

Petitioner's Demonstratives

Google LLC
v.
EyesMatch Ltd.

IPR2024-00810

September 17, 2025

Patents at Issue

U.S. Patent No. 8,982,109 Devices, Systems and Methods of Capturing and Displaying Appearances



(12) **United States Patent**
Vilcovsky et al. (10) **Patent No.:** **US 8,982,109 B2**
(45) **Date of Patent:** **Mar. 17, 2015**

(54) **DEVICES, SYSTEMS AND METHODS OF CAPTURING AND DISPLAYING APPEARANCES**
(58) **Field of Classification Search**
CPC G06F 3/005; G06F 3/01; G06F 3/011
USPC 345/204; 215; 348/333.01; 434/395
See application file for complete search history.

(71) Applicants: **Nissl Vilcovsky, Tokyo (JP); Ofer Saban, Vienna, VA (US)**
(72) Inventors: **Nissl Vilcovsky, Tokyo (JP); Ofer Saban, Vienna, VA (US)**
(73) Assignee: **Eyematch Ltd., Road Town, Tortola (VG)**
(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 169 days.

(21) Appl. No.: **13/843,001**
(22) Filed: **Mar. 15, 2013**
(65) **Prior Publication Data**
US 2013/0229482 A1 Sep. 5, 2013

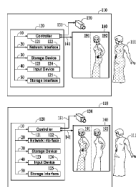
Related U.S. Application Data
(63) Continuation-in-part of application No. 13/088,369, filed on Apr. 17, 2011, now Pat. No. 8,624,883, which is a continuation of application No. 11/817,411, filed as application No. PCT/IL2006/000281 on Mar. 1, 2006, now Pat. No. 7,946,481.
(60) Provisional application No. 60/656,884, filed on Mar. 1, 2005, provisional application No. 60/656,885, filed on Mar. 1, 2005, provisional application No. 61/738,957, filed on Dec. 18, 2012.

Foreign Patent Documents
(21) Appl. No.: **13/843,001**
(22) Filed: **Mar. 15, 2013**
(65) **Prior Publication Data**
US 2013/0229482 A1 Sep. 5, 2013

Other Publications
(21) Appl. No.: **13/843,001**
(22) Filed: **Mar. 15, 2013**
(65) **Prior Publication Data**
US 2013/0229482 A1 Sep. 5, 2013

Abstract
(57) Systems, devices and methods enabling appearance composition. The system includes at least one interactive imaging and display station. The station includes a mirror-display device capable of selectively operating in either or both a mirror mode or a display mode; an imaging device to capture one or more appearances appearing in a field of view in front of the mirror-display device; and/or an image control unit to select the mode of operation of the mirror-display device according to a user command.

18 Claims, 18 Drawing Sheets



'110 Patent is a Continuation-in-Part of '109 Patent

U.S. Patent No. 8,982,110 Method for Image Transformation, Augmented Reality, and Telepresence



(12) **United States Patent**
Saban et al. (10) **Patent No.:** **US 8,982,110 B2**
(45) **Date of Patent:** **Mar. 17, 2015**

(54) **METHOD FOR IMAGE TRANSFORMATION, AUGMENTED REALITY, AND TELEPRESENCE**
(56) **References Cited**
U.S. PATENT DOCUMENTS

(71) Applicant: **Eyematch Ltd., Road Town, Tortola (VG)**
(72) Inventors: **Ofer Saban, Vienna, VA (US); Nissl Vilcovsky, Tokyo (JP)**
(73) Assignee: **Eyematch Ltd., Road Town, Tortola (VG)**

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

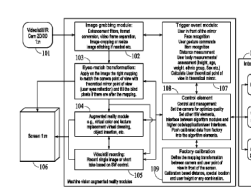
(21) Appl. No.: **14/253,831**
(22) Filed: **Apr. 15, 2014**
(65) **Prior Publication Data**
US 2014/0225978 A1 Aug. 14, 2014

Related U.S. Application Data
(63) Continuation-in-part of application No. 13/843,001, filed on Mar. 15, 2013, which is a continuation-in-part of application No. 13/088,369, filed on Apr. 17, 2011, now Pat. No. 8,624,883, which is a continuation of (Continued)

Abstract
(57) Computerized method for image transformation, augmented reality and telepresence. A camera generates a stream of images of the user, a processor detects the presence of the user in the stream of images and applies adaptive transformation mapping to the stream of images captured by the camera to generate modified images that appear to be captured from a different point of view of the camera's actual point of view. The modified images are displayed on a local and/or remote monitor for telepresence. The processor can also generate an avatar having body characteristics corresponding to body characteristics of a user appearing in the images. The processor may generate the avatar by analyzing registration pointers on the images of the camera. The processor may reside in the remote location, and the camera images transmitted over a network to the processor, and the modified images transmitted back from the processor to the monitor.

Field of Classification Search
CPC G06F 3/01; G06F 3/011; G06F 3/005
USPC 345/204; 215; 348/333.01; 434/395
See application file for complete search history.

18 Claims, 16 Drawing Sheets



The '110 Patent

The camera tilts downwards, and the camera-captured image is transformed to mimic a reflection of a mirror

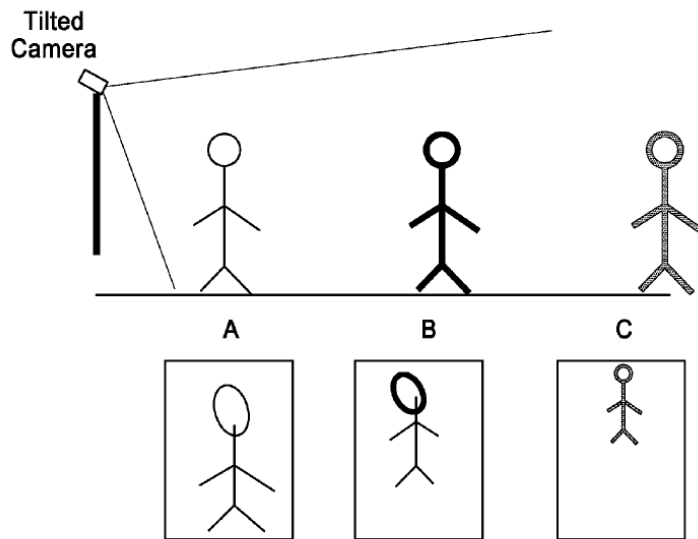


FIG. 8

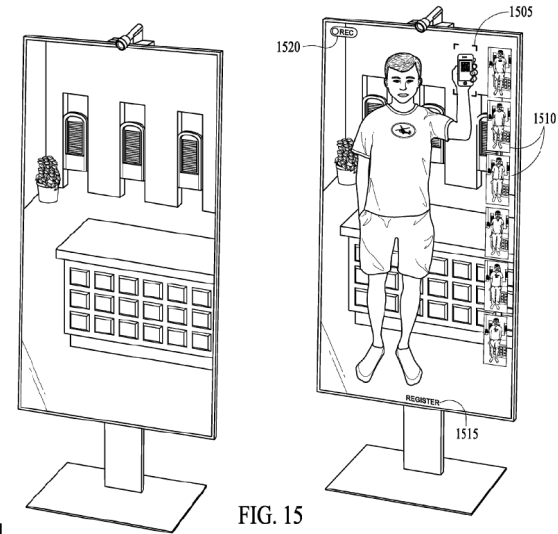


FIG. 14

FIG. 15

When the system is turned on, before a user stands in front of the mirror, the system operates in an idle mode, during which the controller may or may not provide transformation to mimic a mirror reflection. Once the user enters a specified zone in front of the field of view of the camera, the processor is capable of tracking the user in the recorded image. Based on the tracking, the video engine of the processor can calculate a transformation of the image to mimic mirror behavior.

The camera-captured images are analyzed to track the user in the field of view of the camera before transformation to mimic a mirror

Claim Construction

Paper	Claim Construction Position
Petition	No claim construction is necessary
Patent Owner's Preliminary Response	
Institution Decision	
Deposition of Petitioner's Expert	Petitioner's Expert: Magistrate Judge's recommended construction consistent with original positions
Patent Owner's Response	Argues for Magistrate Judge's recommended construction
Deposition of Patent Owner's Expert	Patent Owner's Expert: Applied Magistrate Judge's recommended construction without analysis
Petitioners' Reply	No claim construction is necessary
Patent Owner's Sur-Reply	Argues for Magistrate Judge's recommended construction

IPR2024-00810: Petition (Paper 1), 13-14; Patent Owner's Preliminary Response (Paper 17), 10-11;
 IPR2024-00810: Institution Decision (Paper 20), 11-13; Patent Owner's Response (Paper 27), 9-14;
 IPR2024-00810: Petitioners' Reply (Paper 32), 1-7; Patent Owner's Sur-reply (Paper 37), 2-8;
 IPR2024-00810: Karam Tr. (Ex. 2012), 43:24-44:10, 47:1-51:3, 84:11-88:21, 254:3-255:8, 258:5-25; Forsyth Tr. (Ex. 1034), 75:7-86:17.

Claim Construction: “Mirror Tracking Mode”

Term	Claim Language	Patent Owner Response: 3-part construction	Petitioners
mirror mimicking	'109-1[c] “image ... appears to mimic a reflection of a mirror;” '110-1[f] “mirror tracking mode”	1. “user sees their reversed reflection ... 2. at roughly double the distance from the camera ... 3. and roughly the same size regardless of the user movement”	No construction is needed because prior art renders obvious under any reasonable construction.

- No construction is needed
- Petition prior art renders “mirror tracking mode” obvious under any reasonable construction
- Patent Owner has not presented claim construction analysis and Patent Owner’s expert “took no position” on claim construction
- Board is not bound by Magistrate Judge’s recommendations in district court

IPR2024-00856: Patent Owner’s Response (Paper 22), 18-19, citing Claim Construction Order (Ex. 2008), 14-19;
IPR2024-00810: Patent Owner’s Response (Paper 27), 13-14, citing Claim Construction Order (Ex. 2008), 41.

Patent Owner Did Not Present Analysis or Evidence to Support Claim Construction Position

- Patent Owner only referred to positions taken in district court

Having now obtained a narrow construction of “mirror tracking mode” in the district court, Samsung should be held to that construction and the same construction should be adopted here, for the reasons articulated by Samsung and its expert, and adopted by the district court. Ex.2009 at 12-14, Ex.2010, ¶¶97-100 (concerning “mirror tracking mode”), ¶¶58-65 (concerning “it appears to mimic a reflection of a mirror”), Ex.2008 at 27-28 (concerning “mirror tracking mode”), 14-19 (concerning “it appears to mimic a reflection of a mirror”). As addressed below, given Samsung’s complete failure to address its own construction, and how its asserted Grounds meet that construction, the claims should be found not unpatentable for that reason alone.

Patent Owner's Expert "Did Not Analyze the Construction"

3 Q Did you review any of the related
4 briefing in the District Court relating to claim
5 construction?

6 A No. Or I have no recall of reviewing
7 that.

16 Q You did not provide opinions under any
17 other construction of this limitation. Correct?

18 A That's correct.

12 A Again, I've been provided the
13 construction that the District Court supplied, and
14 I adopted that construction because it came from
15 the District Court. I did not analyze the
16 construction in any detail because I assumed that
17 the district -- well, there is a document, the
18 District Court does that.

19 I -- looking at the construction, it
20 appears reasonable to me, but that is a
21 looking-at-the-construction answer rather than an
22 analysis. And again, I am in no position to
1 correct a district judge.

IPR2024-00810: Forsyth Tr. (Ex. 1034), 76:3-7, 78:6-18, 85:6-86:1.

19 A I understand that one way to interpret a
20 claim term is according to the ordinary and
21 customary meaning as understood by a person of
22 ordinary skill in the art. But under some

82

1 circumstances, if a district judge has told me
2 what a term means, then I must adopt that
3 construction.

IPR2024-00810: Forsyth Tr. (Ex. 1034), 81:19-82:3

8 A There may be terms that the District
9 Court construed and that I did not list in the
10 '109 declaration. If that's the case, it's
11 because I didn't need the construction of the
12 term.

IPR2024-00810: Forsyth Tr. (Ex. 1034), 92:8-12.

Patent Owner's Expert Applied Three-Part Construction

25. I understand that Petitioner Samsung is a Defendant in *EyesMatch Ltd. v. Samsung Electronics Co., Ltd., et al.*, No. 2:23-cv-363 (E.D. Tex.) (“the District Court Litigation”) in which the 110 Patent is also asserted. I understand that the District Court issued a claim construction order in the District Court Litigation. Ex. 2008. I further understand that the PTAB will consider this claim construction order and may find the District Court’s reasoning to be persuasive. In reviewing
Petitioners’ asserted prior art and forming my opinions in this Declaration, I have
applied the constructions from the District Court Litigation Claim Construction
Order.

Claim Construction: “Adaptive Transformation Mapping”

Term	Claim Language	Patent Owner	Petitioners
“adaptive transformation mapping” '110-1[c]	“apply adaptive transformation mapping to the stream of images . . . to generate modified images that appear to be captured from a different point of view of the camera’s actual point of view”	“ continuously variable transformation mapping”	No construction is needed because prior art renders obvious under any reasonable construction.

- No construction needed
- Patent Owner does not argue that claim construction impacts obviousness
- Patent Owner has not presented claim construction analysis or evidence

IPR2024-00810: Patent Owner’s Response (Paper 27), 14, citing Claim Construction Order (Ex. 2008), 37.

'110 Patent - Grounds of Unpatentability

Ground	Claims Challenged	References
1	1-6, 10-12, 16-17	Haan + Francois
2	1-6, 10-12	Rosenberg + Park
3	1-18	Geisner + Lizee
4-5	Dependent claims	Geisner added to combinations 1-2

- All claims of the '110 Patent are challenged
- Claim 1 is the only independent claim
- Patent Owner has not separately argued any dependent claims

'110 Patent - Representative Claim 1

**“different
point of view”**

Independent Claim 1	Disputed?
1[Pre] A computerized method for operating a display system, the display system having a camera, a monitor, and a processor, the method comprising:	NO
1[a] operating the camera to generate a stream of images of the user;	NO
1[b] operating the processor to detect the presence of the user in the stream of images;	NO
1[c] operating the processor to apply adaptive transformation mapping to the stream of images captured by the camera to generate modified images that appear to be captured from a different point of view of the camera's actual point of view; and,	YES
1[d] displaying the modified images on the monitor;	NO
1[e] wherein the different point of view corresponds to an image taken from a different angle and a different distance than the actual images captured by the camera; and	YES
1[f] wherein during mirror tracking mode the processor utilizes the angle of the images captured by the camera and applies parametric input for a mapping transformation that changes imaging perspective of the images captured by the camera.	YES

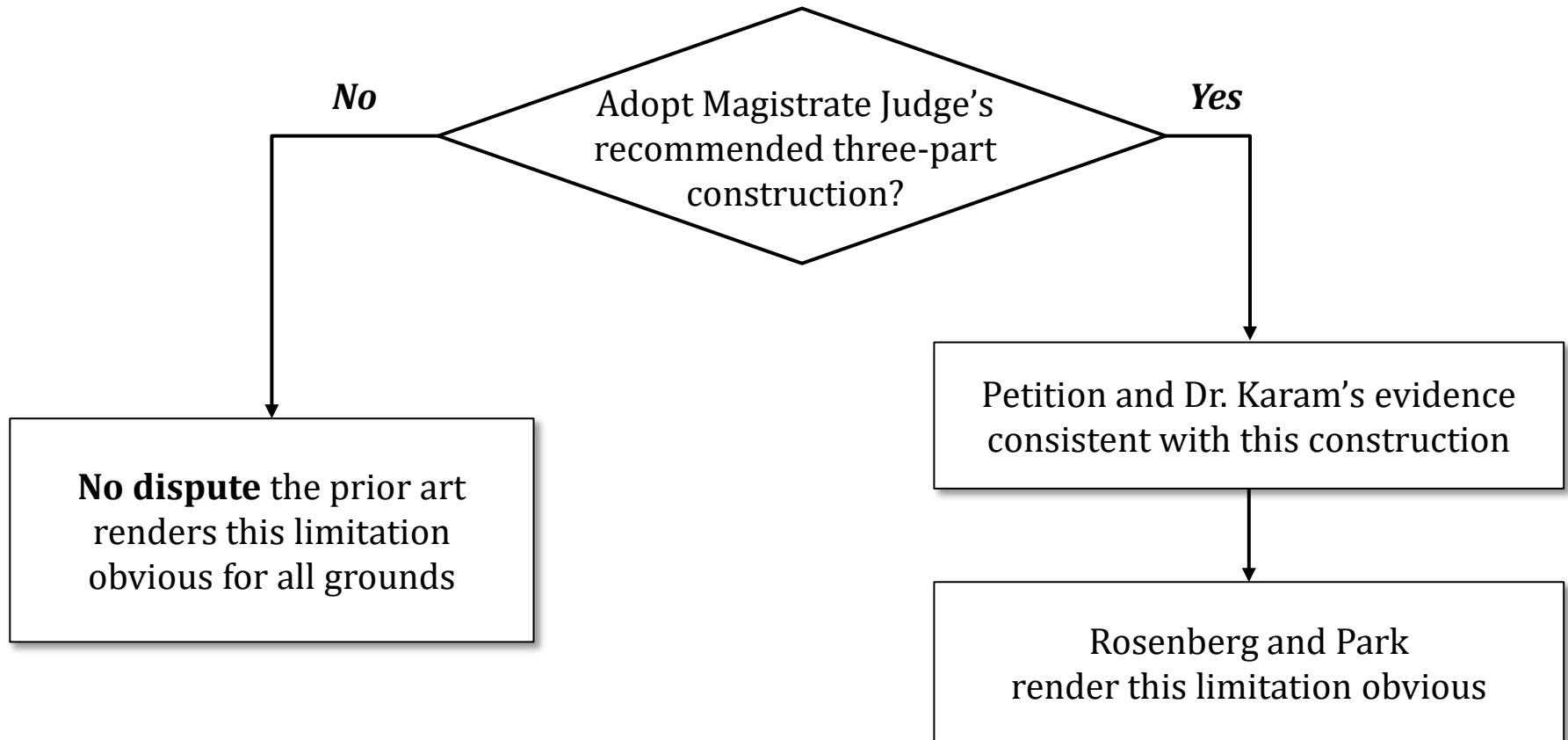
“mirror tracking”

IPR2024-00810: Petition (Paper 1), 22-46, 52-67, 73-91; Patent Owner's Response (Paper 27), 14-60;
IPR2024-00810: Petitioners' Reply (Paper 32), 7-26; Patent Owner's Sur-reply (Paper 37), 8-24.

“Mirror Tracking Mode” (Limitation 1[f])

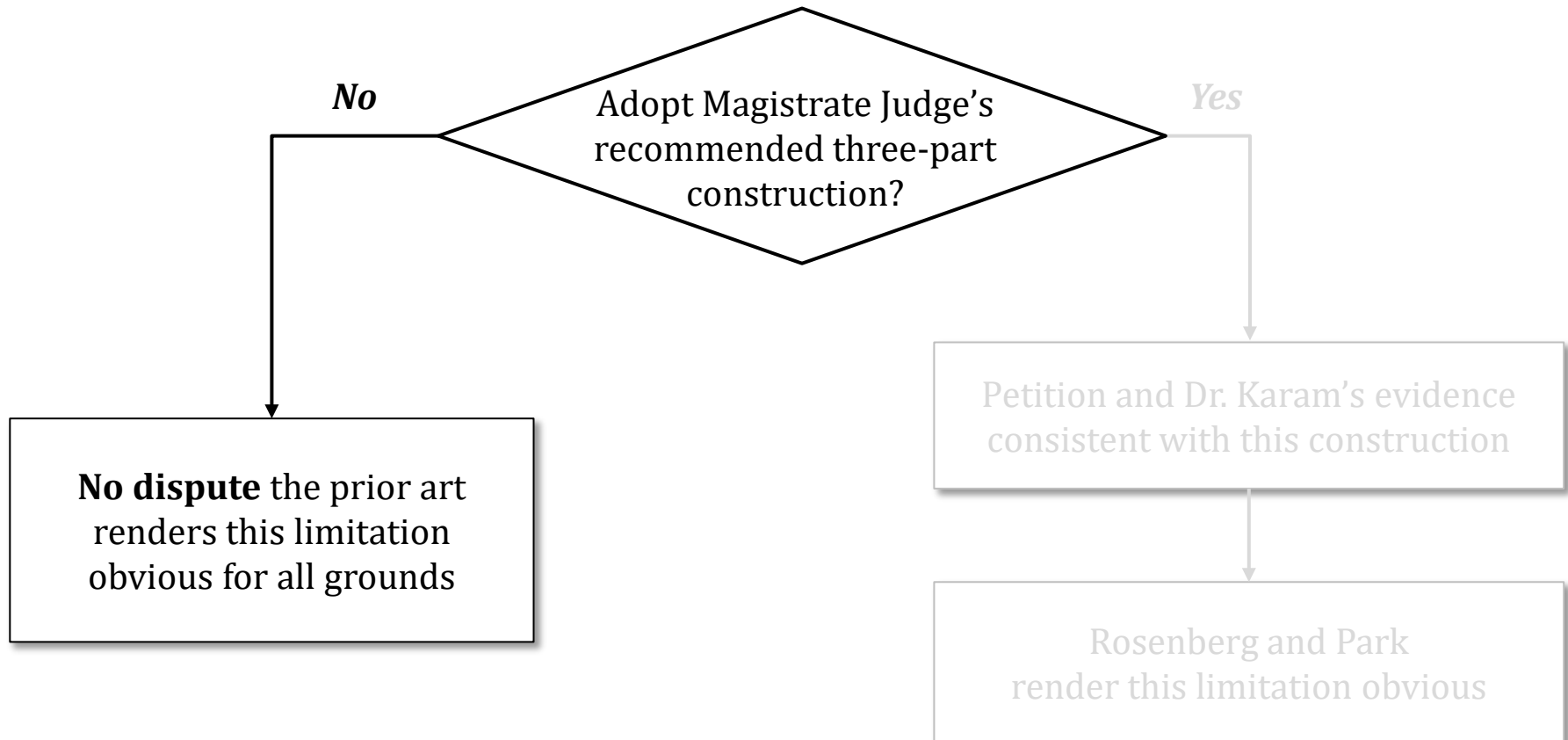
- “Mirror Tracking Mode” limitation is obvious over three combinations
 - Rosenberg and Park
 - Haan and Francois
 - Geisner and Lizée

“Mirror Tracking Mode” (Limitation 1[f])



IPR2024-00810: Petition (Paper 1), 44-46, 64-67, 89-91; Patent Owner's Response (Paper 27), 14-55;
IPR2024-00810: Petitioners' Reply (Paper 32), 7-15, 17-20, 22-25; Patent Owner's Sur-reply (Paper 37), 8-19, 21-24;
IPR2024-00810: Claim Construction Order (Ex. 2008), 41.

“Mirror Tracking Mode” (Limitation 1[f])



IPR2024-00810: Petition (Paper 1), 44-46, 64-67, 89-91; Patent Owner's Response (Paper 27), 14-55;
IPR2024-00810: Petitioners' Reply (Paper 32), 7-15, 17-20, 22-25; Patent Owner's Sur-reply (Paper 37), 8-19, 21-24;
IPR2024-00810: Claim Construction Order (Ex. 2008), 41.

Rosenberg Discloses a “Mirror Tracking Mode” Like the ‘110 Patent

‘110 Patent

eliminate rapid aging of the display electronics. The mirror station can be enabled so as to automatically power up. The mirror station can be controlled via remote control locally or through the cloud to reboot and to enter into normal operation.

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When the system is turned on, before a user stands in front of the mirror, the system operates in an idle mode, during which the controller may or may not provide transformation to mimic a mirror reflection. Once the user enters a specified zone in front of the field of view of the camera, the processor is capable of tracking the user in the recorded image. Based on the tracking, the video engine of the processor can calculate a transformation of the image to mimic mirror behavior.

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In the idle mode, normally operable when there is no user in front of the mirror, monitor may display a screen saver, a static image, video clips, and the likes. All of these examples may be referred to as idle image, wherein the term “image” includes video. During idle mode the monitor may also display the background image recorded at that particular instance by the camera. In order to properly display the back-

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Rosenberg

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.

Rosenberg Discloses “Mapping Transformation” Like the ‘110 Patent

- Rosenberg’s flipping and scaling disclose “mapping transformation” as disclosed in the ‘109 and ‘110 patents

‘109 Patent

24

distance to the screen. Depending on the position and FOV of the camera, an x-y translation of the image may also be required.

5 In practice, it has been shown that performing tilt, elevation, and scale translations provides a rather convincing image that only needs to be right-to-left reversed to very effectively mimic a mirror reflection. For further improvements, one may also use barrel-effect transformation and fish-eye transformation. Additionally, one may add depth

‘110 Patent

10 2. The method of claim 1, wherein the mapping transformation comprises a combination of at least two of the following transformations: vertical flips about a vertical axis, a projection transformation, rotation, resize, two-dimensional offset, optic distortion correction, and polynomial mapping on part or entire captured image.

Rosenberg

[0077] 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.

Park Discloses “Mapping Transformation” to Correct Distortion

- Park corrects perspective distortion by performing image compensation (“mapping transformation”) based on the tilt angle of the camera
- Park uses the tilt angle of the camera and applies parametric input for the mapping transformation

FIG. 5

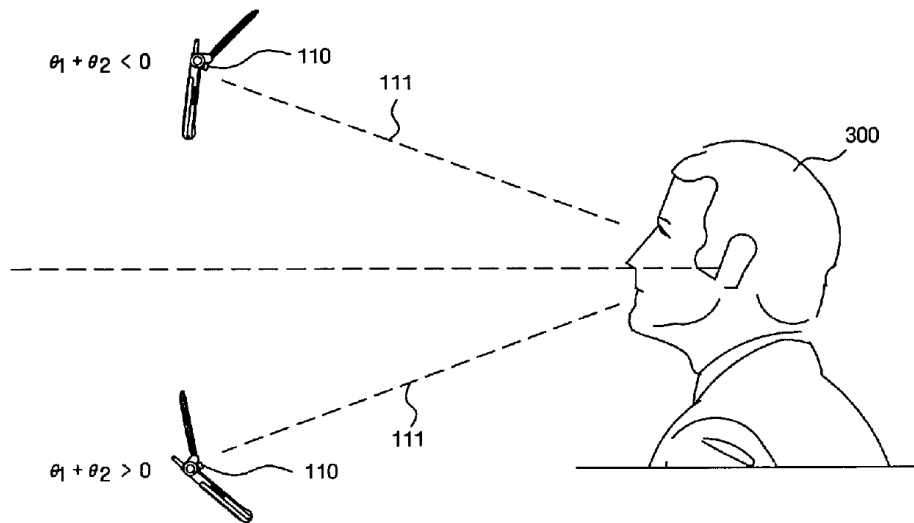


FIG. 1A



BELOW USER' S FACE

FIG. 1B



IN FRONT OF USER' S FACE

FIG. 1C



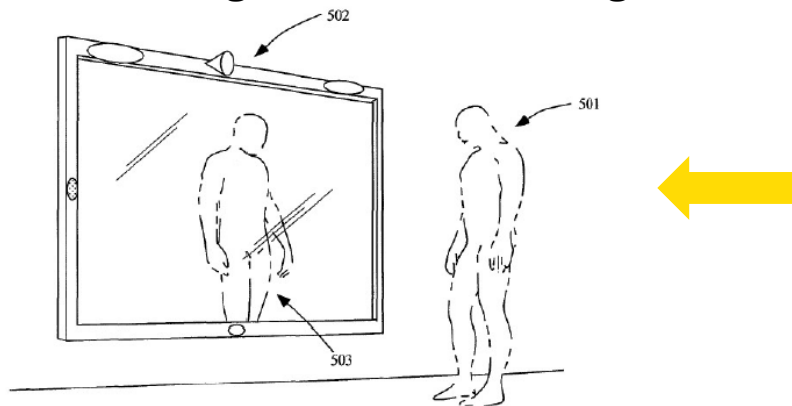
OVER USER' S FACE

IPR2024-00810: Petition (Paper 1), 64-67; Petitioner's Reply (Paper 32), 16-22;
IPR2024-00810: Karam Decl. (Ex. 1003), ¶¶270-275; Park (Ex. 1011), FIGS. 1A-1C, 5-6B, 9-10B, [0003], [0007], [0010], [0014], [0034], [0036], [0050]-[0051], [0060]-[0061].

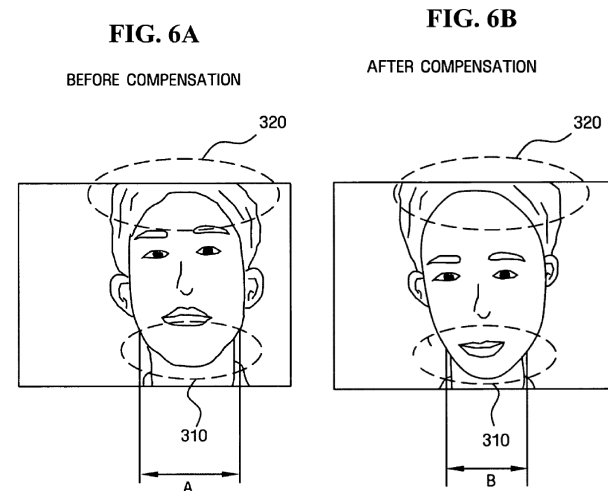
Motivation to Combine Rosenberg and Park for “Mirror Tracking Mode”

- Rosenberg’s image would have perspective distortion due to camera position or varied eye level
- One skilled would have been motivated to address the perspective distortion in Rosenberg’s mirror tracking mode by Park’s compensation to display a realistic mirror image

Rosenberg’s mirror mimicking

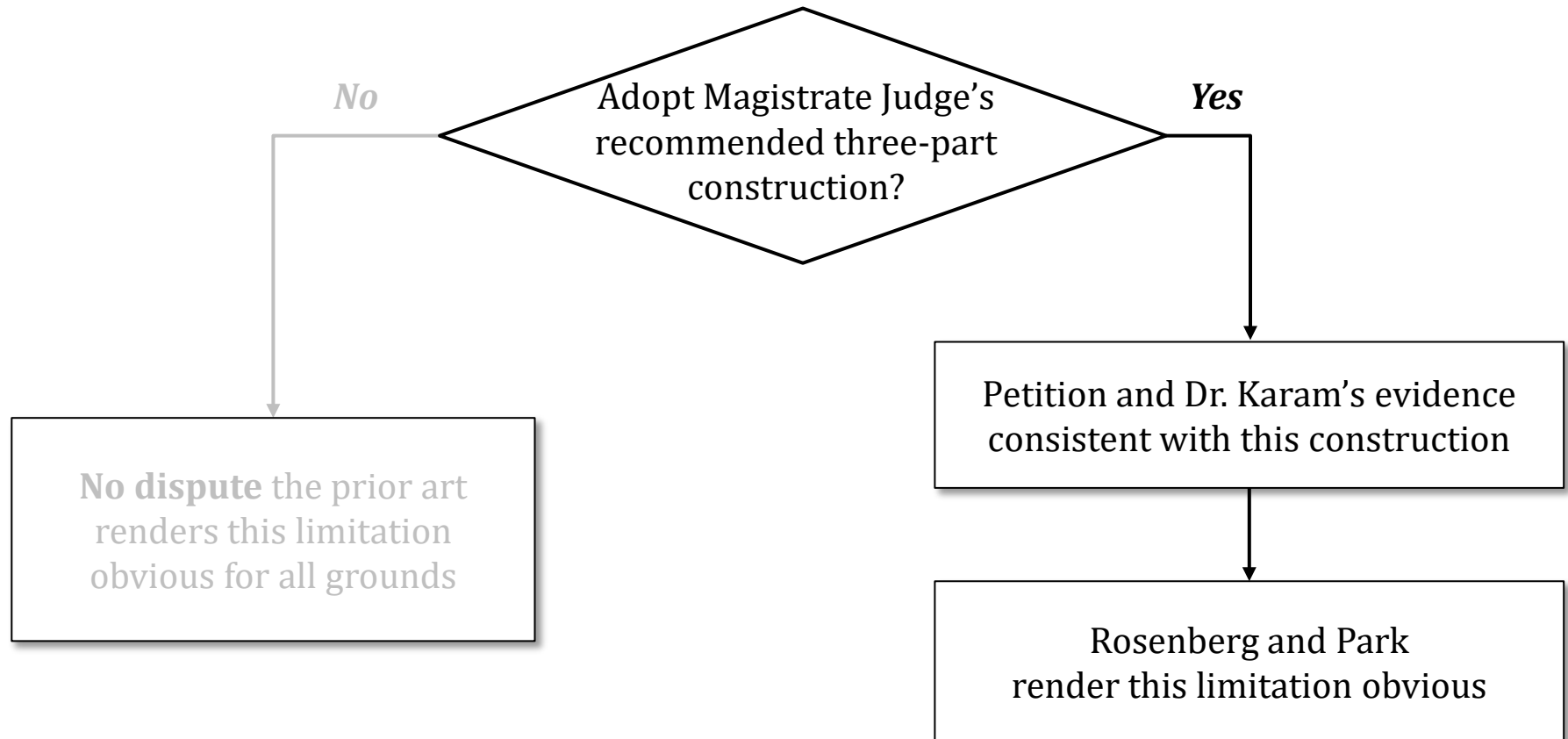


Park’s compensation



Rosenberg and Park disclose all that is needed for “mirror tracking mode” in claim 1.

“Mirror Tracking Mode” (Limitation 1[f])



IPR2024-00810: Petition (Paper 1), 44-46, 64-67, 89-91; Patent Owner's Response (Paper 27), 14-55;
IPR2024-00810: Petitioners' Reply (Paper 32), 7-15, 17-20, 22-25; Patent Owner's Sur-reply (Paper 37), 8-19, 21-24;
IPR2024-00810: Claim Construction Order (Ex. 2008), 41.

Dr. Karam's Declaration Describes Mirror Mimicking Consistent with Three-Part Construction

b. Image Flipping

53. Flipping an image captured by a camera about a theoretical vertical axis

was a well-known technique in the field of image formation and computer vision that allowed for the image to mimic a mirror's reflection. See, e.g., Ex. 1010 (Hartley) at 38. This image flipping transformation falls under the group of isometry transformations, which is mathematically represented by a group of matrices. Ex.

“reversed reflection”

f. Image Resizing and Field of View Transformation

65. As is also commonly known, a reflection of a user in a traditional mirror appears, to the user, to be the same size regardless of the user's point of view. By contrast, the size of a user image captured by a camera and displayed on a display generally changes depending on the position and orientation of the camera relative to the user. It is therefore common in the field of multiple-view geometry modelling to transform an image to alleviate this problem via a scaling or perspective transformation. Ex. 1010 (Hartley) at 166-67, 170, Fig. 6.8. For example, a well-

“double the distance,” “same size”

66. Generally, as a user moves away from the camera, the camera can be optically zoomed in and refocused on the user, such that the focal length is increased, and the image of the user is magnified. Ex. 1010 (Hartley) at 167. However, images captured using a lens with a longer focal length generally correspond to a smaller field of view. Ex. 1010 (Hartley) at 167, 169. The “tracking and zooming” approach described above is well-known and alleviates this problem, such that the size of the user remains fixed within a displayed camera image. Ex. 1010 (Hartley) at 167. This approach is well-known in the field of multiple-view geometry modeling and image formation and can be applied digitally (Ex. 1010 (Hartley) at 7, 166-170, 202-204, Figs. 6.7, 6.8, 8.5) to correct the user image based on the camera's distance to the user to match the size of the image that the user would see in a mirror.

Dr. Karam's Declaration: Rosenberg Discloses Emulating a Traditional Mirror Consistent with Three-Part Construction

114. Furthermore, similar to the '110 Patent, the digital mirror system described in Rosenberg transforms and/or resizes the real-time images captured by the camera, such that a 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." Ex. 1006 (Rosenberg) at [0077].

"double the distance," "same size"

the present invention." Ex. 1006 (Rosenberg) at [0025]. In other words, Rosenberg's system detects the presence of a user to automatically engage a mirror mode. *See* Ex. 1006 (Rosenberg) at [0026], [0028], [0035], [0077]. A POSITA would have understood this discloses a "mirror tracking mode" because during the mirror mode, real-time images of the user captured by the camera are modified (e.g., left-right inversion, scaling) to generate and display real-time mirror images to the user.

"reversed reflection"

265. The '110 Patent describes "resizing the image to reduce variations caused by changes in the object's distance to the camera." *See* Ex. 1001 ('110 Patent) at 3:26-28. Similarly, the '109 Patent discloses resizing the image based on distance to the user to match the size that the user would see in a mirror. *See* Ex. 1021 ('109 Patent) at 2:19-27 (teaching unlike a mirror image, the user appears larger in a camera image as the user approaches the camera), 17:19-23, 21:57-60, 23:65-24:9, 25:46-48, 30:4-11, Fig. 11.

266. Rosenberg, similar to the '110 and '109 Patents, discloses scaling (i.e., resizing) user's images that are captured as real-time video images by the camera so that each of the scaled video images appear to emulate "a traditional life-size mirror image." Ex. 1006 (Rosenberg) at [0077]. A POSITA would have understood that resizing an image would make the image appear to be captured by the camera at a different distance, thereby creating a virtual point of view corresponding to the different distance.

Rosenberg discloses "left-right inversion" and "scaling" that one skilled would have understood as meeting the three-part construction

Dr. Karam's Deposition: Opinions Are Consistent with Three-Part Construction

Page 192

1 Q. Is your testimony that the plain
2 and ordinary meaning of mirror tracking mode
3 is a mode of operation in which the user sees
4 the reversed reflection appearing at roughly
5 double the distance from the camera and the
6 reflection maintains roughly the same size
7 regardless of user movement?

8 MS. WELSH: Objection, form.

9 A. I want to say that in -- for
10 these claim elements, the prior art we --
11 I refer to or relied on in my declaration,
12 they do disclose a mirror tracking mode having
13 these characteristics.

14 There is other -- in addition to
15 also disclosing -- there are other, like prior
16 art also, they do disclose that, like in
17 certain embodiments, in addition to disclosing
18 something else

19 But what I provide in my
20 declaration for grounds and prior art
21 embodiments do disclose these characteristics,
22 especially when we talk about conventional
23 mirror, traditional mirror

IPR2024-00810: Karam Tr. (Ex. 2012), 192:1-23.

2 Q. And is your answer the same for
3 the construction of mirror tracking mode for
4 the '110 patent?

5 MS. WELSH: Objection.

6 A. Mirror tracking mode, when I
7 opined on my declaration, it depends how
8 tolerant you want to be in terms of perceiving
9 a mirror and the quality and the user
10 experience

11 When we build the system, we're
12 doing an approximation. And actually, the
13 court construction said "roughly" and
14 "approximately."

15 So you have to know approximate.
16 As engineer, we have tolerance. Certain
17 applications we tolerate more, for others we
18 don't tolerate

19 So it depends on the fidelity you
20 want to achieve. But it's still consistent
21 with the district court construction.

IPR2024-00810: Karam Tr. (Ex. 2012), 259:2-21.

Dr. Forsyth: Rosenberg “Teaches Away”

Dr. Forsyth

111. Additionally, a POSITA would not have been motivated to combine Rosenberg and Park because Rosenberg teaches away from having a user's image appear at roughly the same size regardless of the user's distance to the camera (Ex. 1006, ¶ 0039) and because Park, at most, only discloses basic image inversion and does not disclose the user appearing at roughly double the distance to the camera nor appearing at roughly the same size regardless of user movement.

on hindsight bias. Although these optical properties of conventional mirrors likely have been known for millennia, it is my opinion that a POSITA reading Rosenberg and Park would not have considered the relative importance of including these optical properties beyond simple inversion. This is because Rosenberg teaches away from incorporating the optical property of having a user's image appear at roughly the same size regardless of the user's distance to the camera (Ex. 1006, ¶ 0039) and Park does not disclose it at all. Therefore, in my opinion a purported combination of

Rosenberg

[0039] 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

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.

IPR2024-00810: Petitioners' Reply (Paper 32), 19; Forsyth Decl. (Ex. 2013), ¶¶ 103-106, 111-112;
IPR2024-00810: Patent Owner's Sur-reply (Paper 37), 17; Rosenberg (Ex. 1006), [0039], [0081], [0087], [0091], [0101];
IPR2024-00810: Petitioner's Opposition to Motion to Strike (Paper 45), 1-10.

Dr. Karam's Reply Declaration Responds to Dr. Forsyth's Testimony

“double the distance”

“reversed reflection”

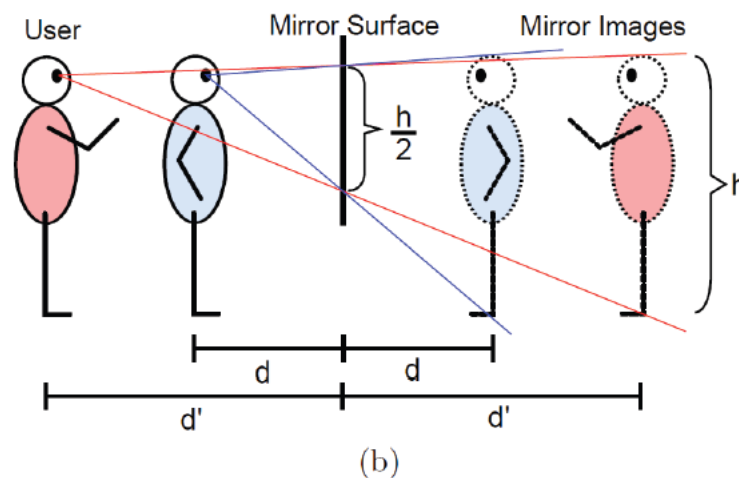
“same size”

13. Third, the '109 Patent explains that, when one looks at a mirror, one's image appears to be reversed left and right, but not top and bottom. '109 Patent (Ex. 1021), 2:33-40. This mirror effect was also well known to a person of ordinary skill in the art, and left-right inversion was performed on camera-captured images to mimic mirror reflections. For example, *Rosenberg* discloses inverting left-right camera-captured images by flipping the image pixels around a vertical axis so that the right side of the user appears on the right side of the display, and the left side of the user appears on the left side of the display (from the user's perspective). *Rosenberg* (Ex. 1006), [0003], [0025]-[0027], [0035], [0041], [0061], [0077],

Patent. For example, *Straka* (Ex. 1037), which was published in the 2011 Scandinavian Conference on Image Analysis (SCIA 2011), explains:

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 h of the user.

Straka (Ex. 1037), 637. *Straka* illustrates this effect in Figure 1(b) below:



Dr. Karam's Reply Declaration Responds to Dr. Forsyth's Testimony

mimic mirror reflections. For example, *Rosenberg* discloses inverting left-right camera-captured images by flipping the image pixels around a vertical axis so that the right side of the user appears on the right side of the display, and the left side of the user appears on the left side of the display (from the user's perspective).

Rosenberg (Ex. 1006) [0003], [0025]-[0027], [0035], [0041], [0061], [0077],

**Rosenberg discloses
“reversed reflection”**

**Rosenberg discloses “double
the distance” and “same size”**

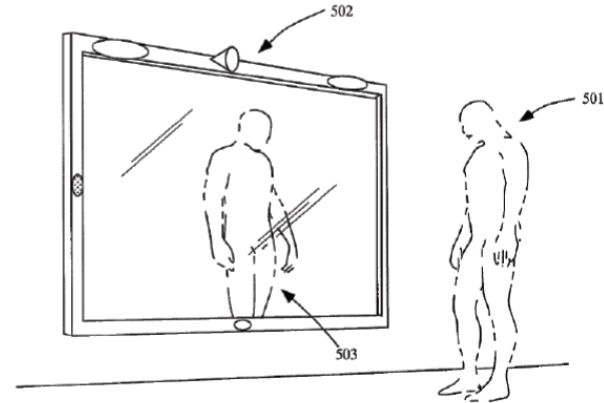


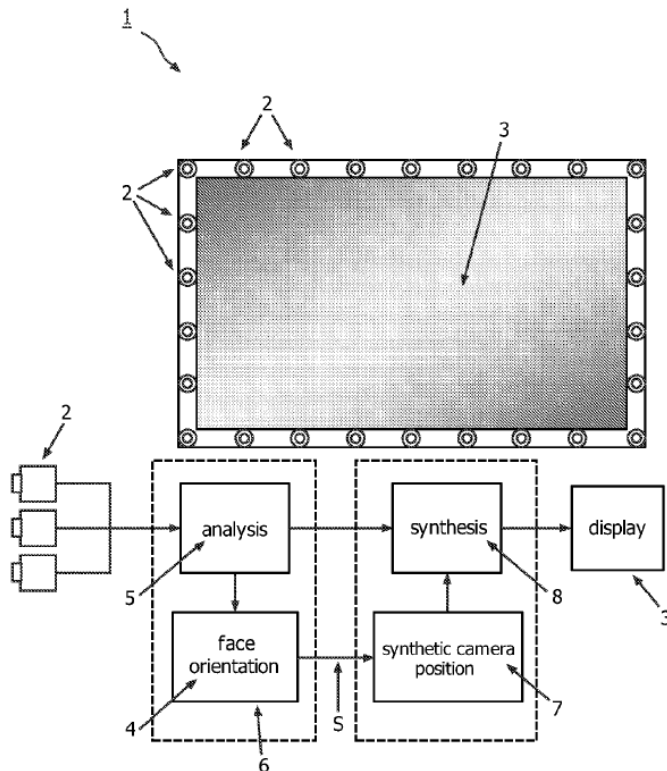
Fig. 5

Rosenberg (Ex. 1006), Fig. 5, [0077].

14. Thus, a POSITA would understand that when a prior art reference talks about a digital mirror emulating a traditional mirror or a conventional mirror, it would have the properties of a conventional mirror, such as reversed reflection, appearing at roughly double the distance, and maintaining roughly the same size regardless of the user movement.

“Mirror Tracking Mode” Limitation 1[f]: Haan/Francois

- Haan discloses a dual mode digital mirror that transitions between a reflective mode and a display mode that displays a mirror image



[0080] In all embodiments wherein the mirror device switches between a reflective mode and a transparent mode smooth transitions between reflective mode and display mode are preferred embodiments.

[0081] A smooth transition can for instance be accomplished by a fade-over, i.e. a gradual change of one mode to another.

[0082] One such fade-over would be, in embodiments wherein a switchable reflective layer is used to switch the reflective layer from the first, reflective state, to the second, transparent state gradually, for instance in a range of angles $x-\Delta$ to $x+\Delta$ where x stands for the angle of orientation or the distance at which the mirror device changes from reflective mode to display mode, and Δ stands for a relatively small range around the transition values.

[0090] The device has three modes and a means to set the device for instance manually (or for instance by means of remote control) to any of three modes:

[0091] a simple display mode to display a movie or television program for instance

[0092] a simple reflective mode, to act as a mirror

[0093] a dual mode, reflective within a range of angles and/or positions, displaying an exaggerated angle when the head or body is turned.

Haan Discloses “Mapping Transformation” in “Mirror Tracking Mode”

- Haan discloses performing rotation and resizing transformations if the user is “within a range of angles and/or positions” (“mirror tracking mode”)
 - Haan’s rotation transformation is based on face orientation and changes imaging perspective; Haan’s resizing transformation is based on user distance
 - Haan’s transformations apply parametric input (signal S indicative of e.g., face orientation, distance)

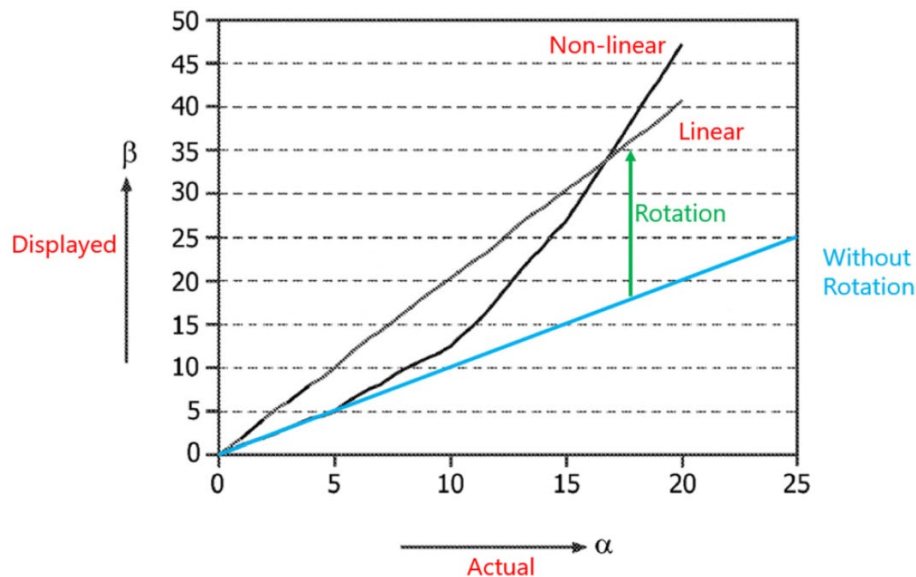


FIG. 6

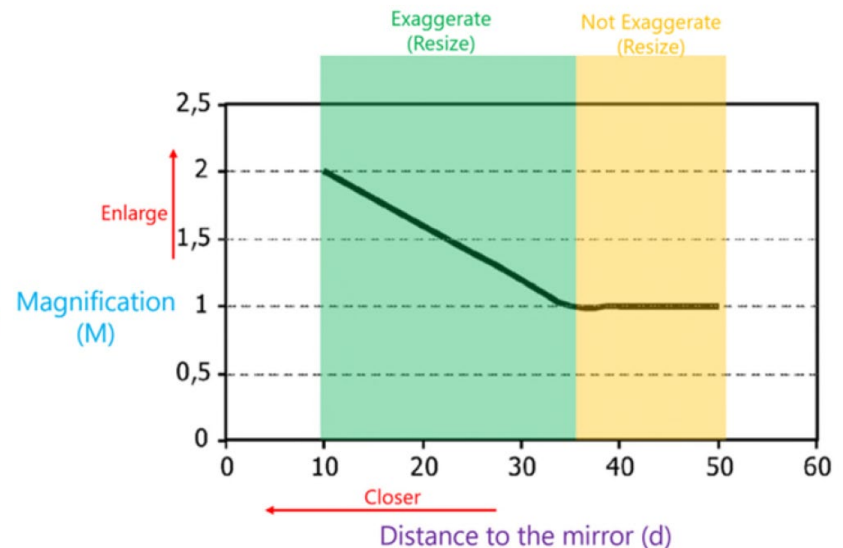


FIG. 8

“Different Point of View” (Limitations 1[c], 1[e])

- “Different Point of View” limitations are obvious over three combinations
 - Rosenberg and Park
 - Haan and Francois
 - Geisner and Lizee

“Different Point of View”: Rosenberg and Park

- Rosenberg’s scaling and zooming transformations change an image’s magnification so that the image appears to be captured at a different distance

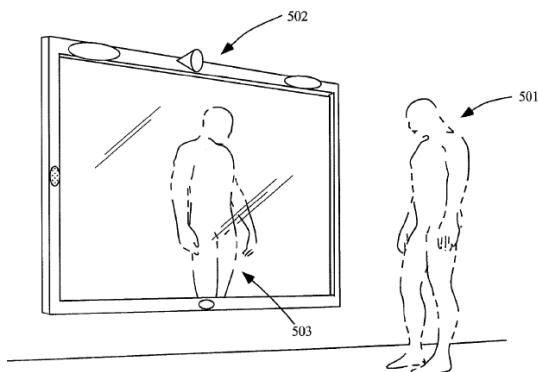


Fig. 5

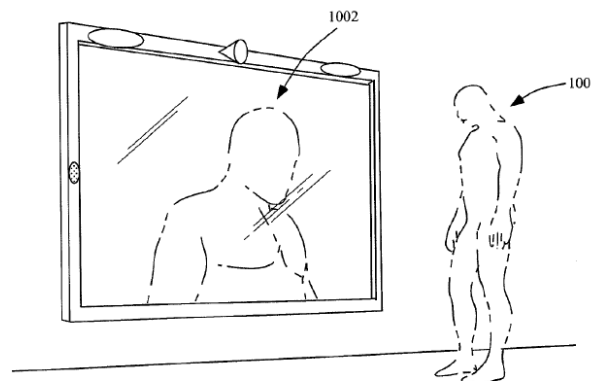


Fig. 10

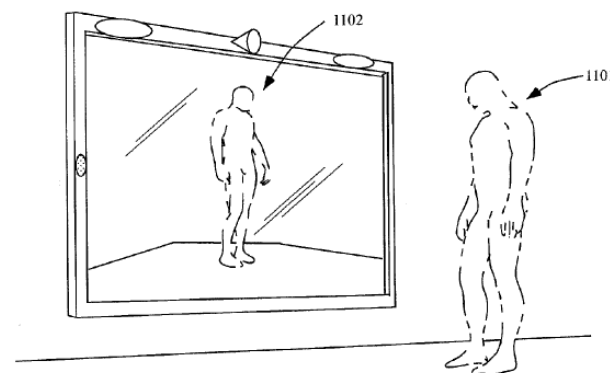


Fig. 11

IPR2024-00810: Petition (Paper 1), 58-64; Rosenberg (Ex. 1006), FIGS. 5, 10, 11, [0050], [0077], [0100];
IPR2024-00810: Karam Decl. (Ex. 1003), ¶¶253-257, 262-268; *see id.*, ¶¶65-67.

“Different Point of View”: Rosenberg and Park

- Park’s compensation corrects the perspective distortion in the image so that the modified image appears to be captured at a different angle

FIG. 5

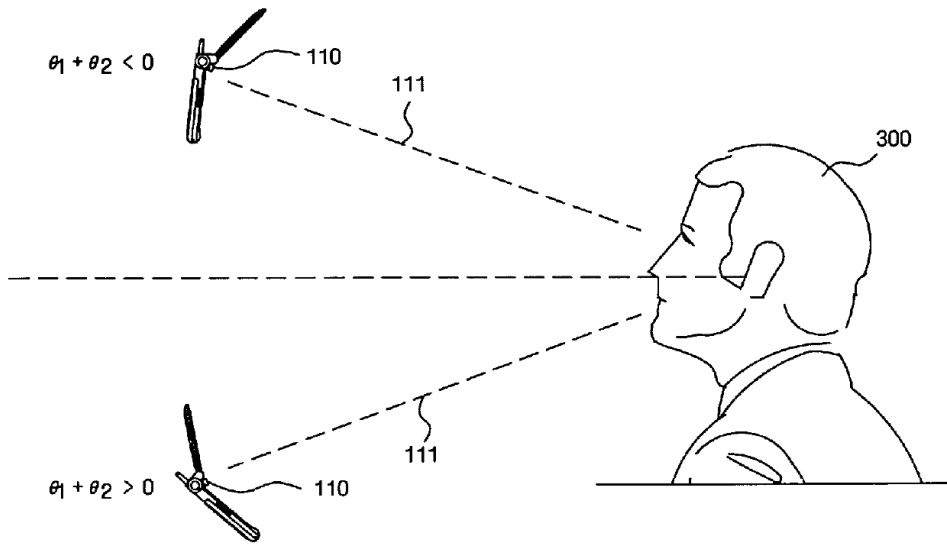


FIG. 6A

BEFORE COMPENSATION

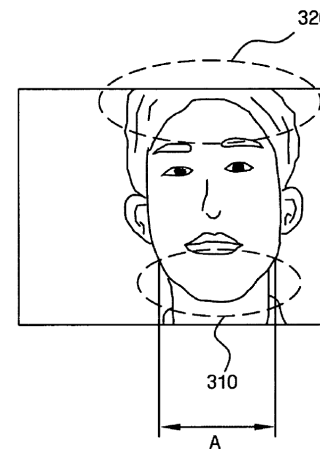
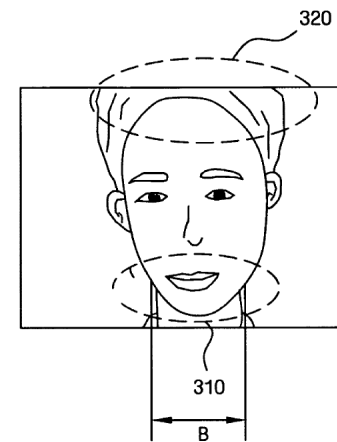


FIG. 6B

AFTER COMPENSATION



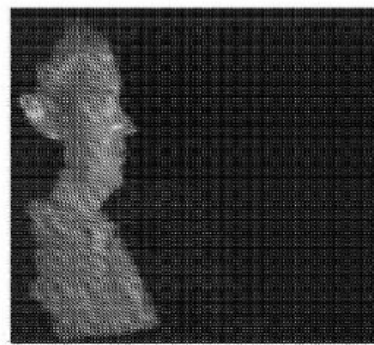
IPR2024-00810: Petition (Paper 1), 58-64; Park (Ex. 1011), FIGS. 6A-8, [0026]-[0028], [0050]-[0051], [0059]-[0061], [0075];
IPR2024-00810: Karam Decl. (Ex. 1003), ¶¶253-257, 262-268; *see id.*, ¶¶65-67.

“Different Point of View”: Haan and Francois

- Haan’s transformations generate images that appear to be captured from a different point of view:
 - Haan’s rotation transformation rotates the viewpoint so that the displayed image appears to be taken from a different angle than the actual camera position
 - Haan’s resizing transformation changes an image’s magnification so that the image appears to be taken at a different distance than the actual distance from the camera to the viewer



from an actual point of view (normal mirror)



from a virtual (different) point of view

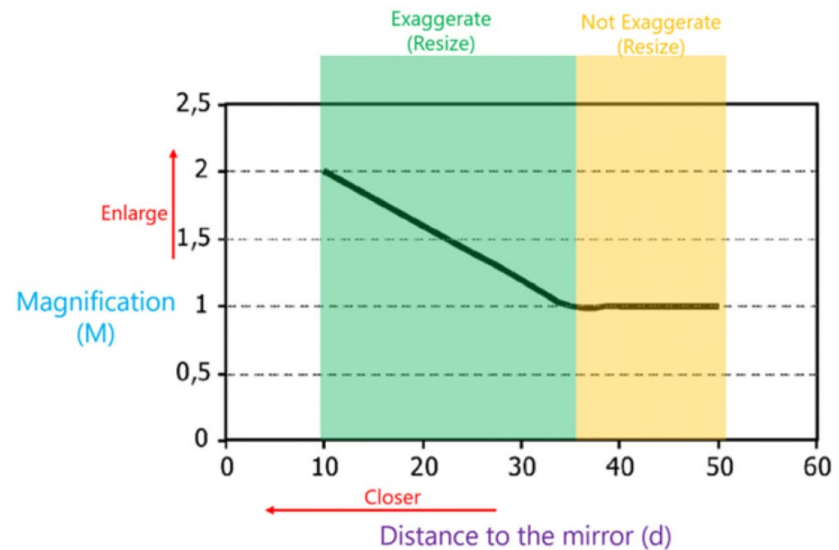


FIG. 8

IPR2024-00810: Petition (Paper 1), 35-44; Haan (Ex. 1005), FIGS. 3, 6, 8 (annotated), [0014], [0027]-[0015], [0058]-[0064], [0070]-[0076], [0097]; IPR2024-00810: Karam Decl. (Ex. 1003), ¶¶172-187, 191-204.