipping the image about a vertical axis so as to reverse right and left sides of the image;	Shiseido 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. "The makeup simulator 1 of FIG. 5 and FIG. 6, which is based on a mirror, an item indispensable for makeup, as a concept, has the function of interacting with a user. That is, the makeup simulator 1 has the characteristic of giving a user a natural feeling as if the user were putting on makeup, looking at a mirror. The makeup simulator 1 performs image processing on a video output from the camera 2 in the control part 8, thereby applying makeup on a user's face included in the image, and displays the video on the monitor 7, which is a digital mirror. The makeup simulator 1 is capable of displaying various merchandise and cosmetic information items and the imaginary image of a user's face with makeup applied on it on the monitor 7." *See* Goto at para. [0103]-[0104]. "The makeup simulator 1 of FIG. 7 and FIG. 8, which is based on a mirror, an item indispensable for makeup, as a concept, has the function of interacting with a user. That is, the makeup simulator 1 has the characteristic of giving a user a natural feeling as if the user were putting on makeup, looking at a mirror. The makeup simulator 1 performs image processing on a video output from the camera 2 in the control part 8, thereby applying makeup on a user's face included in the image, and displays the video on the touch panel monitor 15, which is a digital mirror. The makeup simulator 1 is capable of displaying various merchandise and cosmetic information items and the imaginary image of a user's face with makeup applied on it on the touch panel monitor 15." *See* Goto at paras. [0108]-[0109]. "Created by Japanese beauty brand Shiseido, the simulator allows users to virtually apply make-up to eyes, lips and cheeks. . . .

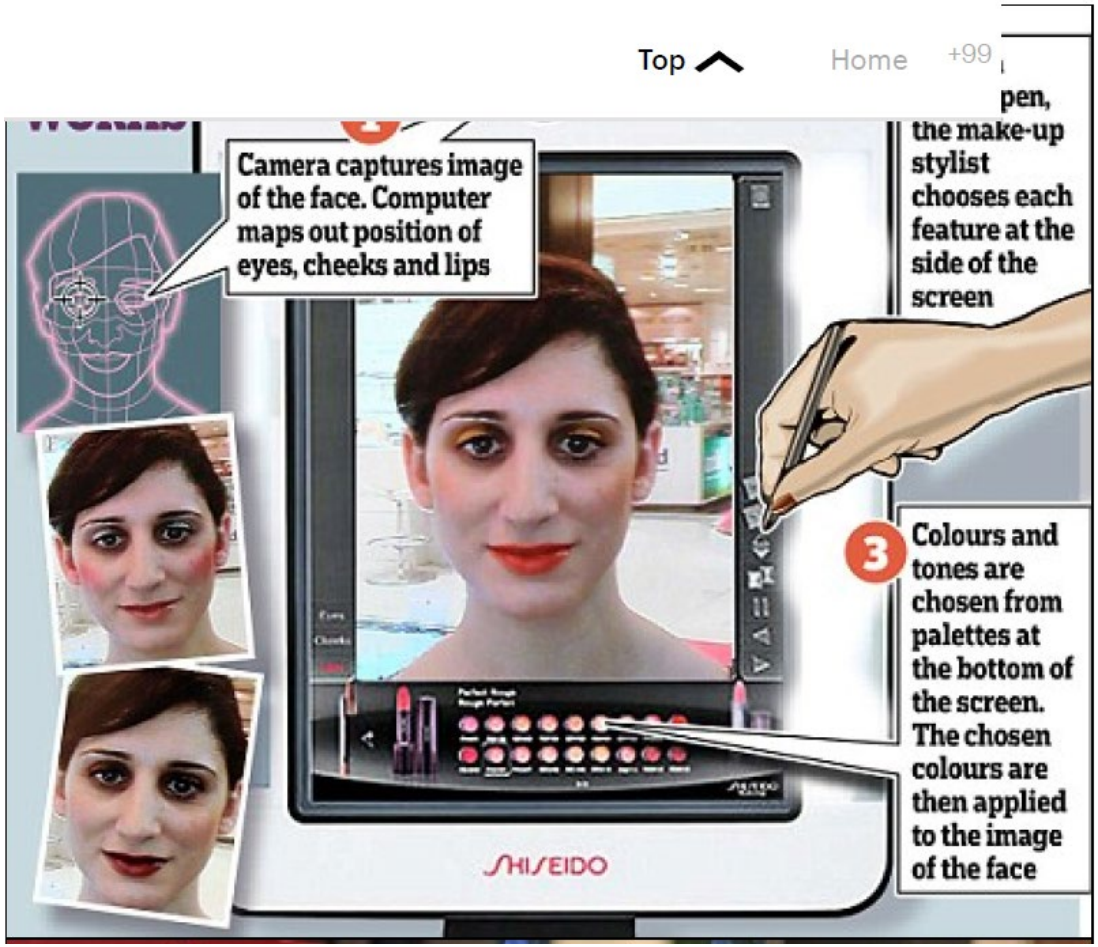
Asserted Claim of the ’109 Patent	Exemplary Citations to Shiseido
	A camera on the device captures your face and works out where your eyes, nose and mouth are. . . . The image you see is a perfect mirror image. If you squint to take a closer look at the eyeshadow you just 'applied', you’ll see it on the screen; turn your head slightly to see how that blusher looks and your mirror image will do likewise.” *See* Daily Mail at 2.

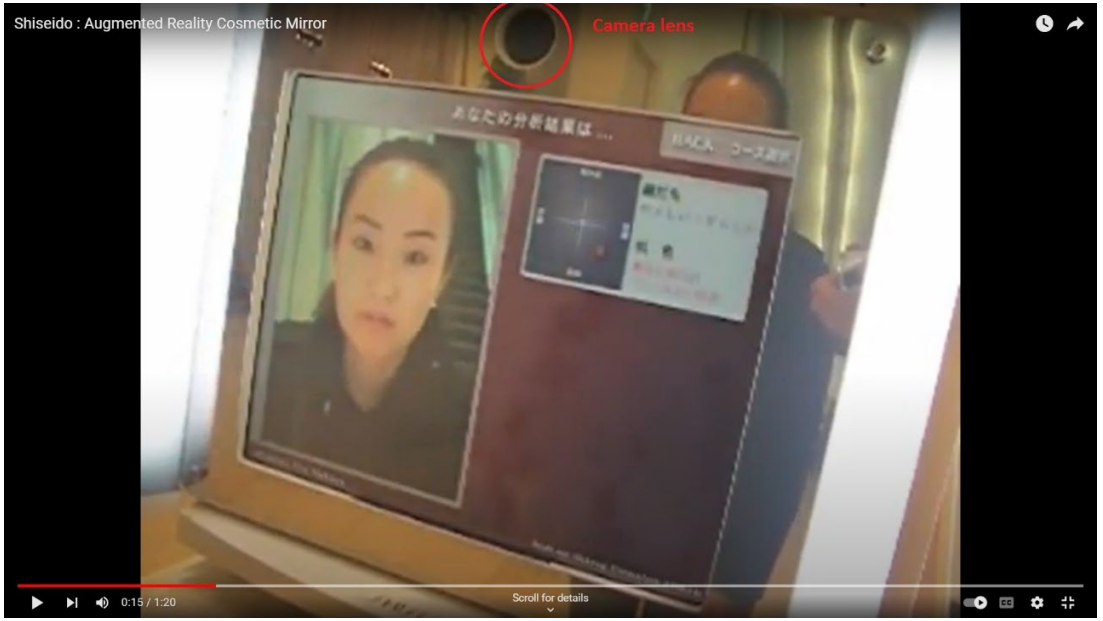
Asserted Claim of the '109 Patent	Exemplary Citations to Shiseido
	 *See* Daily Mail at 3.

Asserted Claim of the ’109 Patent	Exemplary Citations to Shiseido
	“If I was a woman or a man who wore makeup, I would flip over this augmented reality Shiseido makeup mirror. . . . The augmented reality Shiseido makeup mirror is pretty simple. Just sit down in front of the mirror and let the camera take a picture of your face. After that, you can easily see what the latest cosmetic products would look on your face.” *See* Trend Hunter at 2.  *See* YouTube at 0:015.

Asserted Claim of the '109 Patent	Exemplary Citations to Shiseido
	This limitation would have been obvious to a person of ordinary skill in the art based on (1) Shiseido 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;	Shiseido 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 makeup simulator 1 of FIG. 5 and FIG. 6, which is based on a mirror, an item indispensable for makeup, as a concept, has the function of interacting with a user. That is, the makeup simulator 1 has the characteristic of giving a user a natural feeling as if the user were putting on makeup, looking at a mirror. The makeup simulator 1 performs image processing on a video output from the camera 2 in the control part 8, thereby applying makeup on a user's face included in the image, and displays the video on the monitor 7, which is a digital mirror. The makeup simulator 1 is capable of displaying various merchandise and cosmetic information items and the imaginary image of a user's face with makeup applied on it on the monitor 7." *See* Goto at para. [0103]-[0104]. "The makeup simulator 1 of FIG. 7 and FIG. 8, which is based on a mirror, an item indispensable for makeup, as a concept, has the function of interacting with a user. That is, the makeup simulator 1 has the characteristic of giving a user a natural feeling as if the user were putting on makeup, looking at a mirror. The makeup simulator 1 performs image processing on a video output from the camera 2 in the control part 8, thereby applying makeup on a user's face included in the image, and displays the video on the touch panel monitor 15, which is a digital mirror. The makeup simulator 1 is capable of displaying various merchandise and cosmetic

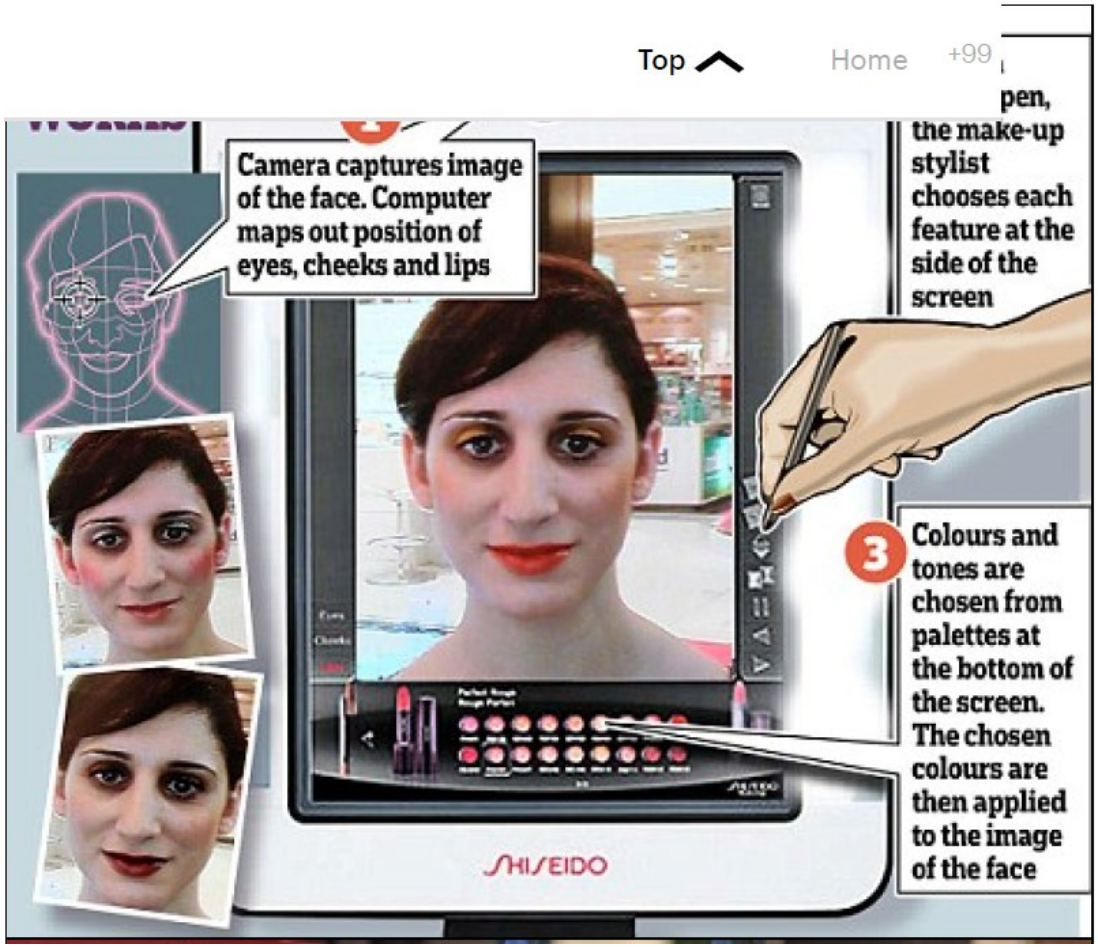
Asserted Claim of the ’109 Patent	Exemplary Citations to Shiseido
	information items and the imaginary image of a user's face with makeup applied on it on the touch panel monitor 15.” *See* Goto at paras. [0108]-[0109]. “Created by Japanese beauty brand Shiseido, the simulator allows users to virtually apply make-up to eyes, lips and cheeks. . . . A camera on the device captures your face and works out where your eyes, nose and mouth are. . . . The image you see is a perfect mirror image. If you squint to take a closer look at the eyeshadow you just 'applied', you’ll see it on the screen; turn your head slightly to see how that blusher looks and your mirror image will do likewise.” *See* Daily Mail at 2.

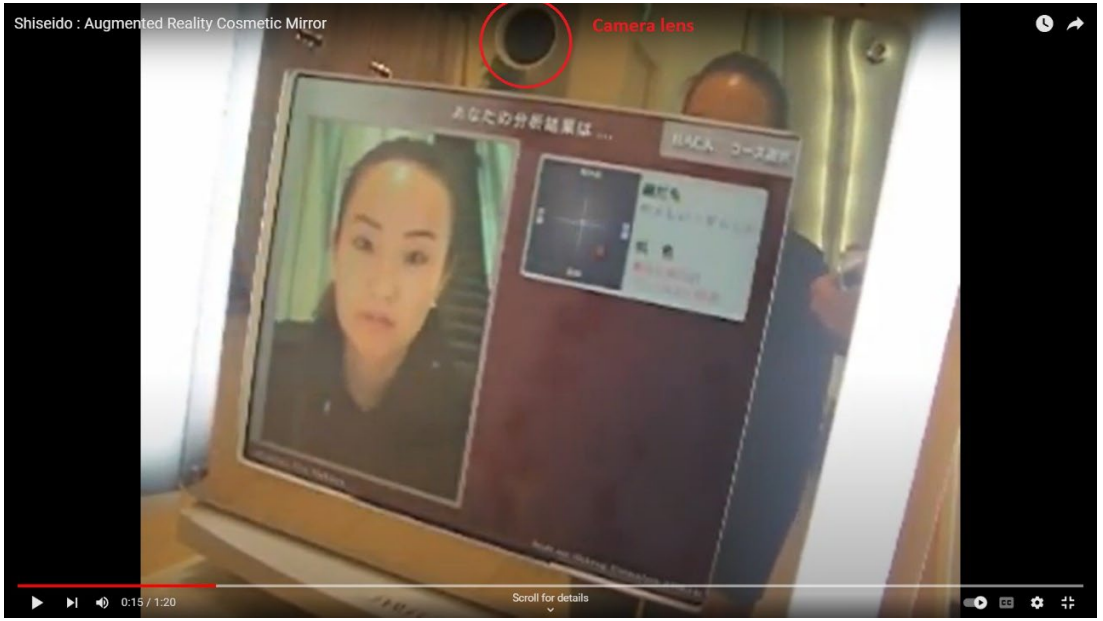
Asserted Claim of the '109 Patent	Exemplary Citations to Shiseido
	 *See* Daily Mail at 3.

Asserted Claim of the '109 Patent	Exemplary Citations to Shiseido
	"If I was a woman or a man who wore makeup, I would flip over this augmented reality Shiseido makeup mirror. . . . The augmented reality Shiseido makeup mirror is pretty simple. Just sit down in front of the mirror and let the camera take a picture of your face. After that, you can easily see what the latest cosmetic products would look on your face." *See* Trend Hunter at 2.  *See* YouTube at 0:015.

Asserted Claim of the '109 Patent	Exemplary Citations to Shiseido
	This limitation would have been obvious to a person of ordinary skill in the art based on (1) Shiseido 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;	Shiseido 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. "The makeup simulator 1 of FIG. 5 and FIG. 6, which is based on a mirror, an item indispensable for makeup, as a concept, has the function of interacting with a user. That is, the makeup simulator 1 has the characteristic of giving a user a natural feeling as if the user were putting on makeup, looking at a mirror. The makeup simulator 1 performs image processing on a video output from the camera 2 in the control part 8, thereby applying makeup on a user's face included in the image, and displays the video on the monitor 7, which is a digital mirror. The makeup simulator 1 is capable of displaying various merchandise and cosmetic information items and the imaginary image of a user's face with makeup applied on it on the monitor 7." *See* Goto at para. [0103]-[0104]. "The makeup simulator 1 of FIG. 7 and FIG. 8, which is based on a mirror, an item indispensable for makeup, as a concept, has the function of interacting with a user. That is, the makeup simulator 1 has the characteristic of giving a user a natural feeling as if the user were putting on makeup, looking at a mirror. The makeup simulator 1 performs image processing on a video output from the camera 2 in the control part 8, thereby applying makeup on a user's face included in the image, and displays the video on the touch panel monitor 15, which is a digital mirror. The makeup simulator 1 is capable of displaying various merchandise and cosmetic

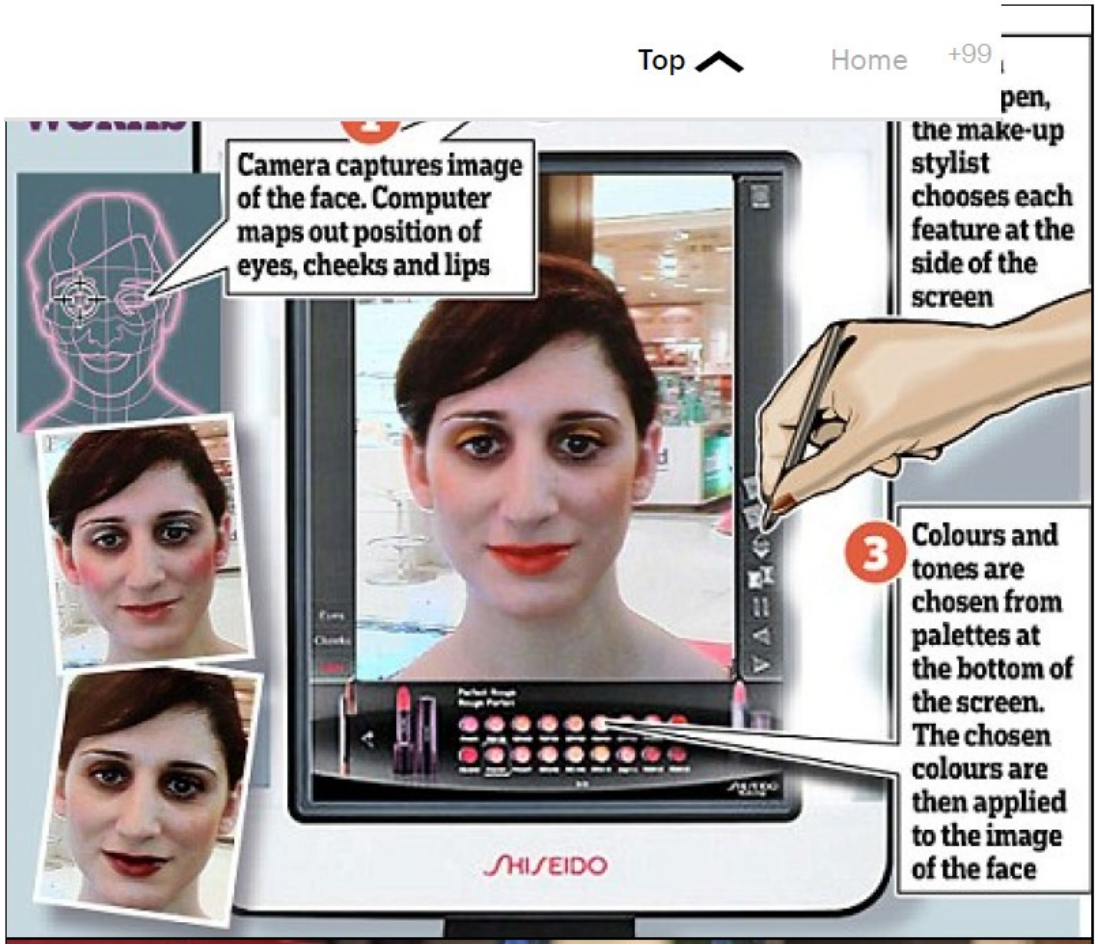
Asserted Claim of the ’109 Patent	Exemplary Citations to Shiseido
	information items and the imaginary image of a user's face with makeup applied on it on the touch panel monitor 15.” *See* Goto at paras. [0108]-[0109]. “Created by Japanese beauty brand Shiseido, the simulator allows users to virtually apply make-up to eyes, lips and cheeks. . . . A camera on the device captures your face and works out where your eyes, nose and mouth are. . . . The image you see is a perfect mirror image. If you squint to take a closer look at the eyeshadow you just 'applied', you’ll see it on the screen; turn your head slightly to see how that blusher looks and your mirror image will do likewise.” *See* Daily Mail at 2.

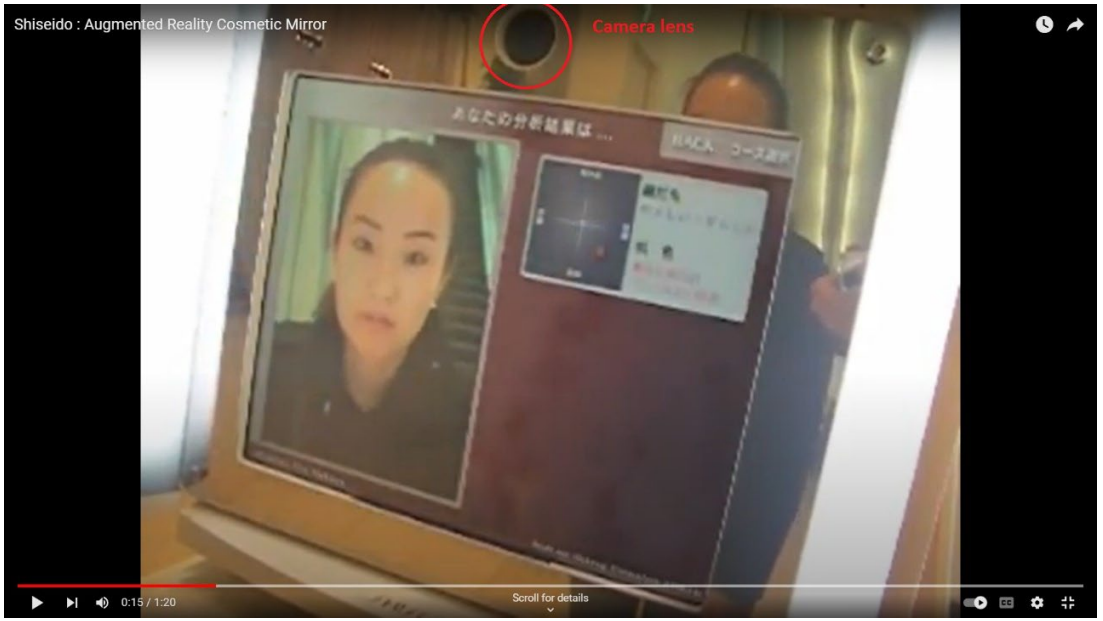
Asserted Claim of the '109 Patent	Exemplary Citations to Shiseido
	 *See* Daily Mail at 3.

Asserted Claim of the '109 Patent	Exemplary Citations to Shiseido
	"If I was a woman or a man who wore makeup, I would flip over this augmented reality Shiseido makeup mirror. . . . The augmented reality Shiseido makeup mirror is pretty simple. Just sit down in front of the mirror and let the camera take a picture of your face. After that, you can easily see what the latest cosmetic products would look on your face." *See* Trend Hunter at 2.  *See* YouTube at 0:015. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Shiseido 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

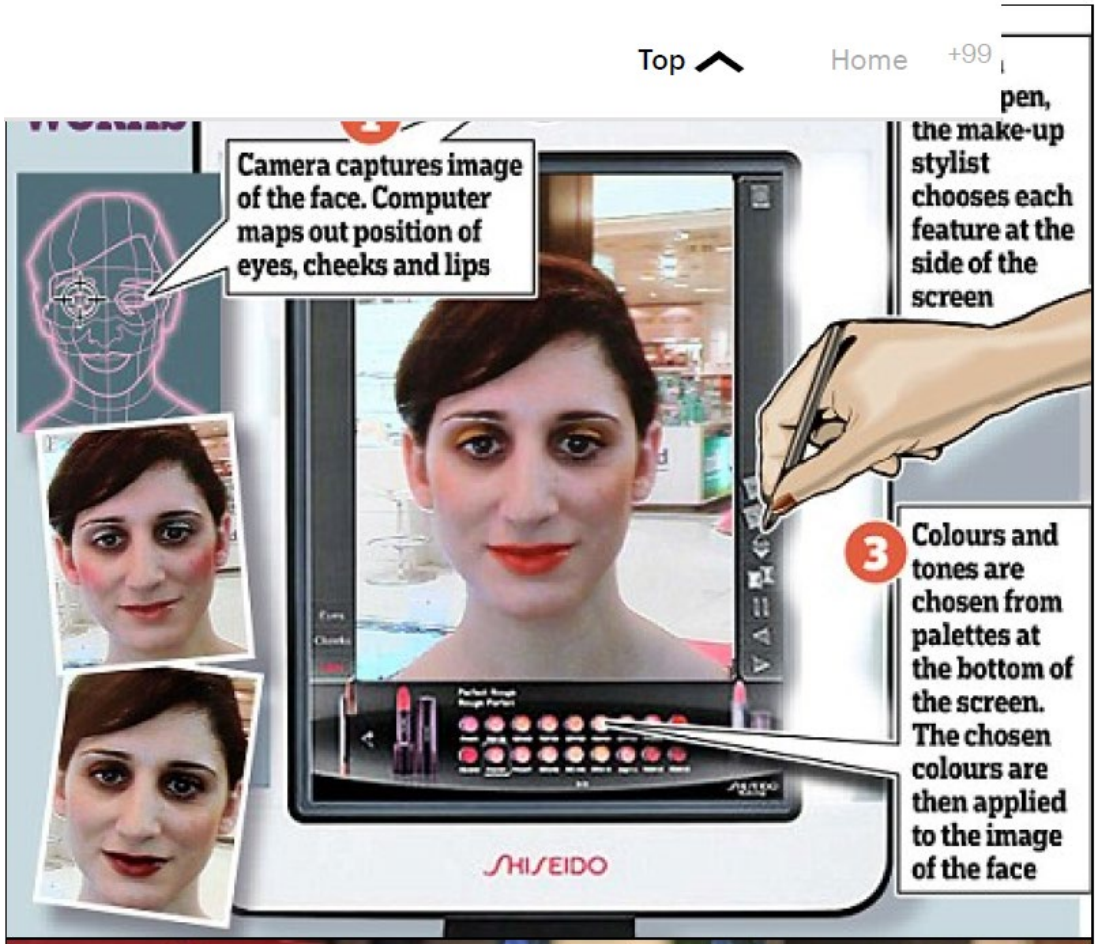
Asserted Claim of the '109 Patent	Exemplary Citations to Shiseido
	Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.
1[e]. displaying the image on the monitor after performing the flipping, transformation mapping, and resizing;	Shiseido 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. "According to the present invention, in order to solve the above-described problems, a makeup simulation system applying makeup to a video having an image of the face of a user captured thereon is characterized by image capturing means for capturing the image of the face of the user and outputting the video, control means for receiving the video output from the image capturing means, performing image processing on the video, and outputting the video; and display means for displaying the video output from the control means, wherein the control means includes face recognition means for recognizing the face of the user from the video based on predetermined tracking points; and makeup processing means for applying a predetermined makeup on the face of the user included in the video based on the tracking points and outputting the video to the display means." *See* Goto at para. [0007]. "The camera 2 captures an image of a user standing in front of the makeup simulator 1 and outputs a video." *See* Goto at para. [0085]. "The makeup simulator 1 of FIG. 1 and FIG.2, which is based on a mirror, an item indispensable for makeup, as a concept, has the function of interacting with a user. That is, the makeup simulator 1 has the characteristic of giving a user a natural feeling as if the user were putting on makeup, looking at a mirror." *See* Goto at para. [0088]. "The makeup simulator 1 performs image processing on a video output from the camera 2 in the control part 8, thereby applying makeup on a user's face included in the image, and displays the video on the monitor 7, which is a digital mirror. The makeup simulator 1 is capable of displaying various merchandise and cosmetic information items and the

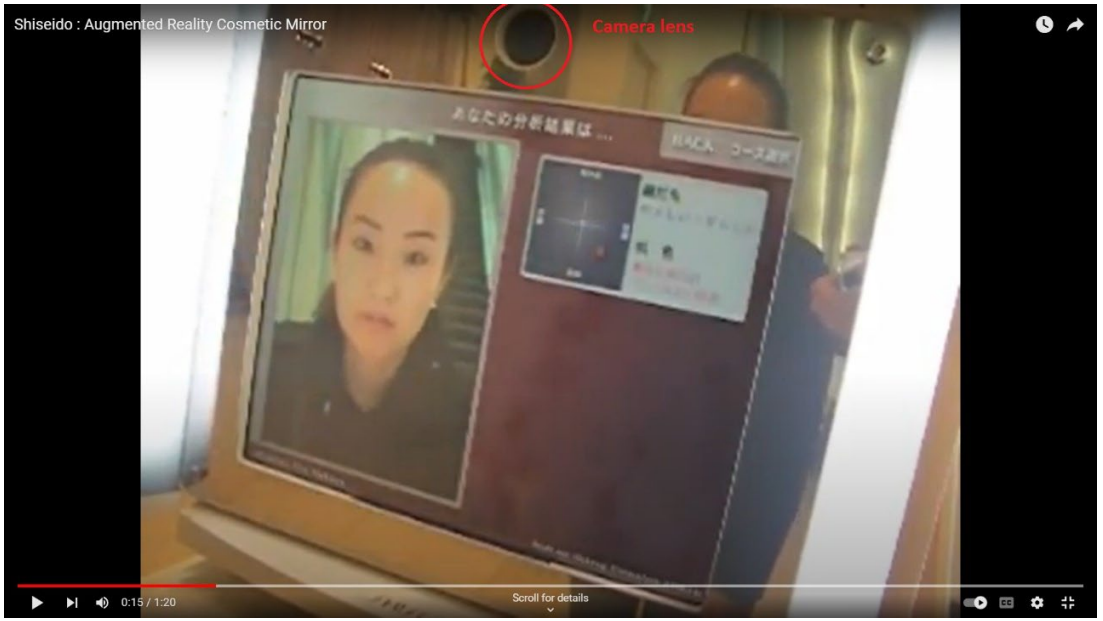
Asserted Claim of the ’109 Patent	Exemplary Citations to Shiseido
	imaginary image of a user's face with makeup applied on it on the monitor 7.” *See* Goto at para. [0104]. “Proceeding to step S3, the control part 8 starts a makeup simulation based on the Software activated in step S2. At this point, the control part 8 displays the screen image 102 on the monitor 7 and displays the screen image 202 on the operations panel 4. The screen image 102 shows the case of displaying the video of the user's face captured with the camera 2 with a magic mirror-like effect on it. The screen image 202 shows the case of displaying a WELCOME message that moves laterally the same as the screen image 201.” *See* Goto at [0129]. “The image you see is a perfect mirror image. If you squint to take a closer look at the eyeshadow you just 'applied', you’ll see it on the screen; turn your head slightly to see how that blusher looks and your mirror image will do likewise.” *See* Daily Mail at 2.

Asserted Claim of the '109 Patent	Exemplary Citations to Shiseido
	 *See* Daily Mail at 3.

Asserted Claim of the '109 Patent	Exemplary Citations to Shiseido
	"The augmented reality Shiseido makeup mirror is pretty simple. Just sit down in front of the mirror and let the camera take a picture of your face. After that, you can easily see what the latest cosmetic products would look on your face." *See* Trend Hunter at 2.  *See* YouTube at 0:015. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Shiseido 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 Shiseido
1[f]. wherein the non-ordered steps are performed on a series of images of a live video feed from the camera;	Shiseido expressly and/or inherently discloses and/or renders obvious the non-ordered steps are performed on a series of images of a live video feed from the camera. *See*, *e.g.*, disclosures below. "The control part 8 is continuously receiving a video captured by the camera 2. At this point, the control part 8 displays the screen image 100 on the monitor 7 and the screen image 200 on the operations panel 4. The screen images 100 and 200 show the case of displaying screen savers." *See* Goto at para. [0125]. "Unlike those based on still images or the conventional makeup simulator 1, the makeup simulator 1 of the present invention, which performs a real-time simulation, is capable of instantaneously recognizing tracking points of a face and performing simulation based on the tracking points. Therefore, the makeup simulator 1 enables the following that have not been possible so far. The makeup simulator 1 of the present invention is capable of a real-time simulation. The makeup simulator 1 of the present invention is capable of simulation not only from a full face as conventionally but also from a face in profile. Accordingly, it is easy to view the simulation effect or technique of blusher or the like." *See* Goto at paras. [0123]-[0124]. "A camera on the device captures your face and works out where your eyes, nose and mouth are. . . . The image you see is a perfect mirror image. If you squint to take a closer look at the eyeshadow you just 'applied', you'll see it on the screen; turn your head slightly to see how that blusher looks and your mirror image will do likewise." *See* Daily Mail at 2.

Asserted Claim of the '109 Patent	Exemplary Citations to Shiseido
	 *See* Daily Mail at 3.

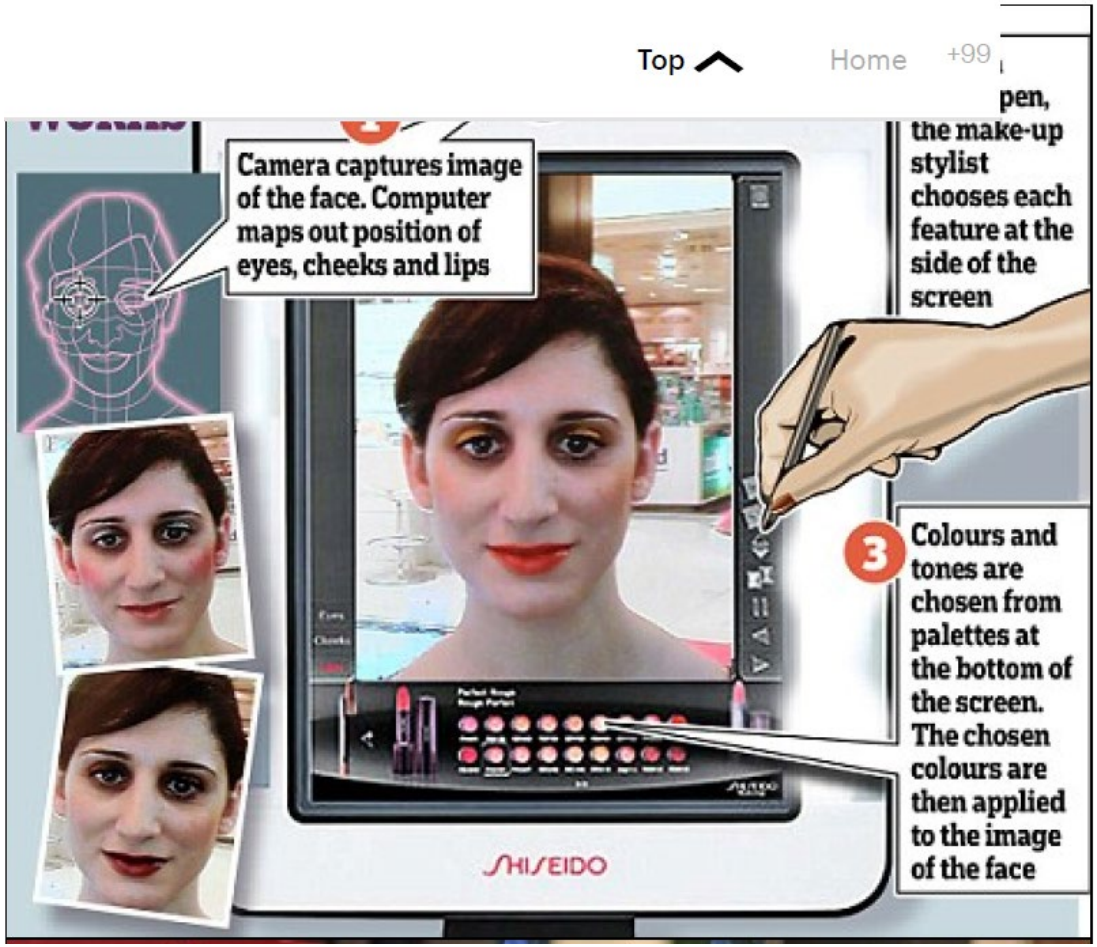
Asserted Claim of the '109 Patent	Exemplary Citations to Shiseido
	"The augmented reality Shiseido makeup mirror is pretty simple. Just sit down in front of the mirror and let the camera take a picture of your face. After that, you can easily see what the latest cosmetic products would look on your face." *See* Trend Hunter at 2.  *See* YouTube at 0:015. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Shiseido 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.

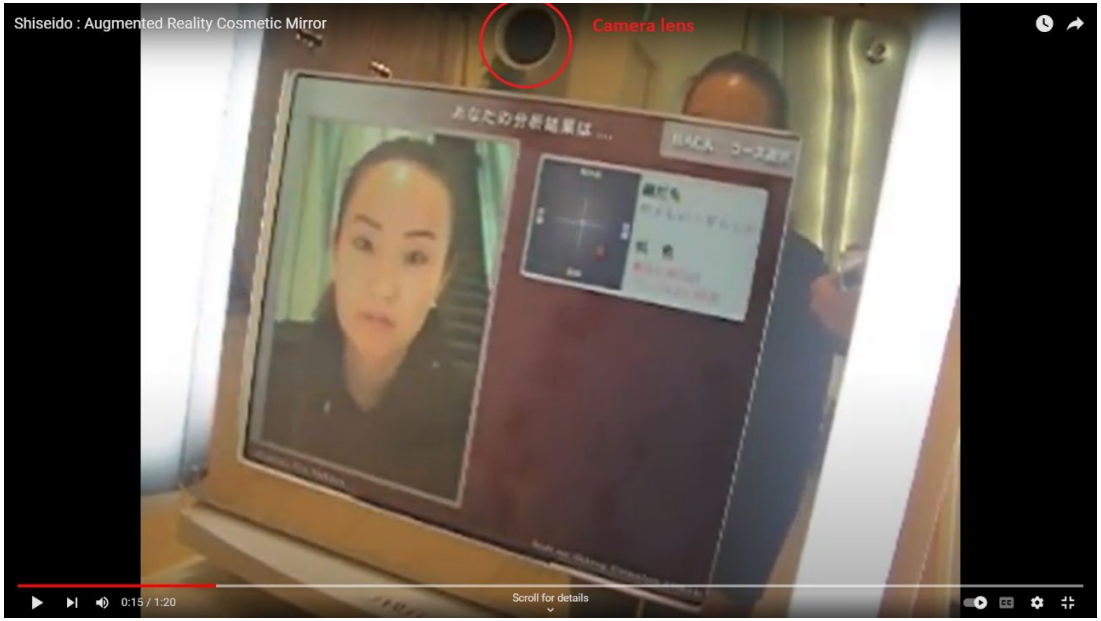
Asserted Claim of the '109 Patent	Exemplary Citations to Shiseido
1[g]. determining distance to a user appearing in the live video feed; and	Shiseido expressly and/or inherently discloses and/or renders obvious determining distance to a user appearing in the live video feed. *See, e.g.*, disclosures below. "The simulator main application 28 trims and reduces the still image of the resolution for still images obtained from the video input using the dedicated API 32. The simulator main application 28 trims the still image of the resolution for still images. Further, the simulator main application 28 reduces the still image of the resolution for still images, thereby obtaining an image for face recognition. A face recognition part 43 obtains tracking points 44 as described below for recognizing the user's face from the image for face recognition. The simulator main application 28 extracts specific regions from the user's face included in the trimmed video based on the tracking points 44, obtains additional information to be used for a features diagnosis and a skin color diagnosis, such as a type and a skin color, from the specific regions, and outputs tracking points 45, which are the tracking points 44 plus the additional information, and the still image of the resolution for still images obtained from the video input using the dedicated API 32 to the still image system 25." *See* Goto at paras. [0156]-[0157]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Shiseido 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.	Shiseido 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. "The simulator main application 28 trims and reduces the still image of the resolution for still images obtained from the video input using the dedicated API 32. The simulator main application 28 trims the still image of the resolution for still images. Further, the

Asserted Claim of the '109 Patent	Exemplary Citations to Shiseido
	simulator main application 28 reduces the still image of the resolution for still images, thereby obtaining an image for face recognition. A face recognition part 43 obtains tracking points 44 as described below for recognizing the user's face from the image for face recognition. The simulator main application 28 extracts specific regions from the user's face included in the trimmed video based on the tracking points 44, obtains additional information to be used for a features diagnosis and a skin color diagnosis, such as a type and a skin color, from the specific regions, and outputs tracking points 45, which are the tracking points 44 plus the additional information, and the still image of the resolution for still images obtained from the video input using the dedicated API 32 to the still image system 25." *See* Goto at paras. [0156]-[0157]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Shiseido 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 Shiseido
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.	Shiseido 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. "The makeup simulator 1 of FIG. 5 and FIG. 6, which is based on a mirror, an item indispensable for makeup, as a concept, has the function of interacting with a user. That

Asserted Claim of the ’109 Patent	Exemplary Citations to Shiseido
	is, the makeup simulator 1 has the characteristic of giving a user a natural feeling as if the user were putting on makeup, looking at a mirror. The makeup simulator 1 performs image processing on a video output from the camera 2 in the control part 8, thereby applying makeup on a user's face included in the image, and displays the video on the monitor 7, which is a digital mirror. The makeup simulator 1 is capable of displaying various merchandise and cosmetic information items and the imaginary image of a user's face with makeup applied on it on the monitor 7.” *See* Goto at para. [0103]-[0104]. “The makeup simulator 1 of FIG. 7 and FIG. 8, which is based on a mirror, an item indispensable for makeup, as a concept, has the function of interacting with a user. That is, the makeup simulator 1 has the characteristic of giving a user a natural feeling as if the user were putting on makeup, looking at a mirror. The makeup simulator 1 performs image processing on a video output from the camera 2 in the control part 8, thereby applying makeup on a user's face included in the image, and displays the video on the touch panel monitor 15, which is a digital mirror. The makeup simulator 1 is capable of displaying various merchandise and cosmetic information items and the imaginary image of a user's face with makeup applied on it on the touch panel monitor 15.” *See* Goto at paras. [0108]-[0109]. “Created by Japanese beauty brand Shiseido, the simulator allows users to virtually apply make-up to eyes, lips and cheeks. . . . A camera on the device captures your face and works out where your eyes, nose and mouth are. . . .

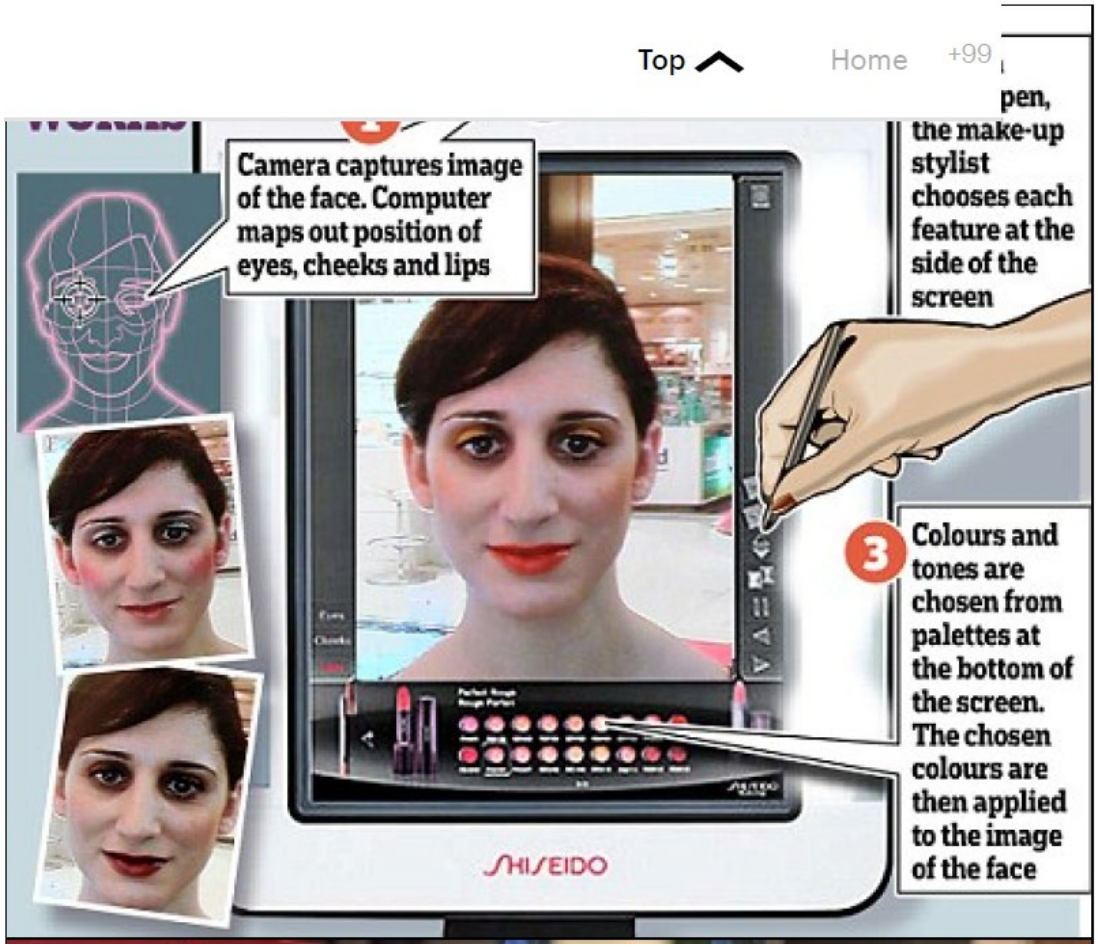
Asserted Claim of the ’109 Patent	Exemplary Citations to Shiseido
	The image you see is a perfect mirror image. If you squint to take a closer look at the eyeshadow you just 'applied', you’ll see it on the screen; turn your head slightly to see how that blusher looks and your mirror image will do likewise.” *See* Daily Mail at 2. 

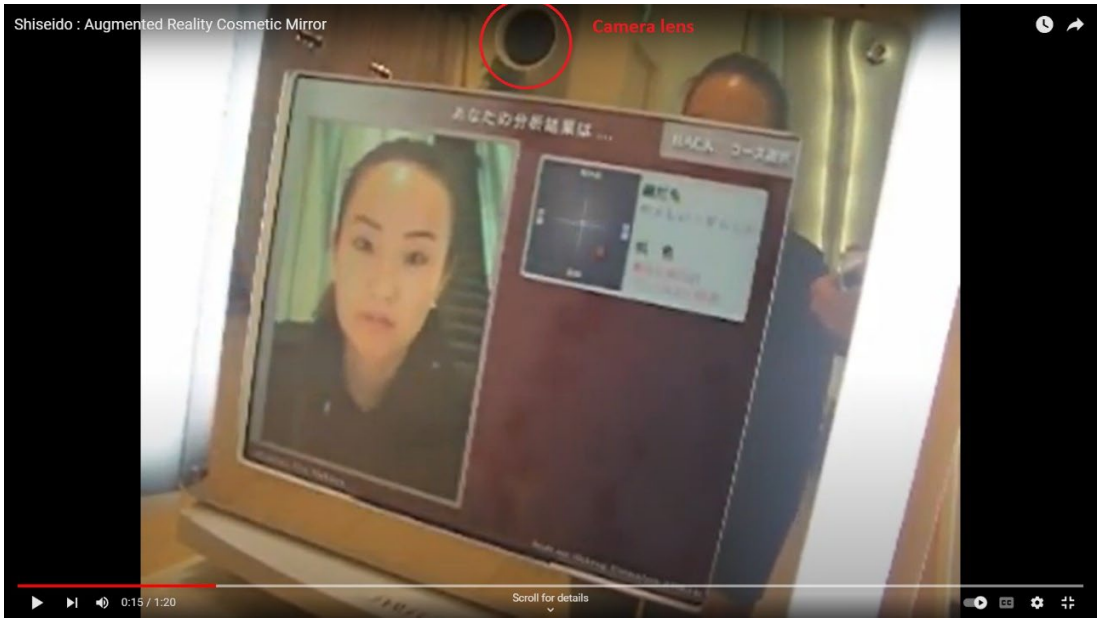
Asserted Claim of the '109 Patent	Exemplary Citations to Shiseido
	See Daily Mail at 3. "If I was a woman or a man who wore makeup, I would flip over this augmented reality Shiseido makeup mirror. . . . The augmented reality Shiseido makeup mirror is pretty simple. Just sit down in front of the mirror and let the camera take a picture of your face. After that, you can easily see what the latest cosmetic products would look on your face." *See* Trend Hunter at 2.  *See* YouTube at 0:015 (showing an image of a user which appears to have been taken at eye-level, despite the camera being positioned above the display).

Asserted Claim of the '109 Patent	Exemplary Citations to Shiseido
	This limitation would have been obvious to a person of ordinary skill in the art based on (1) Shiseido 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 Shiseido
Claim 7	
7[pre]. The method of claim 1, further comprising the steps:	To the extent the preamble is limiting, Shiseido 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) Shiseido 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;	Shiseido expressly and/or inherently discloses and/or renders obvious obtaining a reference image. *See*, *e.g.*, disclosures below. "FIG. 17 is the imaginary image of a user's face included in a pre-makeup image. FIG. 18 is an image diagram showing tracking points. The face recognition part 33 of the simulator main application 28 obtains 45 tracking points 34 for recognizing a user's face as in FIG. 18 from an imaginary image like FIG. 17. The tracking points 34 of FIG. 18 are an example, and may be adjusted in accordance with the processing capability of the control part 8 or the definition of the monitor 7.

Asserted Claim of the ’109 Patent	Exemplary Citations to Shiseido
	By thus obtaining the tracking points 34 from a user's face included in the pre-makeup image, the makeup processing part 35 can set how to apply makeup and color in correlation with the tracking points 34 in a makeup processing parameter file as in FIG. 19.” *See* Goto at paras. [0162]-[0163]. “A camera on the device captures your face and works out where your eyes, nose and mouth are.” *See* Daily Mail at 2. “Once you find a look you like, you can take a still image. The machine can store a few of these, giving you an opportunity to compare different looks.” *See* Daily Mail at 3.

Asserted Claim of the '109 Patent	Exemplary Citations to Shiseido
	 *See* Daily Mail at 3.

Asserted Claim of the '109 Patent	Exemplary Citations to Shiseido
	"The augmented reality Shiseido makeup mirror is pretty simple. Just sit down in front of the mirror and let the camera take a picture of your face. After that, you can easily see what the latest cosmetic products would look on your face." *See* Trend Hunter at 2.  *See* YouTube at 0:015. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Shiseido 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 Shiseido
7[b]. performing registration of the digital image with the reference image;	Shiseido expressly and/or inherently discloses and/or renders obvious performing registration of the digital image with the reference image. *See, e.g.*, disclosures below. "FIG. 17 is the imaginary image of a user's face included in a pre-makeup image. FIG. 18 is an image diagram showing tracking points. The face recognition part 33 of the simulator main application 28 obtains 45 tracking points 34 for recognizing a user's face as in FIG. 18 from an imaginary image like FIG. 17. The tracking points 34 of FIG. 18 are an example, and may be adjusted in accordance with the processing capability of the control part 8 or the definition of the monitor 7. By thus obtaining the tracking points 34 from a user's face included in the pre-makeup image, the makeup processing part 35 can set how to apply makeup and color in correlation with the tracking points 34 in a makeup processing parameter file as in FIG. 19." *See* Goto at paras. [0162]-[0163]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Shiseido 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.	Shiseido 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. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Shiseido 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 Shiseido
Claim 8	
8. The method of claim 1, further comprising applying a translation transformation to move the image within display area of the monitor.	Shiseido expressly and/or inherently discloses and/or renders obvious this limitation. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Shiseido 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 Shiseido
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.	Shiseido 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) Shiseido 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 Shiseido
Claim 11	
11[pre]. The method of claim 1, further comprising:	To the extent the preamble is limiting, Shiseido expressly and/or inherently discloses and/or renders obvious this limitation. *See*, *e.g.*, disclosures below.

Asserted Claim of the '109 Patent	Exemplary Citations to Shiseido
	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) Shiseido 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,	Shiseido 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]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Shiseido 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.	Shiseido expressly and/or inherently discloses and/or renders obvious varying resolution of the image according to the distance. *See, e.g.*, disclosures below. "The simulator main application 28 trims and reduces the still image of the resolution for still images obtained from the video input using the dedicated API 32. The simulator main application 28 trims the still image of the resolution for still images. Further, the simulator main application 28 reduces the still image of the resolution for still images, thereby obtaining an image for face recognition. A face recognition part 43 obtains tracking points 44 as described below for recognizing the user's face from the image for face recognition. The simulator main application 28 extracts specific regions from the user's face included in the trimmed video based on the tracking points 44, obtains additional information to

Asserted Claim of the ’109 Patent	Exemplary Citations to Shiseido
	be used for a features diagnosis and a skin color diagnosis, such as a type and a skin color, from the specific regions, and outputs tracking points 45, which are the tracking points 44 plus the additional information, and the still image of the resolution for still images obtained from the video input using the dedicated API 32 to the still image system 25.” *See* Goto at paras. [0156]-[0157]. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Shiseido 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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Exhibit A-26: Invalidity of U.S. Patent No. 8,982,109 in view of Human-Computer Interface System ("Francois III")

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.

The Human-Computer Interface System ("Francois III") expressly and/or inherently discloses and/or renders obvious the Asserted Claims of U.S. Patent No. 8,982,109 (the "'109 Patent"), as set forth in the chart below. On information and belief, Francois III is described at least in the following documents:

(i) *A Handheld Mirror Simulation*, Francois et al. (2003);

(ii) Integrated Media Systems Center, Alexandre R.J. Francois et al., *A Handheld Virtual Mirror* (2002)

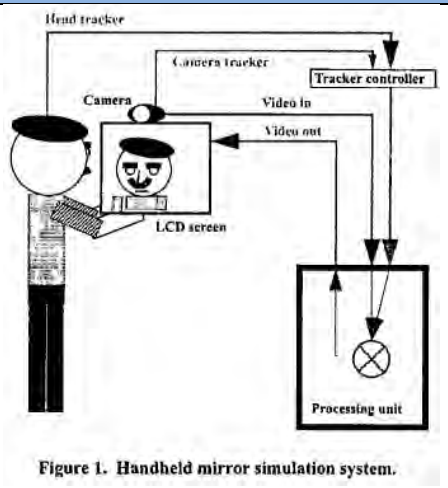
Francois III anticipates the Asserted Claims of the '109 Patent. To the extent it is found Francois III does not expressly disclose certain limitations in the Asserted Claims, such limitations are at least implicitly or inherently disclosed. Moreover, to the extent it is found that Francois III does not anticipate the Asserted Claims, Francois III 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. Further, to the extent relevant, this chart herein incorporates by reference and in its entirety the chart for *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 ("Francois II"), (Exhibit A-03) for the '109 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.

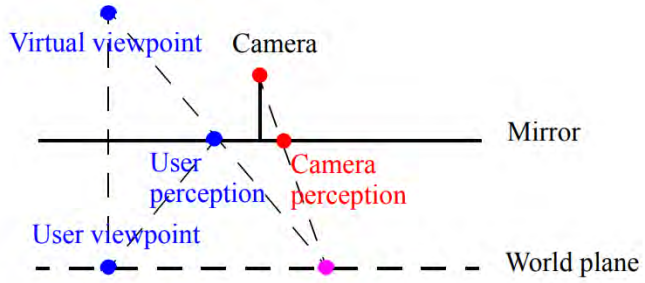
Defendants have endeavored to provide as much detail as possible in these contentions and, in doing so, have exceeded the level of detail required. The inclusion of specific details in some areas is not a concession that such details are required or that the omission of similar details in other areas 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.

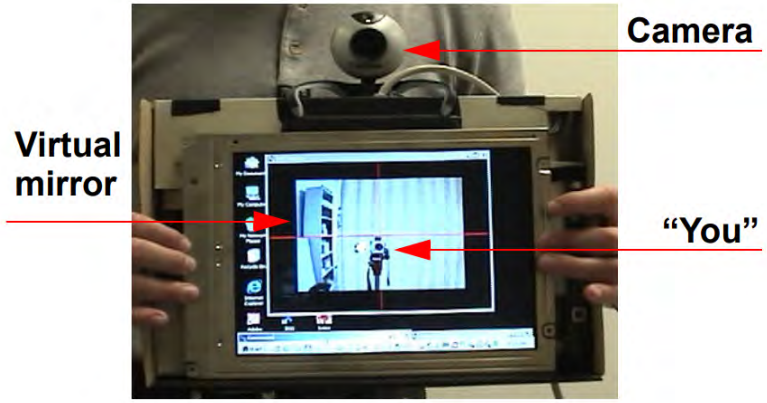
Asserted Claim of the '109 Patent	Exemplary Citations to Francois III
Claim 1	
1[pre]. A method for operating a system having a monitor, a camera, and a processor, so as to display a mirror-mimicking image on the monitor, by performing non-ordered steps comprising:	To the extent the preamble is limiting, Francois III expressly and/or inherently discloses and/or renders obvious this limitation. *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 [*sic*] 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 A Handheld Mirror Simulation*, Francois et al. (2003), 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 [*sic*], 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 ’109 Patent	Exemplary Citations to Francois III
	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 A Handheld Mirror Simulation*, Francois et al. (2003), 1.INTRODUCTION, page 745.

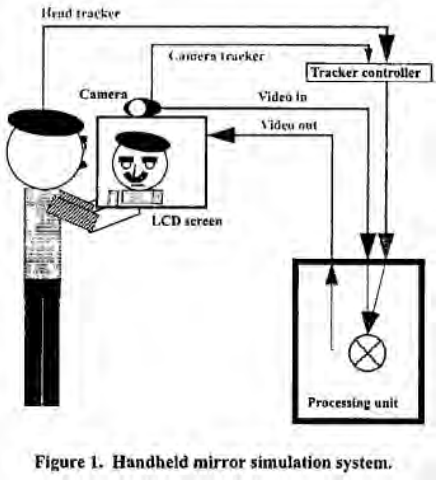
Asserted Claim of the ’109 Patent	Exemplary Citations to Francois III
	 Figure 1. Handheld mirror simulation system. *See A Handheld Mirror Simulation*, Francois et al. (2003), Fig. 1. “This sketch presents the design and construction of a handheld virtual mirror device. The perception of the world reflected 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 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

Asserted Claim of the ’109 Patent	Exemplary Citations to Francois III
	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 private, solitary act of a person looking in a mirror.” *See* Integrated Media Systems

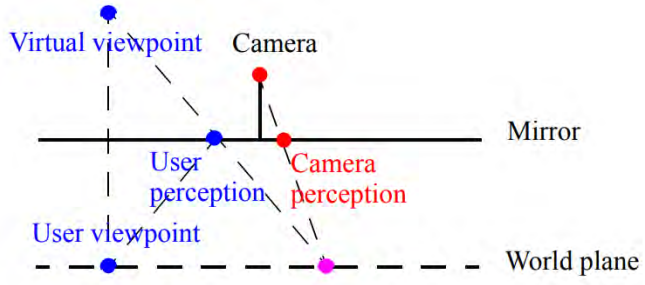
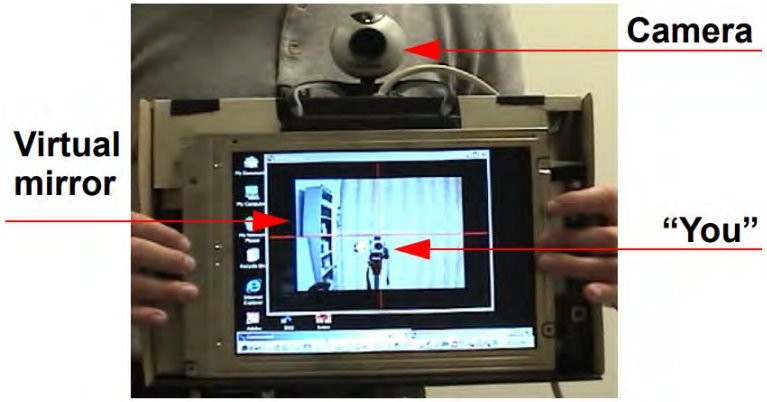
Asserted Claim of the ’109 Patent	Exemplary Citations to Francois III
	Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 3.Perspectives. *See A Handheld Virtual Mirror* (2002), at Figure 1:  Figure 1. Basic mirror geometry. *See A Handheld Virtual Mirror* (2002), 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.
1[a]. obtaining a digital image from a camera;	To the extent the preamble is limiting, Francois III expressly and/or inherently discloses and/or renders obvious obtaining a digital image from a camera. *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 [*sic*] around a LCD screen manipulated by the user, a single camera fixed on the screen, and a tracking

Asserted Claim of the ’109 Patent	Exemplary Citations to Francois III
	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 A Handheld Mirror Simulation*, Francois et al. (2003), 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 [*sic*], 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

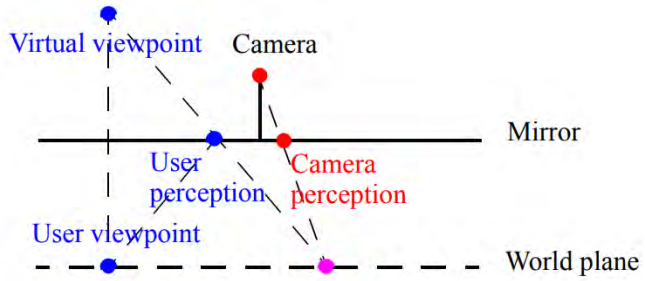
Asserted Claim of the ’109 Patent	Exemplary Citations to Francois III
	what the user would see on the screen surface if it were a real mirror.” *See A Handheld Mirror Simulation*, Francois et al. (2003), 1.INTRODUCTION, page 745.  Figure 1. Handheld mirror simulation system. *See A Handheld Mirror Simulation*, Francois et al. (2003), Fig. 1 “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

Asserted Claim of the ’109 Patent	Exemplary Citations to Francois III
	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 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:

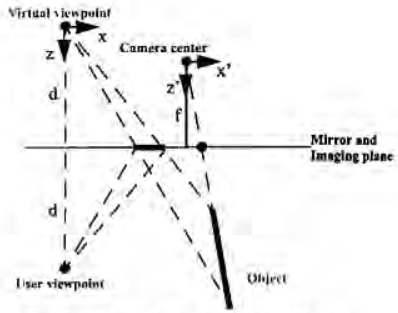
Asserted Claim of the '109 Patent	Exemplary Citations to Francois III
	 Figure 1. Basic mirror geometry. *See A Handheld Virtual Mirror* (2002), at Figure 2:  Figure 2. Handheld virtual mirror device. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois 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.
1[b]. flipping the image about a vertical axis so as to reverse right and left sides of the image;	Francois III 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. "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 [*sic*], 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 A Handheld Mirror Simulation*, Francois et al. (2003), 1.INTRODUCTION, page 745. "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

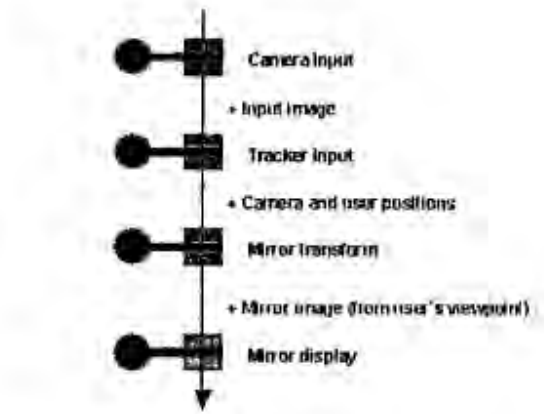
Asserted Claim of the ’109 Patent	Exemplary Citations to Francois III
	if it were a real mirror.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at the introductory paragraph. “When a person looks into a mirror, they see what they would see 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 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.”

Asserted Claim of the '109 Patent	Exemplary Citations to Francois III
	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. 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.

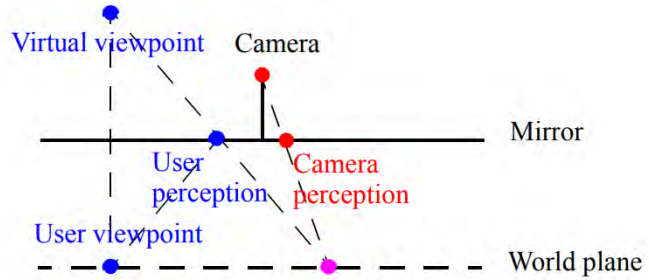
Asserted Claim of the '109 Patent	Exemplary Citations to Francois III
1[c]. applying a transformation mapping to the image to modify the image such that it appears to mimic a reflection of a mirror;	Francois III expressly and/or inherently discloses and/or renders obvious applying a transformation mapping to the image to modify the image such that it appears to mimic a reflection of a mirror . *See*, *e.g.*, disclosures below. "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 hardware 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 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.

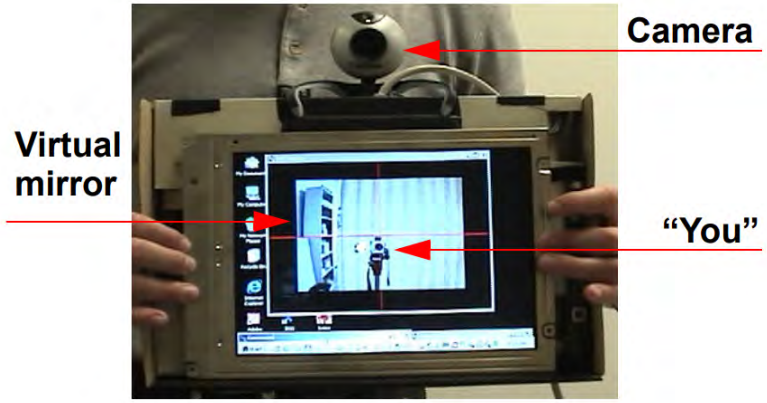
Asserted Claim of the ’109 Patent	Exemplary Citations to Francois III
	$\begin{bmatrix} x \\ y \\ z \\ 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & t_x \\ 0 & 1 & 0 & t_y \\ 0 & 0 & 1 & t_z \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x' \\ y' \\ z' \\ 1 \end{bmatrix}$ The mirror projection equations 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

Asserted Claim of the '109 Patent	Exemplary Citations to Francois III
	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.

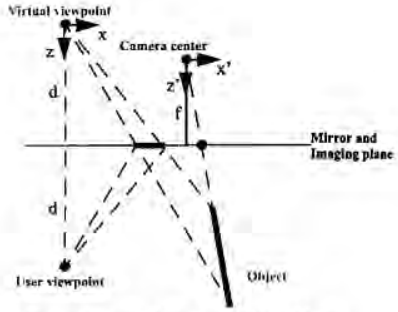
Asserted Claim of the ’109 Patent	Exemplary Citations to Francois III
	 **Figure 6. Mirror simulation application graph.** *A Handheld Mirror Simulation*, Francois et al. (2003), Fig. 6. “This sketch presents the design and construction of a handheld virtual mirror device. The perception of the world 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

Asserted Claim of the ’109 Patent	Exemplary Citations to Francois III
	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

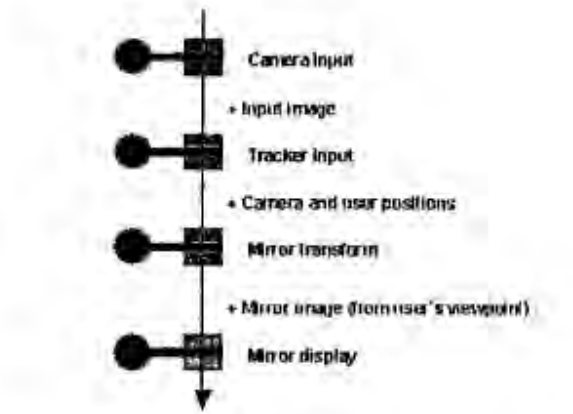
Asserted Claim of the ’109 Patent	Exemplary Citations to Francois III
	private, solitary act of a person looking in a mirror.” *See* Integrated Media Systems Center, Alexandre R.J. Francois II et al., *A Handheld Virtual Mirror* (2002), at Section 3.Perspectives. *See A Handheld Virtual Mirror* (2002), 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.
1[d]. resizing the image to reduce variations caused by changes in object's distance to the camera;	Francois III 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. "Our system provides a fundamental platform for other realtime interactive applications. Digital image processing modules can easily be added to the system in order to simulate various mirror deformations, such as magnifying, concave and convex mirrors (see figure 8). Note that the deformation parameters can also be dynamic." *See A Handheld Mirror Simulation*, Francois et al. (2003), 4.RELATED WORK AND APPLICATIONS, page 748.

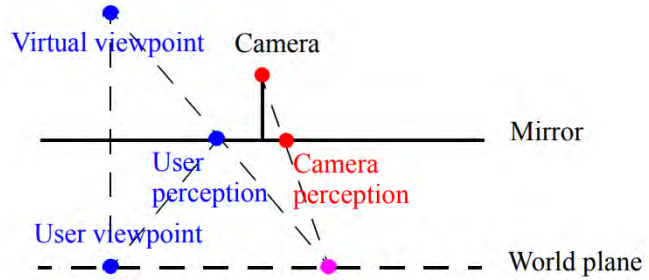
Asserted Claim of the ’109 Patent	Exemplary Citations to Francois III
	“This paper is organized as follows. In section 2, we outline the geometric analysis of mirror and camera imaging, leading to the image transform for mirror simulation, based on the flat world assumption. In section 3, we briefly 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.

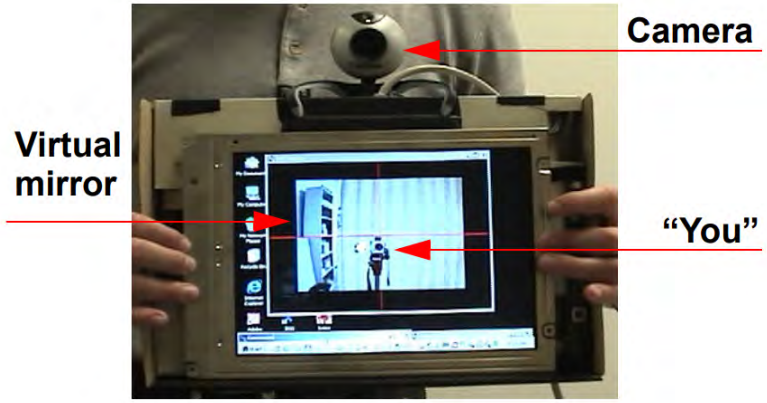
Asserted Claim of the ’109 Patent	Exemplary Citations to Francois III
	$\begin{bmatrix} x \\ y \\ z \\ 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & t_x \\ 0 & 1 & 0 & t_y \\ 0 & 0 & 1 & t_z \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x' \\ y' \\ z' \\ 1 \end{bmatrix}$ The mirror projection equations 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.

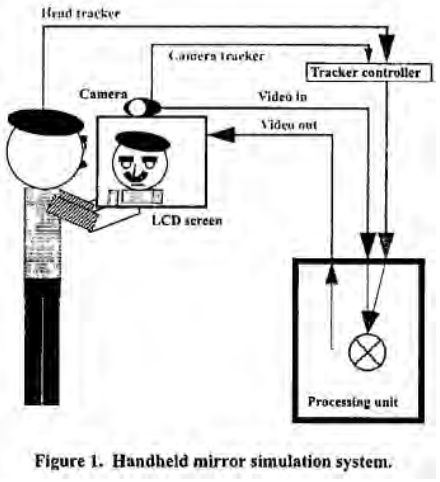
Asserted Claim of the ’109 Patent	Exemplary Citations to Francois III
	 **Figure 6. Mirror simulation application graph.** *See A Handheld Mirror Simulation*, Francois et al. (2003), Fig. 6. “This sketch presents the design and construction of a handheld virtual mirror device. The perception of the world 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

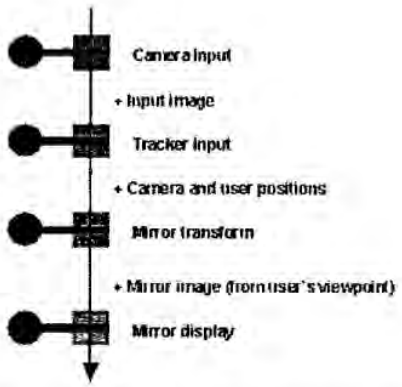
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	respect to the mirror produces a video stream that corresponds to this particular viewpoint. In order to synthesize the images corresponding to the user's viewpoint from the images captured by the camera, we must relate them geometrically. Such a 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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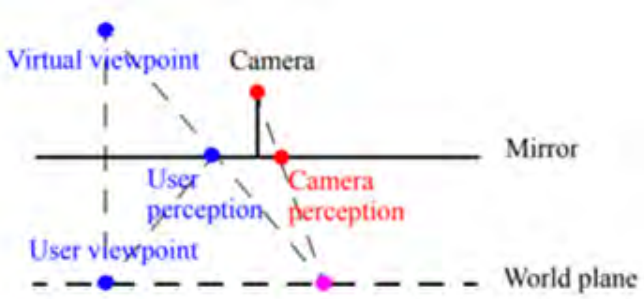
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	 Figure 2. Handheld virtual mirror device. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois III alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect 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.
1[e]. displaying the image on the monitor after performing the flipping, transformation mapping, and resizing;	To the extent the preamble is limiting, Francois III 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. "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 [*sic*] around a LCD screen manipulated by the user, a single camera fixed on the screen, and a tracking

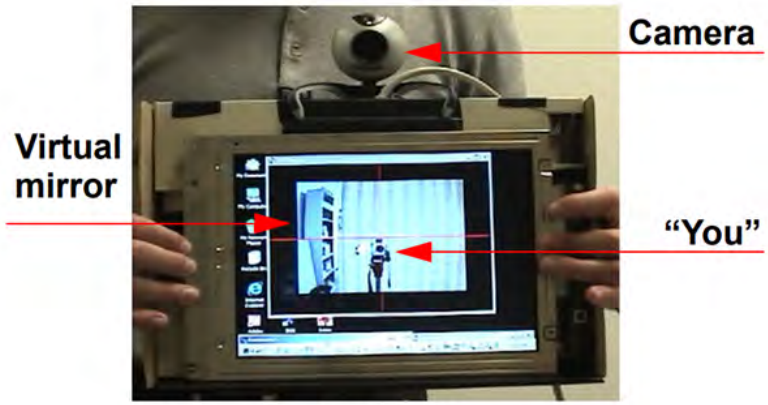
Asserted Claim of the ’109 Patent	Exemplary Citations to Francois III
	device. The continuous input video stream and tracker data is used to synthesize, in real-time, a continuous video stream displayed on the LCD screen. The synthesized video stream is a close approximation of what the user would see 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 A Handheld Mirror Simulation*, Francois et al. (2003), 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 [*sic*], 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

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	what the user would see on the screen surface if it were a real mirror.” *See A Handheld Mirror Simulation*, Francois et al. (2003), 1.INTRODUCTION, page 745.  Figure 1. Handheld mirror simulation system. *See A Handheld Mirror Simulation*, Francois et al. (2003), Fig. 1. “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 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 A Handheld Mirror Simulation*, Francois et al. (2003), 3.SYSTEM INTEGRATION, page 747.

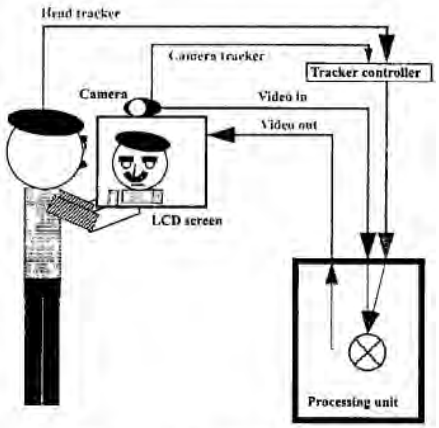
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	 **Figure 6. Mirror simulation application graph.** *See A Handheld Mirror Simulation*, Francois et al. (2003), Fig. 1. “This sketch presents the design and construction of a handheld virtual mirror device. The perception of the world reflected through 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

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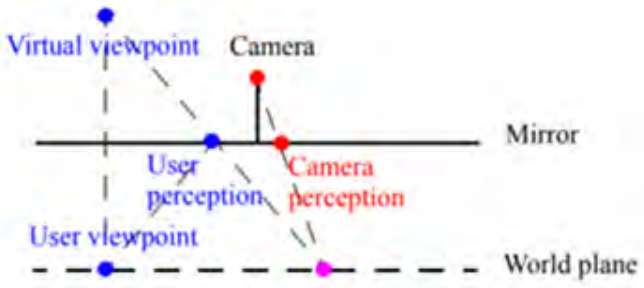
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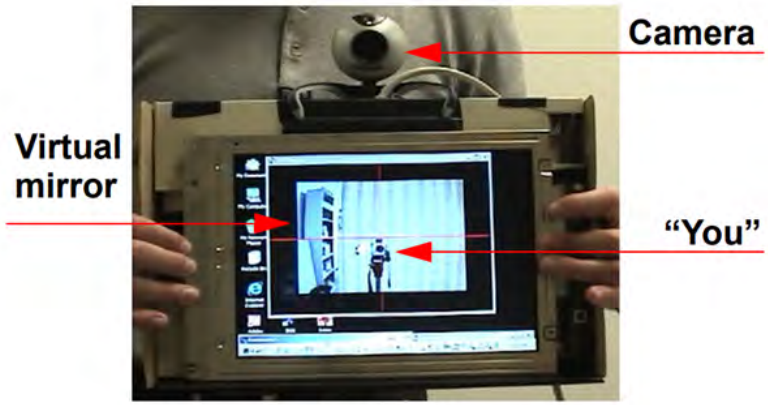
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	 Figure 2. Handheld virtual mirror device. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois III alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect 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.
1[f]. wherein the non-ordered steps are performed on a series of images of a live video feed from the camera;	To the extent the preamble is limiting, Francois III 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. "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 [*sic*] 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

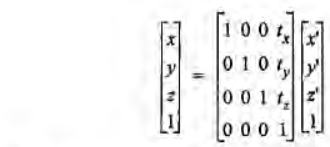
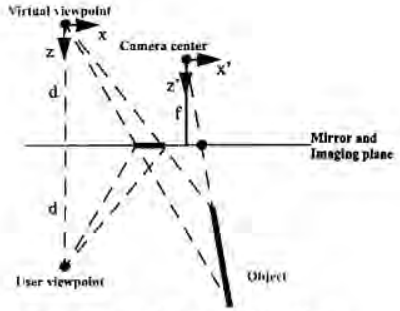
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	what the user would see on the screen surface if it were a real mirror.” *See A Handheld Mirror Simulation*, Francois et al. (2003), 1.INTRODUCTION, page 745.  Figure 1. Handheld mirror simulation system. *See A Handheld Mirror Simulation*, Francois et al. (2003), Fig. 1. “A camera whose position and orientation are fixed with respect to the mirror produces a video stream that corresponds to this particular viewpoint.” *See* 2.2 Pinhole camera geometry, page 746. “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.” *See A Handheld Mirror Simulation*, Francois et al. (2003), 3.SYSTEM INTEGRATION, 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

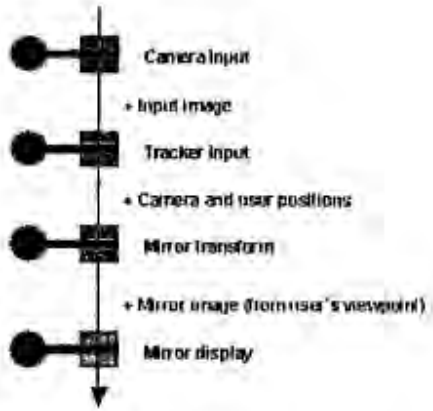
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	mirror on a computer screen, images of the observed world, consistent with the viewer's position, must be synthesized and displayed in real-time. Our system is build around a flat LCD screen manipulated by the user, a single camera fixed on the screen, 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:

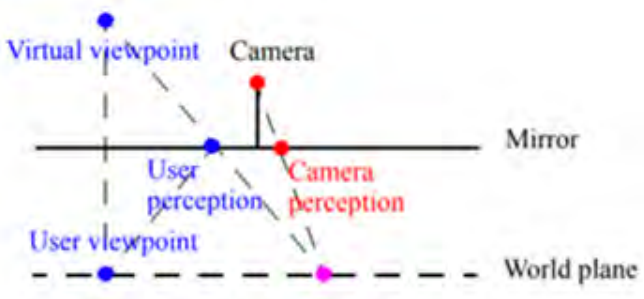
Asserted Claim of the '109 Patent	Exemplary Citations to Francois III
	 Figure 2. Handheld virtual mirror device. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois III alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the 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.
1[g]. determining distance to a user appearing in the live video feed; and	Francois III 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. "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.

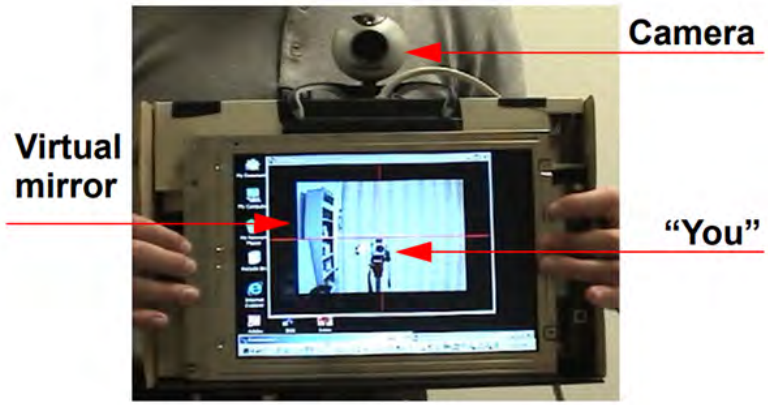
Asserted Claim of the '109 Patent	Exemplary Citations to Francois III
	"In order to synthesize the images corresponding to the user's view1point from the images captured by the camera, we must relate them geometrically, i.e. express x_p and y_p in terms of x'_p and y'_p.  $\begin{bmatrix} x \\ y \\ z \\ 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & t_x \\ 0 & 1 & 0 & t_y \\ 0 & 0 & 1 & t_z \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x' \\ y' \\ z' \\ 1 \end{bmatrix}$ 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

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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 variations occuring when varying the angle of view and the distance to the mirror, are

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	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. “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

Asserted Claim of the ’109 Patent	Exemplary Citations to Francois III
	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 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.”

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	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:

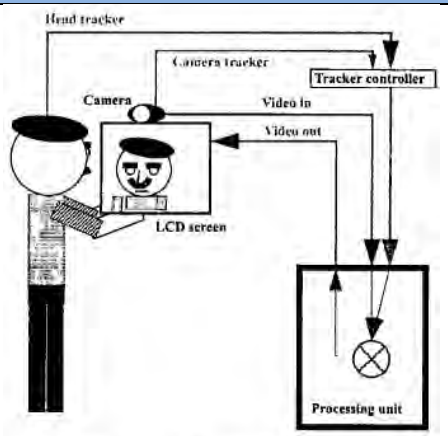
Asserted Claim of the ’109 Patent	Exemplary Citations to Francois III
	 Figure 2. Handheld virtual mirror device. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois III alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the 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.
1[h]. varying rate at which the non-ordered steps are performed on the series of images according to the distance.	Francois III 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. “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

Asserted Claim of the '109 Patent	Exemplary Citations to Francois III
	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. 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.

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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.	To the extent the preamble is limiting, Francois III 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. "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 projected location [xpypd], where d is the orthogonal distance of the viewpoint to the mirror plane, and

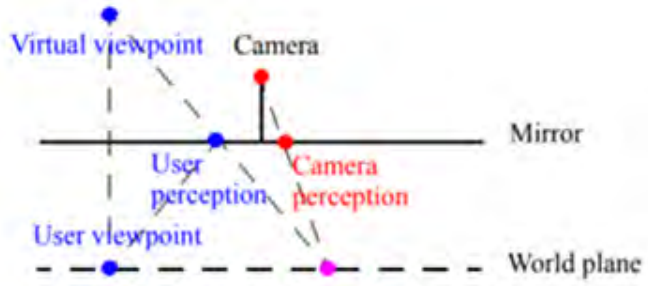
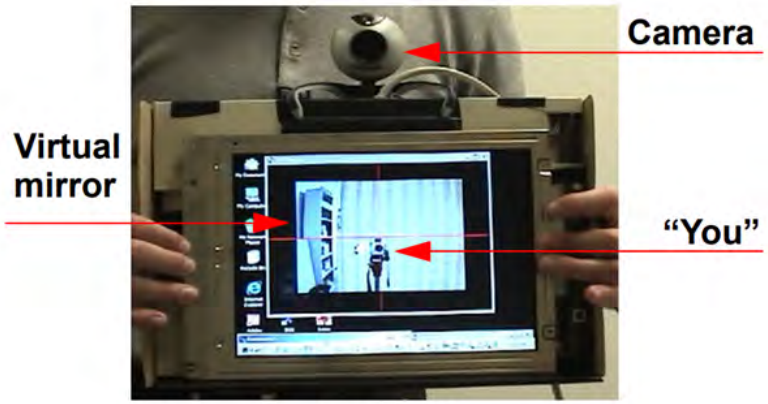
Asserted Claim of the ’109 Patent	Exemplary Citations to Francois III
	$\begin{bmatrix} U_p \\ V_p \\ W_p \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1/d & 0 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \\ 1 \end{bmatrix}$ $x_p = U_p / W_p = dx/z$ $y_p = V_p / W_p = dy/z$ The 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 A Handheld Mirror Simulation*, Francois et al. (2003), 2.GEOMETRIC ANALYSIS, pages 745-46. “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 [*sic*] 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 A Handheld Mirror Simulation*, Francois et al. (2003), 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 [*sic*], 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

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	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 A Handheld Mirror Simulation*, Francois et al. (2003), 1.INTRODUCTION, page 745.

Asserted Claim of the ’109 Patent	Exemplary Citations to Francois III
	 Figure 1. Handheld mirror simulation system. *See A Handheld Mirror Simulation*, Francois et al. (2003), Fig. 1. “We have presented a handheld mirror interface system. The system is designed to be a platform that will be used in many interactive applications. In particular, the use of the Modular Flow Scheduling Middleware as the software architecture ensures efficiency and extensibility through multithreading and modularity. 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.

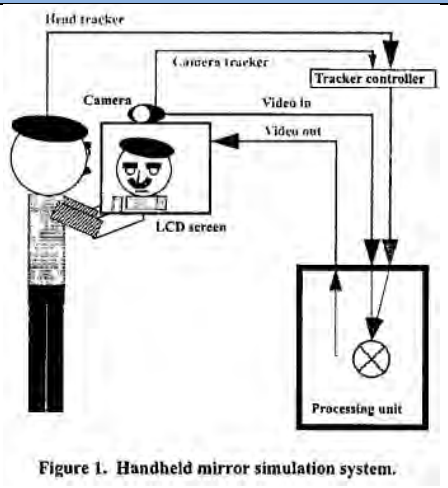
Asserted Claim of the ’109 Patent	Exemplary Citations to Francois III
	“We have implemented the mirror image transform as a module in the Modular Flow Scheduling Middleware [François 2001], the open source implementation of IMSC's software architecture for Integrated Media Systems. It is specifically 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

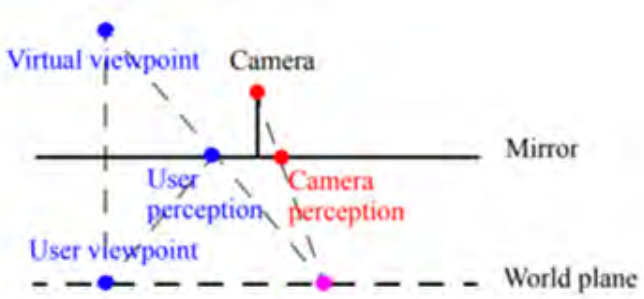
Asserted Claim of the '109 Patent	Exemplary Citations to Francois III
	Defendants' Invalidity Contentions and Defendants' other invalidity charts. Exemplary combinations are provided in Section II.B of the cover document.

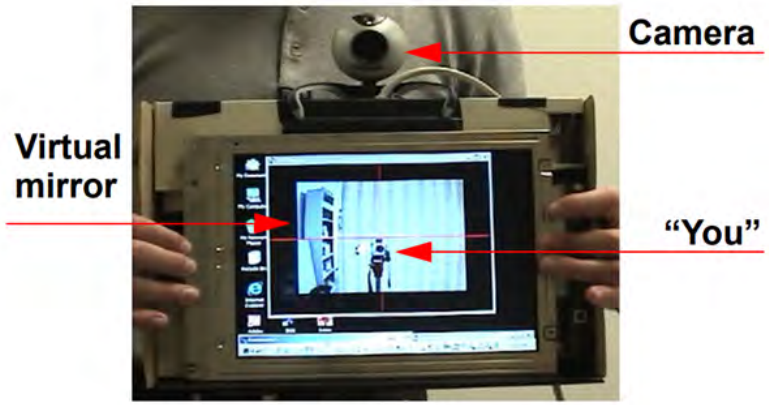
Asserted Claim of the '109 Patent	Exemplary Citations to Francois III
Claim 7	
7[pre]. The method of claim 1, further comprising the steps:	To the extent the preamble is limiting, Francois III expressly and/or inherently discloses and/or renders obvious this limitation. *See, e.g.*, disclosures below. *See* Claim Limitations 1[pre]-1[h]. 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[a]. obtaining a reference image;	To the extent the preamble is limiting, Francois III expressly and/or inherently discloses and/or renders obvious obtaining a reference image. *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 [*sic*] 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

Asserted Claim of the ’109 Patent	Exemplary Citations to Francois III
	rich, first-person interaction, such as the Virtual Daguerreotype.” *See A Handheld Mirror Simulation*, Francois et al. (2003), 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 [*sic*], 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 what the user would see on the screen surface if it were a real mirror.” *See A Handheld Mirror Simulation*, Francois et al. (2003), 1.INTRODUCTION, page 745.

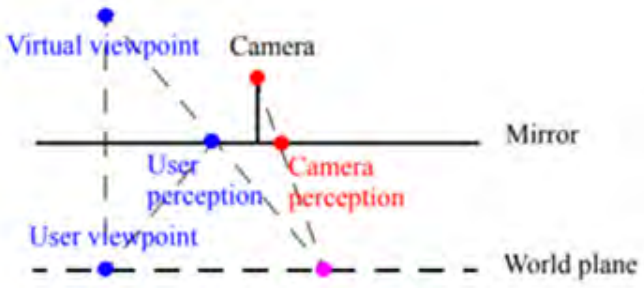
Asserted Claim of the ’109 Patent	Exemplary Citations to Francois III
	 Figure 1. Handheld mirror simulation system. *See A Handheld Mirror Simulation*, Francois et al. (2003), Fig. 1. “This sketch presents the design and construction of a handheld virtual mirror device. The perception of the world reflected 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

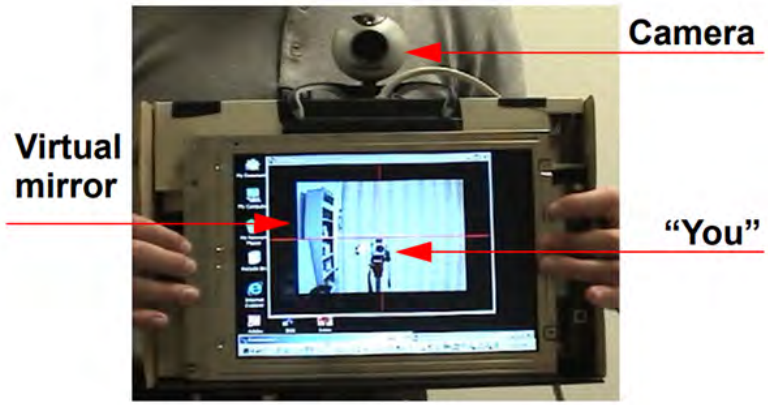
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	viewpoint. In order to synthesize the images corresponding to the user's viewpoint from the images captured by the camera, we must relate them geometrically. Such a transform cannot be formulated without assumptions or knowledge about the world geometry. 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 private, solitary act of a person looking in a mirror.” *See* Integrated Media Systems

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	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:

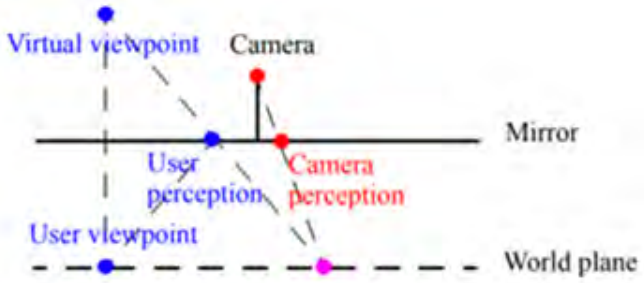
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	 Figure 2. Handheld virtual mirror device. This limitation would have been obvious to a person of ordinary skill in the art based on (1) Francois III alone; (2) knowledge of a personal of ordinary skill in the art, and/or (3) the teachings with respect 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.
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

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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

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