

Exhibit 1

**IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION**

EYESMATCH LTD.,

Plaintiff,

v.

SAMSUNG ELECTRONICS CO., LTD.,
SAMSUNG ELECTRONICS AMERICA, INC.,
and SAMSUNG RESEARCH AMERICA, INC.,

Defendants.

Case No. 2:23-cv-00363-JRG-RSP

**DECLARATION OF HARLEY R. MYLER, PH.D.
REGARDING CLAIM CONSTRUCTION**

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I. INTRODUCTION AND ENGAGEMENT

1. I have been retained as a technical expert in the above-captioned cases by Defendants Samsung Electronics Co., Ltd. (“SEC”), Samsung Electronics America, Inc. (“SEA”), and Samsung Research America, Inc. (“SRA”) (collectively, “Defendants” or “Samsung”). I understand that EyesMatch Ltd. (“Plaintiff” or “EyesMatch”) asserts that Samsung infringes certain claims of U.S. Patent No. 8,982,109 (the “’109 Patent”) and U.S. Patent No. 8,982,110 (the “’110 Patent”) (collectively, the “Asserted Patents”).

2. I have been asked to analyze and provide opinions on the scope and meaning that a person of ordinary skill in the art (“POSITA”) would have given to certain terms and phrases in the claims of the Asserted Patents at the time of the alleged invention, a process that is referred to as claim construction.

3. In rendering my opinions, I have reviewed the claims and specifications¹ of the Asserted Patents, the prosecution histories of the Asserted Patents, EyesMatch’s P.R. 3-1 Infringement Contentions, and Samsung’s and EyesMatch’s P.R. 4-2 Preliminary Claim Constructions. My opinions are based on my years of education, training, teaching, and experience in the relevant art.

4. I am being compensated at a rate of \$450 per hour for my work on this case. My compensation is not dependent upon my opinions or testimony, or the outcome of this case.

II. BACKGROUND AND QUALIFICATIONS

5. I am presently an *Emeritus Professor*, and I was previously the Chair of the Electrical Engineering Department, now the Department of Electrical & Computer Engineering at Lamar University in Beaumont, Texas. At Lamar, I am the inaugural holder of the William B. and

¹ Including Provisional Application Nos. 61/892,368; 61/862,025; 61/738,957; 60/656,884; and 60/656,885.

Mary G. Mitchel Endowed Chair in Telecommunications and I have held this position since August 2001.

6. I received a B.S. in Chemistry and Electrical Engineering from the Virginia Military Institute in 1975. I received M.S. and Ph.D. degrees in Electrical & Computer Engineering from New Mexico State University (NMSU) in 1981 and 1985, respectively. My Ph.D. training was in digital signal processing to include image processing and, more specifically, communications and control. During my graduate studies at NMSU, the work on my doctorate was performed at the Physical Sciences Laboratory in a government-classified area known as the NMSU Image Processing Laboratory. This lab was equipped with one of the first disk drives (1983) to enable digital video processing, and my dissertation involved an intelligent imaging tracker that utilized this technology and was an early application of *Artificial Intelligence*. My experience with digital media and video, as well as machine intelligence, spans over forty years.

7. My industry experience includes working as a Digital Systems Engineer at General Instrument Corporation, as a Digital Systems Engineer at Space Communications Company, and as a Staff Engineer at Martin Marietta Orlando Aerospace (now Lockheed Martin). I was also the President and Chief Engineer at I-Math Associates, where I supervised projects involving image and video processing for military applications. My work at Martin Marietta and at I-Math Associates involved digital video algorithm development in connection with contracts for the US Government. I have also consulted for the following companies: The Center for Occupational Research and Development (Waco, TX); Frontier Technologies, Inc. (Orlando, FL); The American Academy of Ophthalmology (San Francisco, CA); McDonnell-Douglas Aerospace Co. (St. Louis, MO); Martin-Marietta Orlando Aerospace n/k/a Lockheed Martin (Orlando, FL and Denver, CO);

Autonomous Technologies, Inc. (Orlando, FL); National Instruments (Austin, TX); Analog Devices (Norwood, MA); and Quantronix, Inc. (Farmington, UT).

8. My academic experience includes the following positions at the University of Central Florida: Assistant Professor of Electrical Engineering (September 1986–August 1991); Associate Professor of Electrical Engineering (September 1991–August 1997); and Professor of Electrical Engineering (September 1997–August 2001).

9. I have taught courses in digital telecommunications and control, machine intelligence, image and signal processing and computer programming at both UCF and Lamar University.

10. I am the author or co-author of numerous peer-reviewed scientific publications on signal processing, image processing, digital systems, digital telecommunications systems and machine intelligence.

11. I am the named inventor on four issued patents, U.S. Patent No. 5,094,521, entitled *Apparatus for Evaluating Eye Alignment*, U.S. Patent No. 6,577,764, entitled *Method for Measuring and Analyzing Digital Video Quality*, U.S. Patent No. 8,581,744 entitled *Traffic Information Warning Systems and Methods*, and U.S. Patent No. 8,963,738 entitled *Vehicle Information Systems and Methods*.

12. I am a Life Senior Member of the Institute of Electrical and Electronics Engineers (IEEE) and served as the Chair of the Beaumont Section from 2002 to 2006 and East Area Chair of Region V from 2006 to 2007.

13. I am a registered Professional Engineer (retired) in electrical engineering in the States of Texas (Lic#94458) and Florida (Lic#94001152) and have taught courses related to professional development that include the use of standards in engineering practice.

14. A number of my publications, presentations, doctoral dissertations and master's theses supervised pertained to or involved image processing, which feature in the patent claims, see Table 1 below for selected examples.

Table 1

Weeks, A. R., Sartor, L. J. and Myler, H. R., "Histogram specification of 24-bit color images in the color difference (C-Y) color space," Journal of Electronic Imaging, Volume 8, Issue 3, July 1999, pp. 290-300.

Weeks, A.R., Myler, H. R., and Emery, J.D., "Nonlinear Image Transformations Implemented with Spatial Light Modulators," Optical Engineering, 33:3, 1994.

Myler, H. R. and Gilson, R.D., "Taxonomic Selection of Computer-Driven Visual Display Systems," Computer Standards and Interfaces, 12, 1991.

Myler, H. R., Jolson, A.S. and Weeks, A.R., "Automated Evaluation of Ocular Deviation," Binocular Vision, 6:3, 1991.

Voicu, L. I., Patton, R. and Myler, H. R., "Multi-criterion vehicle pose estimation for SAR-ATR," Proc. SPIE Vol. 3721, p. 497-506, Algorithms for Synthetic Aperture Radar Imagery VI, Orlando, April 1999.

Rabadi, W. A., Myler, H. R., "Image reconstruction using wavelets," Proc. SPIE Vol. 2751, p. 153-158, Hybrid Image and Signal Processing V, June 1996.

Yoo, H. J., Crevier, D., Lepage, R., Myler, H. R., "Line drawing extraction from gray level images by feature integration," Proc. SPIE Vol. 2353, p. 96-107, Intelligent Robots and Computer Vision XIII: Algorithms and Computer Vision, October 1994.

Rabadi, W., Myler, H. R. and Weeks, A.R., "Large-Scale Image Transforms on a Hypercube Supercomputer," Proceedings of the Second Congress of the Network of Arab Scientists and Technologists Abroad, Amman, Jordan, July 1994.

Myler, H. R., Weeks, A.R. and Yoo, H. J., "Grayscale Image Preprocessing for Viewpoint Independent 3-D Extraction of Objects," Proceedings of the SPIE International Symposium on Optics, Imaging and Instrumentation, San Diego, 1994.

Myler, H. R., "Machine Vision Analysis of Human Eye Movements," Proceedings of the 20th Annual Pittsburgh Conference on Modeling and Simulation, May 1989.

15. Additionally, I have written textbooks on computer programming, *Fundamentals of Engineering Programming with C and Fortran* and *Computer Imaging Recipes in C*, both of which relate to the computer programming aspects of the patents at issue. My book *The Pocket Handbook of Image Processing Algorithms in C* is one of the most popular and widely distributed handbooks that describe image processing algorithms. In that book, published in 1993, are many of the geometric imaging algorithms pertinent to this case such as: Flipping, Morphing, Rotating, Warping and Zooming.

16. Additional details about my employment history, fields of expertise, awards, publications, and other activities are further included in my curriculum vitae (which is attached to this report as Exhibit A).

III. LEGAL PRINCIPLES

17. For purposes of my opinion, I have applied legal principles that have been provided to me, which I summarize below.

A. Claim Construction

18. Terms in a patent claim are generally given the ordinary and customary meaning that a person of skill in the art (“POSITA”), at the time of the invention, would understand them to have.

19. The meaning of a claim term as would have been understood to a POSITA is obtained by consideration of the intrinsic evidence of the patent (i.e., patent claim language, specification, and prosecution history). The ordinary meaning of a claim term is its meaning to a POSITA after reading the entire patent, including the claim having the term to be construed and other claims, as well as the specification. The ordinary and customary meaning of a term in a claim is sometimes readily apparent to a POSITA.

20. The claims themselves provide substantial guidance as to the meaning of a term. In particular, the meaning of a term can be understood based on the context in which the term appears in a claim. Since claim terms are usually used consistently throughout the patent, the use of a term in one claim can often inform the meaning of the same term in other claims.

21. The specification is often the best guide to the meaning of a term. However, the scope of a claim generally should not be limited to the examples or embodiments that appear in the patent's specification, even when the specification describes very specific embodiments or only one embodiment.

22. The prosecution history can also provide guidance as to the meaning of a term in a claim because it may demonstrate the interpretation that should be given certain terms and phrases in a claim. The scope of a claim can also be limited if there is clear and unmistakable disclaimer of a feature in the specification and/or the prosecution history.

23. Extrinsic evidence, such as dictionaries and scientific treatises, can be useful in claim construction when considered with the intrinsic evidence. However, such extrinsic evidence should not depart from the plain and ordinary meanings of a term as would be understood based on the intrinsic evidence.

24. I understand that in general, a term or phrase found in the introductory words of the claim, the preamble of the claim, should be construed as a limitation if it recites essential structure or steps, or is necessary to give life, meaning, and vitality to the claim. Conversely, a preamble term or phrase is not limiting where a patentee defines a structurally complete invention in the claim body and uses the preamble only to state a purpose or intended use for the invention. In making this distinction, one should review the entire patent to gain an understanding of what the inventors claimed they actually invented and intended to encompass by the claims.

25. I understand that the language in the preamble limits scope (i) if dependence on a preamble phrase for antecedent basis indicates a reliance on both the preamble and claim body to define the claimed invention; (ii) if reference to the preamble is necessary to understand limitations or terms in the claim body; or (iii) if the preamble recites additional structure or steps than the specification identifies as important.

26. I have been informed that a patent may disclaim or disavow an embodiment disclosed in the specification from the scope of the claims when such disclaimer is clear and deliberate, such that the disclaimer is unambiguous. A specific example of claim scope disavowal occurs when the specification includes repeated derogatory statements about an embodiment such that it may reasonably be considered a disavowal.

B. Indefiniteness

27. I have been informed that the claims of a patent must particularly point out and distinctly claim the subject matter of the patented invention. A claim is indefinite if, in view of the patent specification and prosecution history, it does not reasonably inform a POSITA of the scope of the invention with reasonable certainty. The degree of precision necessary for adequate claims depends on the nature of the subject matter.

28. I understand that the issue of indefiniteness applies to the overall claim rather than to particular claim terms in isolation. That is, the question in an indefiniteness inquiry is whether the claims as a whole, not particular claim terms, read in light of the specification delineating the patent and the prosecution history fail to inform with reasonable certainty those skilled in the art about the scope of the invention.

IV. LEVEL OF ORDINARY SKILL IN THE ART

29. In my opinion, a POSITA would have a bachelor's degree in electrical or computer engineering, or a related field such as computer science, and two years of work experience with image capture and processing systems or related fields. A person with less and/or different education, but more relevant practical experience, or vice versa, may also meet this standard. The prior art also evidences such level of skill.

V. OVERVIEW OF THE ASSERTED PATENTS

A. Priority Date

30. I understand that the priority date for both of the Asserted Patents is December 18, 2012, as both of the Asserted Patents claim priority to a December 18, 2012 provisional application and the claims appear to rely on disclosures made no earlier than this date. While the Asserted Patents also claim priority to other earlier applications, these earlier applications do not support several limitations, including “transformation mapping” (or “mapping transformation”), which is recited in claim 1 for both of the Asserted Patents. The earliest priority date is therefore December 18, 2012. Furthermore, EyesMatch has admitted in its infringement contentions that the priority date of the Asserted Patents is December 18, 2012. Exhibit B² at 5. Based on the information I have reviewed to date my analysis would not change based on the potential alternative priority dates of the Asserted Patents ranging from around March 2006 to August 2013 for the '110 Patent.

B. The '109 Patent

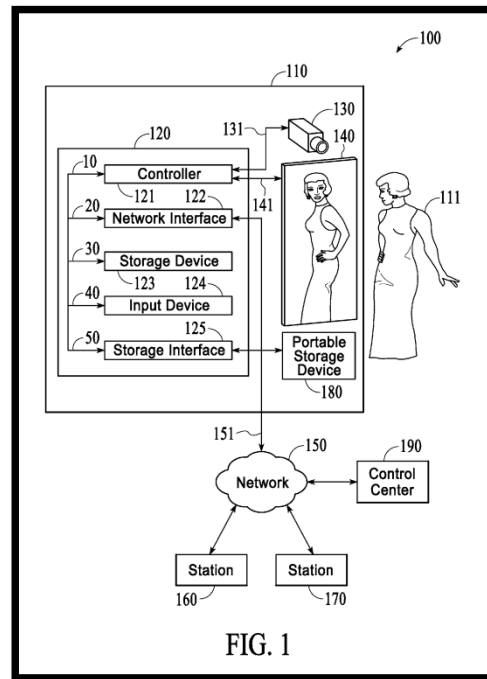
31. The '109 Patent, titled “Devices, systems and methods of capturing and displaying appearances,” generally relates to “imaging and display systems and, more particularly, to monitors, and interactive displays” and discloses methods for causing a computerized flat panel display system to behave similarly to a mirror. *See* '109 Patent at 1:26-31. More particularly, the

² Cover Letter (to SEC) from Plaintiff EyesMatch Ltd.'s Disclosure of Asserted Claims and Infringement Contentions in EyesMatch Ltd. v. Samsung Electronics America, Inc., No. 2:23-cv-00363-JRG-RSP (E.D. Tex.).

claims of the '109 Patent relate to a method for operating a system comprising a monitor, camera, and processor, “so as to display a mirror-mimicking image on the monitor.” *Id.* at claim 1. According to the method recited by the claims of the '109 Patent, a camera captures live images of a user, which undergo digital image processing by a processor and are subsequently displayed on a digital screen, which is supposed to replace a conventional mirror. *See, e.g., id.* at 1:63-2:3, 15:41-45, 15:47-51.

32. According to the Background section of the '109 Patent “[t]he conventional mirror (i.e., reflective surface) is the common and most reliable tool for an individual to explore actual self-appearance.” '109 Patent 1: 61:63. The Background section further purports that prior art alternatives to a mirror use a “combination of a camera and a screen.” *Id.* at 63-65. But according to the patent “these techniques are not convincing and are not accepted as a reliable image ... mainly because the image generated by a camera is very different from an image generated by a mirror. *Id.* at 1:65-2:3. According to the '109 Patent, the combination is not convincing as a mirror for several reasons including that the user does not see himself at twice the distance to the camera, as he would in a mirror. *Id.* 2: 7-8. Moreover, the camera and screen does not increase the angle of the Field of View (FOV) as when a user approaches a mirror. *Id.* at 10-22. Other differences include a mirror reversing the image and maintaining the reflection of a user’s eye on the same virtual line. *See, e.g., id.* 2:28-54.

33. According to the '109 Patent the embodiments described provide “appearance comparison” using “a mirror-display device” (LCD), “imaging device” (video camera), and “image control unit.” *See, e.g., id.* at 5:20-60; 6:33-57; 7:32-43; 18:27-32; 23:11-14; Fig. 1.



Id. at Fig. 1.

34. The camera can be above the display tilted downwards. *Id.* at 15:26-31. For “appearance comparison,” the mirror-display device “operate[s] selectably in two modes”: (i) a “mirror mode” that displays images “in real time” or (ii) a “display mode” that displays already-captured images. *Id.* at 3:48-57; 5:61-6:32; 9:33-63; 12:62-14:5; 28:5-37; Fig. 4.

35. The ’109 Patent describes that the virtual mirror system that implements a computer method that receives, as input, an image captured by a camera and “performs a transformation of the image to correct the point of view and field of view of the camera to fit with the view point that would occur with a conventional mirror.” *Id.* at 15:48-52.

C. The ’110 Patent

36. The ’110 Patent, titled “Method for image transformation, augmented reality, and telepresence” [*sic*] relates to “imaging and display systems and, more particularly, to monitors, and interactive displays.” *See* ’110 Patent at 1:43-45. The Background section of the ’110 Patent

explains that the '110 Patent incorporates by reference the disclosure of the '109 Patent (U.S. Patent App. Ser. No. 13/843,001 to the same inventors, which issued into the '109 Patent, is incorporated by reference). *See* '110 Patent at 1:65-2:2.

37. The claims of the '110 Patent relate to a computerized method for operating a virtual display system comprising a camera, a display monitor, and a processor. *Id.* at claim 1. The method recited in claim 1 of the '110 Patent includes detecting, via the processor, a user's presence in a stream of images captured by the camera, and "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." *Id.*

38. The '110 Patent further describes that it relates to interactive virtual mirrors used in retail, service, medical, and home environments for shopping, "video conferencing, gaming and the like." *Id.* at 1:43-51. The '110 Patent describes a large range of use cases, including clothes fitting, virtual dressing, video conferencing over a network, remotely sharing outfits while shopping, and gaming with/without altered appearances. *Id.* at 7:31-55; 13:55-14:16; 23:8-9; 23:50-57; 29:56-63; 1:44-51; 8:16-26.

VI. CONSTRUCTION OF THE CLAIM TERMS

39. I have been informed that the parties have agreed that the preamble of claim 1 of the '109 Patent is limiting and I proceed with my analysis based on that understanding.

40. I provide my opinions below on the construction of the following claim terms, which I understand that the parties dispute. I reserve the right to modify my opinions in the event any new or additional information comes to my attention and if EyesMatch changes any of its constructions.

A. '109 and '110 Patents: “transformation mapping” (*also*, “mapping transformation”)

<i>Claim Term</i>	<i>Claims</i>	<i>EyesMatch’s Proposed Construction</i>	<i>Samsung’s Proposed Construction</i>
“transformation mapping” (<i>also</i> , “mapping transformation”)	'109 Patent: 1[c], 2, 3, 6, 7, 12, 13, 16 '110 Patent: 1[f], 2	A selected set of image transformations.	At least modifying the point of view (POV) and field of view (FOV) prior to displaying the image.

41. A person of ordinary skill in the art, in light of the specifications and claims of the '109 and '110 Patents, would understand the term “transformation mapping” (*also*, “mapping transformation”) to mean “at least modifying the point of view (POV) and field of view (FOV) prior to displaying the image.” The term “transformation mapping” appears within claims 1, 2, 3, 6, 7, 12, 13, and 16 of the '109 Patent, and the term “mapping transformation” appears with claims 1 and 2 of the '110 Patent.

42. As an initial matter, looking at the specifications of the '109 and '110 Patents, a POSITA would understand the terms “transformation mapping” and “mapping transformation” to be synonymous, as both patents use the terms interchangeably. *See, e.g.*, '109 Patent at 25:52-59 (using “*transformation mapping*” and “*mapping transformation*” interchangeably to describe a mechanism used to correct image distortions):

As can be understood, while some of the above embodiments relate to building the transformation mapping by registering images or other empirical methods, alternatively direct calculations of the distortion between camera and theoretical user point of view can be performed based on analytics. Using analytics voids the need for any registration procedure. Instead, analytical mapping transformation is created to correct for the distortions.

Id. at 25:52-59 (highlighting added)

43. The term “transformation mapping” appears within the following two limitations of claim 1 of the ’109 Patent: (i) “applying a transformation mapping to the image to modify the image such that it appears to mimic a reflection of a mirror” and (ii) “displaying the image on the monitor after performing the flipping, transformation mapping, and resizing.” Additionally, the term “transformation mapping” appears in claims 2, 3, 6, 7, 12, 13, and 16 of the ’109 Patent.

1. 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: obtaining a digital image from a camera; flipping the image about a vertical axis so as to reverse right and left sides of the image; applying a transformation mapping to the image to modify the image such that it appears to mimic a reflection of a mirror; resizing the image to reduce variations caused by changes in object’s distance to the camera; displaying the image on the monitor after performing the flipping, transformation mapping, and resizing; wherein the non-ordered steps are performed on a series of images of a live video feed from the camera; determining distance to a user appearing in the live video feed; and, varying rate at which the non-ordered steps are performed on the series of images according to the distance.

’109 Patent at claim 1 (highlighting added).

44. The term “mapping transformation” appears within the following limitation of claim 1 of the ’110 Patent: “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.”³ (emphasis added).⁴ Additionally, the term “mapping transformation” appears in claim 2 of the ’110 Patent.

³ Claim 1 of the ’110 Patent also recites the term “adaptive transformation mapping,” for which I offer my construction opinion in Section G of this declaration.

⁴ Unless otherwise noted, all emphases have been added.

1. A computerized method for operating a display system, the display system having a camera, a monitor, and a processor, the method comprising:

- operating the camera to generate a stream of images of the user;
- operating the processor to detect the presence of the user in the stream of images;
- 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,
- displaying the modified images on the monitor;

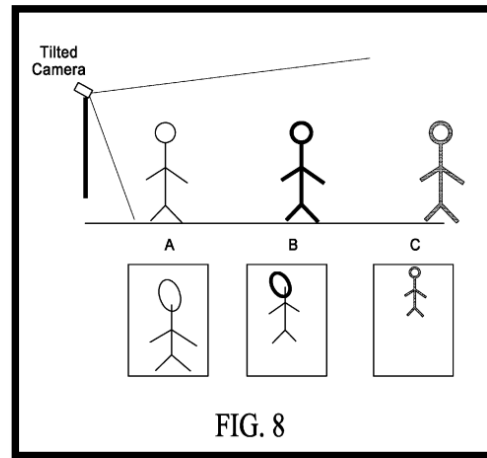
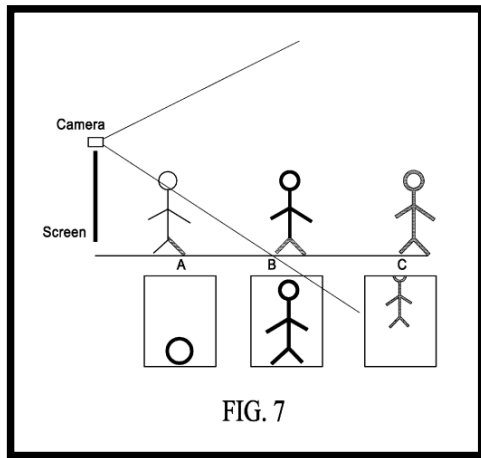
wherein the different point of view corresponds to an image taken from a different angle and a different distance than the actual images captured by the camera; and wherein during mirror tracking mode the processor utilizes the angle of the images captured by the camera and applies parametric input for a mapping transformation that changes imaging perspective of the images captured by the camera.

'110 Patent at claim 1 (highlighting added).

45. Based on the intrinsic evidence of the Asserted Patents, a POSITA would construe the terms “transformation mapping” and “mapping transformation” as “*at least modifying the point of view (POV) and field of view (FOV) prior to displaying the image.*” As explained below, this construction is directly supported by the specification of the '109 Patent (which is incorporated by reference into the '110 Patent) and the specification of the '110 Patent.

46. The specification of the '109 Patent explains the difficulties with trying to recreate a mirror image with a camera and a display. *See supra*, Section V.B, ¶¶31-34. These difficulties include a user not seeing himself at twice the distance to the display as would occur in a conventional mirror. *See, e.g.*, '109 Patent 2:4-10; Fig. 5A; Fig. 5B; *see also infra*, Section VI.B, ¶58. Similarly, with a conventional camera and display, the user image displayed is distorted as the user moves closer to or further away from the camera. *See, e.g.*, '109 Patent 15: 16-25; Fig 7; 15:30-40; Fig. 8 *see also infra*, Section VI.B, ¶¶59-61. For these reasons, a “transformation mapping” must at least modify the point of view and field of view prior to displaying an image that mimics a mirror. *See also*, '109 Patent 15:48-52 (“The computerized method receives as an

input the image captured by the camera and performs a transformation of the image to correct the point of view and field of view of the camera to fit with the view point that would occur with a conventional mirror”).



Id. at Figs 7 and 8.

47. The '109 Patent explains the need for at least a field of view and point of point of view modification for a transformation to mimic the reflection of a mirror:

Specifically, attempting to solve the virtual mirror problem by only flipping the image vertically as was proposed in the prior art is insufficient to create a mirror experience. When using a camera, once the user gets closer to the camera/screen the user's image becomes larger, and vice versa, as opposed to a conventional mirror where the user will always see himself roughly at the same size with a bit of a different FOV, regardless [of] his distance from the mirror. In addition, getting closer to the camera introduces image distortion that needs to be corrected in a much more advanced computerized method. Performing an adaptive POV and adaptive FOV prior to displaying the image on the screen results in an image that mimics the reflection of a mirror positioned at the location of the screen.

'109 Patent at 15:59-16:5. A POSITA would agree with this conclusion.

48. A POSITA would understand that a “transformation mapping” to mimic a mirror as described above applies to the purported invention of the '109 Patent and '110 Patent and not to a specific embodiment because the cited language above ('109 Patent at 15:59-16:5) is not made

in reference to a specific embodiment but to the generic problem of “[s]pecifically [] attempting to solve the virtual mirror problem[.]” *Id.* at 15:59-60.

49. Moreover, the ’109 Patent and ’110 Patent only disclose details for embodiments for systems with one or more cameras that are located on or around the perimeter of the display. *See, e.g., id.* at Fig. 7, Fig. 8. A POSITA would understand *all* such embodiments, regardless of variations and as supported by the specifications of the patents, would suffer from the described deficiencies of differing subject size and image distortion with subject movement. For example, for the embodiment of Figure 8 of the ’109 Patent, where a camera is located on top of the screen and tilted downward, a POSITA would understand that due to this placement of the camera, at least an elevation transformation and a tilt transformation—which amount to a POV modification—is required “to create a convincing eye-to-eye look experience.” *Id.* at 14:19-29; *see also id.* at claim 3 (“the transformation mapping comprises at least a tilt transformation and an elevation transformation.”). Thus, as supported by the patent specification, a POSITA would understand the need for at least a modification of point of view and field of view to mimic a mirror according to the invention.

50. The ’109 Patent also discloses an embodiment where a camera is behind the screen. *See id.* at Fig. 6. However, the ’109 Patent repeatedly disparages this embodiment as having severe difficulties that could only be overcome “in theory.” *See* ’109 Patent at 14:22-24. In reference to Figure 6, the patent states that “[i]n an ideal situation the camera would be able to move on a parallel plane behind the screen, in correspondence with the user’s eye location.” *Id.* at 16-18. However, the ’109 Patent and ’110 Patent fail to disclose this purported “ideal” embodiment in sufficient detail so that a POSITA could make and use this purported inventive embodiment where a camera moves in a parallel plane behind the screen in correspondence with

the user's eyes' location. Further, supporting the view that the inventors did not intend to claim the embodiment of Fig. 6, the patent states that "[in theory], it is possible to overcome this problem using a semitransparent screen or multiple pinholes with multiple cameras, though it may be too expensive and complex to implement." '109 Patent at 22-25. In other words, the inventors of the Asserted Patents state that the embodiment of Fig. 6 is only theoretical and not realistic. Additionally, Provisional Application No. 61/738,957, which provides the original priority for the language related to Fig. 6 of the '109 Patent, unequivocally describes the invention as the embodiments with one or more cameras on the periphery of the display:

In this invention we disclose a practical method to implement the ideal system described above with a fixed mounted camera/cameras located at the perimeter of the screen and facing the user. The main challenge is how to compensate the image distortion adaptively to create similar user experience as we would get in the ideal setup.

Provisional Application No. 61/738,957 at 5.

51. Perhaps for this reason, the '109 Patent and '110 Patent fail to disclose this purported "theor[etical]" and "ideal" embodiment in sufficient detail so that a POSITA could carry out this purported inventive embodiment using a display with pinholes with multiple cameras or a semitransparent screen so that a POSITA could make and use out this purported inventive embodiment.

52. For the reasons described above, it appears that the embodiment of Figure 6 was not intended to be claimed. However, even if it were determined that the embodiment described in Fig. 6 having one or more camera behind the screen is claimed, the proper construction for "transformation mapping" is still "at least modifying the point of view (POV) and field of view (FOV) prior to displaying the image." The embodiment of Fig. 6 undoubtedly requires a field of view modification because the displayed image of the subject needs to continue to appear at twice

the distance to the camera. *See, e.g., id.* at 14:29-32 (“[In reference to Fig. 6] [a]n adaptive FOV is required in order to compensate for the changes in the distances between the user and the screen, so that the user will see his image at the same size, just like in a mirror”). In addition, the ’109 Patent acknowledges that the embodiment of Figure 6 also has image distortion, although less than other embodiments. *See id.* at 4:19-21 (“FIG. 6 illustrates an embodiment having one camera or multiple cameras in a vertical array at the user’s eye-level, so as to obtain low image distortion.”). Image distortion in this context, is corrected to “mimic a mirror” by modifying to the point of view. The patent acknowledges that image distortion in the embodiment of Figure 6 can be corrected, for example, by image “stitching.” *See, e.g.,* ’109 Patent at 14:57-59 (“For example, for close distances, one embodiment may use an array of cameras and the image manipulator would use stitching to reduce image distortion”).

53. Moreover, in my opinion, for the single camera behind the screen embodiment of Figure 6, it would be impossible for the camera to move up and down in parallel behind the display to perfectly track the eyes of the subject without enduring an image distortion that would require a point of view modification to “mimic a mirror.” Therefore, all of the embodiments disclosed in the ’109 and ’110 patent require “at least modifying the point of view (POV) and field of view (FOV) prior to displaying the image.”

54. The ’109 patent acknowledges that “[i]n 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 the reflection of a mirror.” ’109 Patent at 24:4-8. The patent strongly suggests these are the minimum transformations to “mimic a mirror” because it follows by disclosing potential transformations “[f]or further improvement” such as a “barrel-effect transformation,” “fish-eye transformation,” “depth perception,” and “3D effects.” *Id.* at

24:7-16. As for the minimum transformations, they are merely examples of point of view transformations (tilt and elevation transformations) and field of view transformations (scale translations).

55. In addition, the express language of claim 1 of the '110 patent requires “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.”

56. In my opinion, requiring that the “transformation mapping” term include a modification of the point of view is not overly narrow. A modification to a point of view can include various specific techniques, for example, spatial translation and tilt transformation depending on the specific implementation.

57. Thus, based on the intrinsic evidence and for at least the reasons above with respect to the construction of “transformation mapping” is “at least modifying the point of view (POV) and field of view (FOV) prior to displaying the image.”

B. '109 Patent: “it appears to mimic a reflection of a mirror”

<i>Claim Term</i>	<i>Claims</i>	<i>EyesMatch’s Proposed Construction</i>	<i>Samsung’s Proposed Construction</i>
“it appears to mimic a reflection of a mirror”	'109 Patent: Claims 1[c], 13, 16	Appears to mimic the image that would have reflected from a mirror, i.e., from a reflective surface.	An image where the user sees their reversed reflection appearing at double the distance from the camera and the reflection maintains the same size regardless of the user movement.

58. A person of ordinary skill in the art, in light of the '109 Patent specification and claims, would understand the term “it appears to mimic a reflection of a mirror” to mean “an image

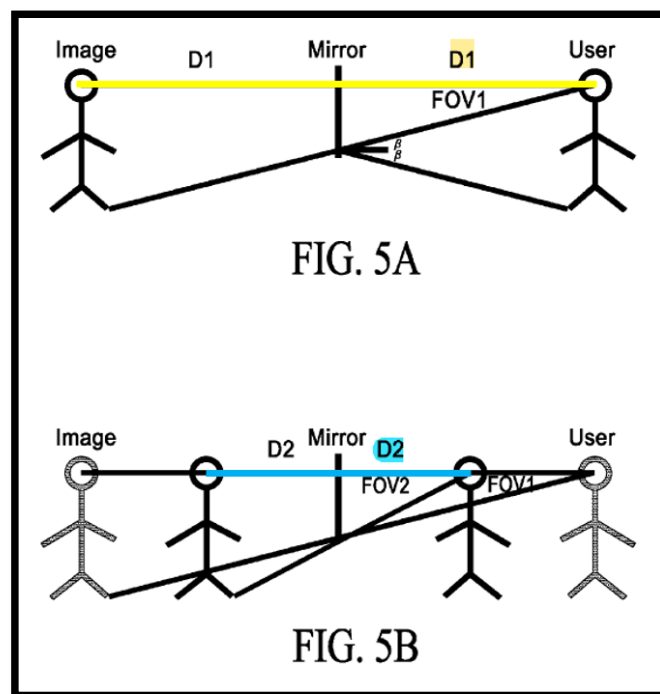
where the user sees their reversed reflection appearing at double the distance from the camera and the reflection maintains the same size regardless of the user movement.” This term appears in claim 1 of the ’109 Patent.

59. Samsung’s construction is consistent with the ’109 Patent specification. The ’109 Patent explains that when a user views himself in a conventional mirror, his reflection will be: (i) reversed, i.e., flipped or mirrored, (*id.* at 2:33-36); (ii) appearing at double the distance from the mirror (*id.* at 2:4-6), and (iii) appearing at the same size, regardless of the user’s distance from the mirror (*id.* at 2:20-23). The virtual mirror described in the ’109 Patent attempts to mimic these properties, in order to achieve displaying to the user “a reliable image . . . as if he was looking at himself in a conventional mirror.” *Id.* at 1:67-2:1. The ’109 Patent describes that images of virtual mirrors without the above-mentioned features do not convincingly or reliably mimic a conventional mirror. For example, the ’109 Patent distinguishes images generated by a camera indicating that they are “very different from an image generated by a mirror.” ’109 Patent at 1:65-2:3; *see also id.*, 15:59-61 (“only flipping the image vertically as was proposed in the prior is insufficient to create a mirror experience.”), 16:2-5 (“Performing an adaptive POV and adaptive FOV . . . results in an image that mimics a reflection of a mirror positioned at the location of the screen.”).

60. Taking the first part of Samsung’s construction, “an image where the user sees their reversed reflection,” this is described explicitly in the ’109 Patent specification. The ’109 Patent describes that one difference between a camera and a mirror is that “**when one looks at a mirror, one’s image appears to be reversed** (e.g., if one raises one’s right hand, his left hand will appear to go up in the mirror).” ’109 Patent at 2:33-36. As the ’109 Patent explains, to “effectively mimic a mirror reflection,” a necessary step is to cause the image “to be right-to-left reversed. *Id.* at 24:6-

7. Therefore, the virtual mirror system described in the '109 Patent performs “reversing, and/or mirroring the appearance captured by imaging device.” *Id.* at 10:12-13.

61. The second part of Samsung’s construction, an image “appearing at double the distance from the camera,” is also pulled directly from the '109 Patent specification. *Id.* at 2:4-6 (“what he actually sees is the reflection of himself as if he was standing at a **distance that is double the distance from him to the mirror**”). This phenomenon is illustrated in Figs. 5A and 5B of the '109 Patent. As shown in Fig. 5A (replicated below), a user standing at a distance **D1** from a conventional mirror will see himself (i.e., his reflected “image”) at a distance equal to twice of D1. *Id.* at Fig 5A; 2:7-8. Fig. 5B similarly shows that a user standing at a distance **D2** from a mirror will see himself at a distance equal to twice of D2. *Id.* at Fig 5B; 2:9-10.

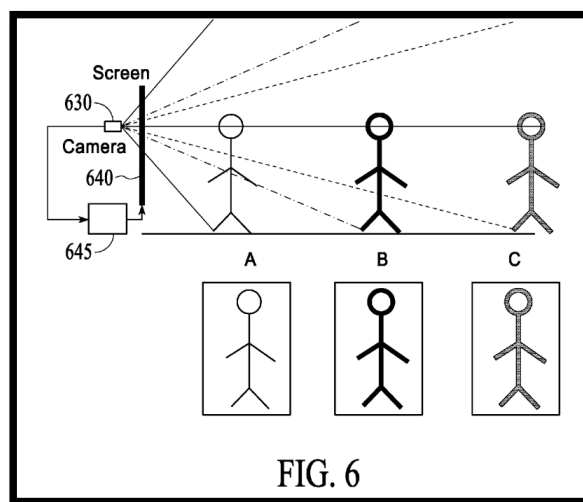


'109 Patent at Figs 5A-5B (annotations added).

62. Lastly, the '109 Patent describes that another important feature of a conventional mirror is that the user will see himself at approximately the same size in a conventional mirror,

regardless of the user's distance from the mirror. *Id.* at 14:29-32 (“An adaptive FOV is required in order to compensate for the changes in the distances between the user and the screen, ***so that the user will see his image at the same size, just like in a mirror***”); *see also id.* at 15:64-66 (“...a conventional mirror where the user will always see himself roughly ***at the same size with a bit of a different FOV, regardless of his distance from the mirror***”).

63. Conversely, and as the '109 Patent explains, “[w]hen using a camera, once the user gets closer to the camera/screen the user's image becomes larger, and vice versa, as opposed to a conventional mirror where the user will always see himself roughly at the same size with a bit of different FOV, regardless of his distance to the mirror.” *Id.* at 15:61-66. Fig. 6 of the '109 Patent illustrates a virtual mirror system in which images of a user are “***captured at different distances*** to the mirror, but ***showing the user's body at the same size by***, among others, manipulating the FOV.” *Id.* at 14:53-55. To replicate this conventional mirror effect, the '109 Patent describes that the virtual mirror system will use an “adaptive FOV” to “giv[e] the perception that the user sees a reflection at double the distance to the mirror, ***such that the entire body is visible even if the digital screen is smaller than the height of the user.***” *See* '109 Patent at 14:48-51.



Id. at Fig 6.

64. Thus, to “mimic a reflection of a mirror” as the claim requires, the virtual mirror in the ’109 Patent, must also implement this property of the reflection maintaining the same size regardless of the user movement closer or away from the mirror. The ’109 Patent highlights this important feature of conventional mirrors by contrasting conventional mirrors with cameras, and explains, that “[w]hen using a camera, once the user gets closer to the camera/screen the user's image becomes larger, and vice versa.” *Id.* at 15:61-32.

65. As I mentioned above, the ’109 Patent describes that by implementing the above-described effects in the virtual mirror system, an image that mimics the user’s reflection in a conventional mirror is displayed to the user. Accordingly, a POSITA, in view of the intrinsic evidence, would construe the term “it appears to mimic a reflection of a mirror” as “an image where the user sees their reversed reflection appearing at double the distance from the camera and the reflection maintains the same size regardless of the user movement.”

C. ’109 Patent: “determining distance to a user appearing in the [live video feed/image]”

<i>Claim Term</i>	<i>Claims</i>	<i>EyesMatch’s Proposed Construction</i>	<i>Samsung’s Proposed Construction</i>
“determining distance to a user appearing in the [live video feed/image]”	’109 Patent: Claims 1[g] (live video feed), 11 (image)	Plain and ordinary meaning as understood by a person of ordinary skill in the art.	Measuring the distance from the camera to the user.

66. A person of ordinary skill in the art, in light of the ’109 Patent specification, would understand the term “determining distance to a user appearing in the [live video feed/image]” to mean “measuring the distance from the camera to the user.” The ’109 Patent recites “determining distance to a user appearing in the live video feed” in claim 1 and “determining distance to a user appearing in the image” in claim 11.

67. In my opinion a POSITA would consider the “*distance*” in “*distance* to a user appearing in the *live video feed*” (as recited in claim 1) and “*distance* to a user appearing in *the image*” to be the same, given that both the “live video feed” and the “image” are captured by the camera. A POSITA would understand that the determined distance is between the camera (which captures the live video feed/image) and the user, and therefore, my construction for this term applies to both claims 1 and 11.

68. The ’109 Patent’s specification and claims describes exemplary techniques to compensate for the distance between the user and the virtual mirror’s camera, to enable the user to view a virtual user reflection. It would be clear to a POSITA that these techniques require measuring the distance between the camera and the user. For example, claim 1 of the ’109 Patent recites “resizing the image to reduce variations caused by changes *in object’s distance to the camera*.” *Id.* at claim 1. A POSITA would understand that this “object” (which otherwise lacks any antecedent basis in the claim) corresponds to “a user” as recited in the limitation “determining distance to *a user* appearing in the live video feed.” *See id.*

69. As another exemplary technique, the ’109 Patent’s specification further describes that “[a]n adaptive FOV is required in order to *compensate for the changes in the distances between the user and the screen*, so that the user will see his image at the same size, just like in a mirror.” *Id.* at 14:29-32. The specification further describes that “*once the user gets closer to the camera/screen* the user’s image becomes larger, and vice versa, as opposed to a conventional mirror where the user will always see himself roughly at the same size with a bit of a different FOV, regardless of his distance from the mirror.” *Id.* at 15:62-66. The specification also describes that “*getting closer to the camera* introduces image distortion that needs to be corrected.” *Id.* at 15:66-16:1.

70. As another example, the specification describes that “optimization on FOV to get the max resolution will be done based user [*sic*] distance from each camera.” See ’109 Patent at 16:60-62. An “image projection and scaling approach” is also described, in which “***based on user distance***,” a “projection transformation error ***between user/user-eyes and camera location*** is calculated or measured.” See ’109 Patent at 17:23-27. A POSITA would understand that measuring the distance from the camera to the user is necessary to compensate for changes in distance between the camera and the user, and to correct any subsequent distortions.

71. A POSITA would therefore understand, based on the intrinsic evidence of the ’109 Patent, that “determining distance to a user appearing in the live video feed” recited in claim 1 and “determining distance to a user appearing in the image” recited in claim 11 should be construed as “measuring the distance from the camera to the user.”

D. ’109 Patent: “varying rate at which the non-ordered steps are performed on the series of images”

<i>Claim Term</i>	<i>Claim</i>	<i>EyesMatch’s Proposed Construction</i>	<i>Samsung’s Proposed Construction</i>
“varying rate at which the non-ordered steps are performed on the series of images”	’109 Patent: claim 1[h]	Plain and ordinary meaning as understood by a person of ordinary skill in the art	Indefinite.

72. A person of ordinary skill in the art, in light of the ’109 Patent specification and claims, would understand the term “varying rate at which the non-ordered steps are performed on the series of images” to be indefinite. This term appears in claim 1 of the ’109 Patent, and as I explain below, this term is indefinite because a POSITA would not be able to determine the scope of the invention with reasonable certainty after reviewing the specification of the ’109 Patent.

73. As I describe in the next section of this declaration, the '109 Patent does not specify *which steps* of the numerous steps recited in the '109 Patent fall into the group of “*non-ordered steps*.” See *infra*, Section VI.E, ¶¶81-85. Therefore, it would be unclear to a POSITA which of the steps recited in claim 1 of the '109 Patent should be performed at a “varying rate.”

74. However, even if the POSITA would understand which steps comprise the “non-ordered steps,” a POSITA would not be able to determine *how many* of the non-ordered steps have to “vary [the] rate” for the limitation to be met. Because the claim term recites “non-ordered *steps*,” a POSITA would understand that the rate must “vary” for multiple steps. But is the limitation met if the rate is varied for only two of the non-ordered steps? Alternatively, does the rate have to “vary” for each and all of the “non-ordered steps” for the limitation to be met? A POSITA would not know the answers to these questions with reasonable certainty. Therefore, a POSITA would be unable to determine the scope of the limitation “varying rate at which the non-ordered steps are performed on the series of images” with reasonable certainty.

75. Finally, “rate” as it is used in “varying rate at which the non-ordered steps are performed on the series of images” is also ambiguous because a POSITA would not be able to ascertain the type or nature of the claimed “rate” based on the '109 Patent’s claims and specification. There are *various types of “rates”* that would be familiar to a person of ordinary skill in the art and that could correspond to the “rate” recited in claim 1 of the '109 Patent. Some examples include an image frame rate, a processing rate, or a processor clock rate (i.e., clock speed of a processor). However, a POSITA would be left uncertain about which type of rate is the claimed “varying rate” after reading the specification of the '109 Patent.

76. The only type of “rate” explicitly mentioned in the specification is a frame rate. '109 Patent at 20:30-32, 30:33-36. As the specification describes, the frame rate can be modified

or manipulated, and in one embodiment, the system is “manipulating the display in a higher frame rate [than the frame rate of the recorded video] so as to smooth the video.” *Id.* at 30:33-36. None of the steps comprising the recited “non-ordered steps,” i.e., at least steps 1[a]-1[e] (*see infra*, Section VI.E, ¶82), correspond to providing a smoothing effect to a video. Therefore, while this disclosure mentions that a frame rate is manipulated to provide a smoothing effect, a POSITA would not understand this as “varying [the] rate *at which the non-ordered steps are performed* on the series of images,” as recited in claim 1.

77. Similarly, the specification states “[t]he input can be optimized in size, bandwidth and rate to perform the required functionality.” ’109 Patent 18:43:44. However, this optimization of “rate” applies only to the “input” and not to the “non-ordered steps” of the claim. Moreover, a POSITA would not understand what type of “optimiz[ation]” to the input the specification is describing further making any connection between this statement in the specification and the “non-ordered steps” ambiguous and not helpful to determining the scope of the claim.

78. The specification also describes an example of a virtual mirror having an optional “frequency of transformation parameter update” feature (’109 Patent at 27:41-63); which may correspond to varying the rate of step 1[c] (“applying a transformation mapping to the image to modify the image such that it appears to mimic a reflection of a mirror”). However, the specification does not describe any other alleged non-ordered step with respect to this exemplary feature. This does not align with the plain language of “varying rate at which the non-ordered steps are performed on the series of images” which implies varying the rate of performance of “the non-ordered *steps*” (i.e., *multiple* non-ordered steps). No disclosure in the ’109 Patent provides a person with ordinary skill in the art any clarity surrounding this term.

79. For at least these reasons, the '109 Patent fails to provide reasonable certainty concerning the meaning of “varying rate at which the non-ordered steps are performed on the series of images.” Therefore, this term is indefinite.

E. '109 Patent: “non-ordered steps”

<i>Claim Term</i>	<i>Claim</i>	<i>EyesMatch’s Proposed Construction</i>	<i>Samsung’s Proposed Construction</i>
“non-ordered steps”	'109 Patent: Claim 1[pre], 1[f], 1[h]	Steps 1(b)-1(d): “1b flipping the image about a vertical axis so as to reverse right and left sides of the image; 1c applying a transformation mapping to the image to modify the image such that it appears to mimic a reflection of a mirror; 1d resizing the image to reduce variations caused by changes in object's distance to the camera;”	Indefinite.

80. A person of ordinary skill in the art, in light of the '109 Patent specification and claims, would understand the term “non-ordered steps” to be indefinite. The term “non-ordered steps” appears in claim 1 of the '109 Patent. As I explain below, this term is indefinite because a POSITA would not be able to determine the scope of the invention with reasonable certainty after a review of the claims and specification of the '109 Patent.

81. Claim 1 of the '109 Patent recites the term “non-ordered steps” three times—first, in the preamble (which the parties agree is limiting), and next in limitations 1[f] and 1[h], as depicted below:

Claim 1 of the '109 Patent

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:
1[a]	obtaining a digital image from a camera;
1[b]	flipping the image about a vertical axis so as to reverse right and left sides of the image;
1[c]	applying a transformation mapping to the image to modify the image such that it appears to mimic a reflection of a mirror;
1[d]	resizing the image to reduce variations caused by changes in object's distance to the camera;
1[e]	displaying the image on the monitor after performing the flipping, transformation mapping, and resizing;
1[f]	wherein the non-ordered steps are performed on a series of images of a live video feed from the camera;
1[g]	determining distance to a user appearing in the live video feed;
1[h]	and, varying rate at which the non-ordered steps are performed on the series of images according to the distance.

82. The preamble recites a method “to display a mirror-mimicking image on the monitor, by performing non-ordered steps comprising,” and then recites steps 1[a] through 1[e]. Limitations 1[f] and 1[h] then recite “*the* non-ordered steps,” referring back to the previously-recited steps 1[a]-1[e]. Therefore, the claim language plainly indicates that the “non-ordered steps” comprise at least steps 1[a] through 1[e]. The ordinary meaning of “non-ordered steps” would be understood by a POSITA to mean that the “steps” do not need to be performed in a particular order.

83. However, a POSITA would find this claim contradictory and irreconcilable. On the one hand, the preamble and the limitations 1[f] and 1[h] plainly indicate to a POSITA that the steps 1[a] through 1[e] are “non-ordered steps.” On the other hand, the claim language also plainly indicates the opposite to a POSITA, by also expressly requiring that steps 1[a] through 1[e] have specific ordering. For example, a POSITA would be unclear on the scope of the claim because step 1[a] (“obtaining *a* digital image from a camera”) contains an antecedent for steps 1[b]-1[e],

which all recite operations performed on “*the* image” (i.e., the digital image obtained from the camera in step 1[a]). Similarly, a POSITA would be unclear on claim scope because step 1[e] (“displaying the image on the monitor *after* performing the flipping, transformation mapping, and resizing”) is on the one hand a “non-ordered step,” yet the plain language requires the “displaying ...” step to occur “after” other steps. A POSITA would find the plain language of the claim directly contradictory, unclear in scope, inherently irreconcilable, and nonsensical. Thus, a POSITA would be unable to determine the scope of the claim limitation.

84. Nothing in the specification clarifies the scope of “non-ordered steps” in the context of claim 1 because there is no disclosure surrounding whether the steps comprising the method of claim 1 can be performed in any order. Even if the specification did have such disclosure, this would not change the fact that claim 1 is contradictory on its face, as it explicitly describes at least the steps in limitations 1[a]-1[e] as “non-ordered steps,” while also requiring an order for some of the steps.

85. For at least these reasons, a POSITA would not be able to determine the scope of the “non-ordered steps” limitation with reasonable certainty after a review of the intrinsic evidence of the ’109 Patent, and therefore the claim is indefinite.

F. ’109 Patent: “performing registration of the digital image with the reference image”

<i>Claim Term</i>	<i>Claim</i>	<i>EyesMatch’s Proposed Construction</i>	<i>Samsung’s Proposed Construction</i>
“performing registration of the digital image with the reference image”	’109 Patent: Claim 7[b]	Plain and ordinary meaning as understood by a person of ordinary skill in the art	Matching pointers on a captured image to corresponding pointers on the reference image.

86. A person of ordinary skill in the art, in light of the '109 Patent specification and claims, would understand the term “performing registration of the digital image with the reference image” to mean “matching pointers on a captured image to corresponding pointers on the reference image.” This term appears in claim 7 of the '109 Patent.

7. The method of claim 1, further comprising the steps:
 obtaining a reference image;
 performing registration of the digital image with the reference image;
 using data obtained from the registration to generate the transformation mapping.

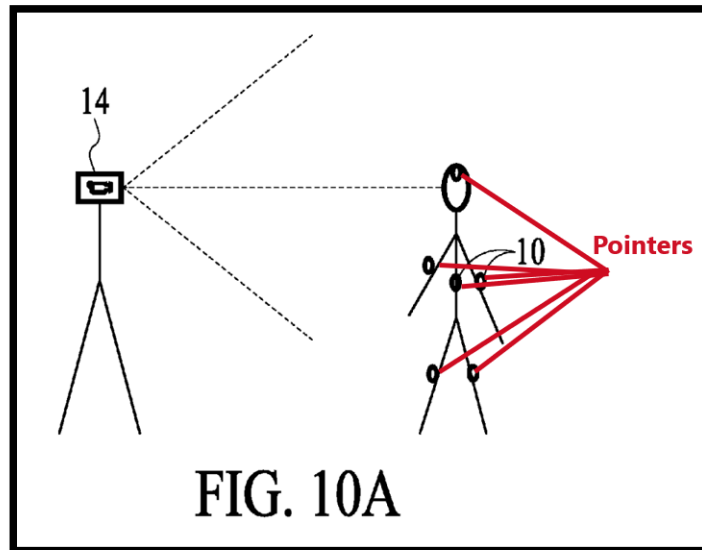
'109 Patent at Claim 7.

87. The '109 Patent describes an embodiment in which “*a registration approach*” is used. *See* '109 Patent at 17:29-30. “According to this approach, the transformation is pre-programmed based on offline true registration technique of raw image from offset/projected/back oriented camera to an image that was taken in front of the user when the user eyes are staring at the camera.” *Id.* at 17:31-35. The '109 Patent further describes that a “[*r*]eference image can be generated from one multiple cameras [*sic*] with stitching.” *See id.* at 17:35-36.

88. The '109 Patent explains that “a reference camera will be located in a similar height and distance that will reduce most optic distortion, e.g., at eye level and 2-3m from the user” and that this “registration will yield the best transformation to match the eyes and the full body based on multiple pointers.” *Id.* at 17:37-41.

89. In one example depicted in Fig. 10A, a user is equipped with several *pointers* (e.g., white sticker dots), and a camera is located “at the location of the ‘supposed’ mirror and at the user’s eye height or close to it.” *Id.* at 20:63-65. The user is “positioned at a distance from the camera, such that it will eliminate most of the camera distortion when looking at the camera.” *Id.* at 20:66-21:1. “The scaling of the image can be matched and cropped to represent true size [*sic*]

of a supposed reflection at a mirror, or slightly smaller. That is, the *generated reference image should match the true size of the user* on a mirror placed at the camera location, or smaller to fit the screen if preferred (depend [sic] on the size of the screen).” *Id.* at 21:1-6.



Id. at Fig. 10A (annotated).

90. The '109 Patent describes that once the reference image is generated, an “actual image” is taken “by placing the camera at its actual service location, e.g., above the screen.” *Id.* 21:19-22. “Then a registration of the reference and actual image is performed, by matching the pointers on the actual image to those of the references image.” *Id.* at 21:22-24. Based on the registration information, a transformation that “can best bring the distort [sic] image to the right eyes and body orientation is extracted.” *Id.* at 21:25-26. The '109 Patent then describes that by “matching . . . the pointers of the input images to the reference images . . . the transformation parameters that lead to the best image matching can be determined and selected.” *Id.* at 23:41-44.

91. Therefore, based on the intrinsic evidence, it is my opinion that a POSITA would interpret this term to mean “matching pointers on a captured image to corresponding pointers on the reference image.”

G. '110 Patent: “adaptive transformation mapping”

<i>Claim Term</i>	<i>Claim</i>	<i>EyesMatch’s Proposed Construction</i>	<i>Samsung’s Proposed Construction</i>
“adaptive transformation mapping”	'110 Patent: Claim 1[c]	A selected set of image transformations based on what is detected in the stream of images.	A transformation mapping whose parameters are continuously variable.

92. A person of ordinary skill in the art, in light of the '110 Patent specification and claims, would understand the term “adaptive transformation mapping” to mean “a transformation mapping whose parameters are continuously variable.” The term “adaptive transformation mapping” appears within the limitation “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” in claim 1 of the '110 Patent.

1. A computerized method for operating a display system, the display system having a camera, a monitor, and a processor, the method comprising:
operating the camera to generate a stream of images of the user;
operating the processor to detect the presence of the user in the stream of images;
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,
displaying the modified images on the monitor;
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

'110 Patent at claim 1.

93. Outside of claim 1 and the Abstract (which generally parallels claim 1), the word “adaptive” does not appear anywhere in the '110 Patent. The term “adaptive,” however, does

appear several times in the '109 Patent, which is incorporated into the '110 Patent by reference. Although neither of the Asserted Patents explicitly recite the term “adaptive transformation mapping” in their detailed descriptions, the use of the term “adaptive” in the '109 Patent is instructive.

94. The '109 Patent explicitly defines the term “adaptive” as “continuously variable.” '109 Patent at 14:35-39 (teaching that the FOV must be *“adaptive, i.e., continuously variable”*). The '109 Patent describes the need for an “adaptive FOV” “to compensate for the changes in the distances between the user and the screen, so that the user will see his image at the same size, just like in a mirror.” '109 Patent at 14:30-31. As the user changes his distance from the screen, the FOV must also change to maintain the “double distance” and “same size” as required to mimic a mirror. *See id.* This means that the FOV must change in real time and, as such, must be continuously variable. *Id.* at 14:35-39.

95. This explicit definition of “adaptive” is supported by the context surrounding the other uses of the word “adaptive” throughout the '109 Patent. For example, each of (i) 15:9-12⁵, (ii) 15:52-58⁶, (iii) 15:66-16:5⁷, and (iv) 16:25-29⁸ describe that the system must continuously vary in real time to accommodate for user movement in front of the camera and any resulting image distortions.

⁵ “The main challenge is how to compensate for the image distortions *adaptively and in real time*, so as to create similar user experience as we would get in the ideal setup.”

⁶ “That is, when the user moves closer or further from the mirror, the view point that would have been reflected in the mirror would have been different from that captured by the camera. Embodiments of the inventive computerized method incorporate an adaptive POV (point of view) and *Adaptive FOV* modules based on tracking the position of the user.”

⁷ “In addition, getting closer to the camera introduces image distortion that needs to be corrected in a much more advanced computerized method. Performing an *adaptive POV and adaptive FOV* prior to displaying the image on the screen results in an image that mimics a reflection of a mirror positioned at the location of the screen.”

⁸ “As mentioned in the preceding paragraph, to properly convey a mirror experience, the system may further implement an *adaptive optical Zoom*. The adaptive optical Zoom enhances the image/video’s quality/resolution, based on distance tracking, *i.e., continuously tracking the distance to the user.*”

96. A POSITA would therefore understand, based on the intrinsic evidence, that “adaptive transformation mapping” recited in claim 1 of the ’110 Patent should be construed as “a transformation mapping whose parameters are continuously variable.”

H. ’110 Patent: “mirror tracking mode”

<i>Claim Term</i>	<i>Claim</i>	<i>EyesMatch’s Proposed Construction</i>	<i>Samsung’s Proposed Construction</i>
“mirror tracking mode”	’110 Patent: Claim 1[f]	A mode of tracking a user to mimic a mirror reflection of the user.	A mode of operation in which the user sees their reversed reflection appearing at double the distance from the camera and the reflection maintains the same size regardless of the user movement.

97. A person of ordinary skill in the art, in light of the ’110 Patent specification and claims, would understand the term “mirror tracking mode” to mean “a mode of operation in which the user sees their reversed reflection appearing at double the distance from the camera and the reflection maintains the same size regardless of the user movement.” The term “mirror tracking mode” appears in claim 1 of the ’110 Patent, in the limitation “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.” ’110 Patent at claim 1

98. The specification of the ’110 Patent does not explicitly recite a “mirror tracking mode.” The specification of the ’109 Patent, incorporated by reference into the ’110 Patent, also does not explicitly recite a “mirror tracking mode.” Rather, the ’109 and ’110 Patents describe a “***mirror mode***,” wherein “the controller perform [*sic*] transformation operation on the image of the user, such that the image presented on the monitor ***mimics the user’s reflection in a mirror.***” ’110

Patent at 29:21-24; *see also* '109 Patent at 28:32-35 (“*during mirror mode*, since the monitor shows a transformed image of what the camera sees now, the user observing the monitor has the *perception that he is looking at a mirror*”). Similarly, the '110 Patent also describes a “*mirror-mimicking mode* for displaying the *mirror-mimicking image on the monitor*.” *Id.* at 31:13-16.

99. Based on the intrinsic evidence, a POSITA would understand that “mirror tracking mode” involves displaying an image that appears to mimic a reflection of a mirror, similar to “mirror mode” or “mirror-mimicking mode.” As discussed above, the '109 Patent specification, which is incorporated by reference into the '110 Patent, describes that to mimic a reflection of a mirror, it is required that a user’s reflection will be: (i) reversed, i.e., flipped or mirrored, ('109 Patent at 2:33-36); (ii) appearing at double the distance from the mirror (*id.* at 2:4-6), and (iii) appearing at the same size, regardless of the user’s distance from the mirror (*id.* at 2:20-23).

100. Thus, based on the intrinsic evidence and for at least the reasons above with respect to the construction of “it appears to mimic a reflection of a mirror” (*see infra*, Section VI.B), a POSITA would understand the term “mirror tracking mode” to include similar requirement to mimic the reflection of a mirror in this mode. Thus, a POSITA would consider this term to mean “a mode of operation in which the user sees their reversed reflection appearing at double the distance from the camera and the reflection maintains the same size regardless of the user movement.”

I. '110 Patent: “utilizes the angle of the images captured by the camera”

<i>Claim Term</i>	<i>Claim</i>	<i>EyesMatch’s Proposed Construction</i>	<i>Samsung’s Proposed Construction</i>
“utilizes the angle of the images captured by the camera”	'110 Patent: Claim 1[f]	Utilizes the angle of the user’s image captured by the camera	Indefinite.

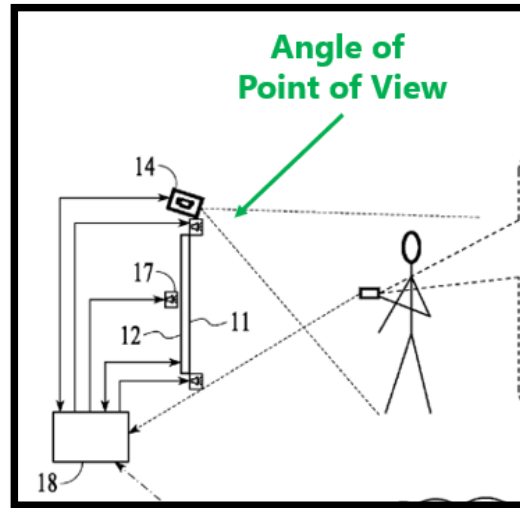
101. A person of ordinary skill in the art, in light of the '110 Patent specification, would understand the term “utilizes the angle of the images captured by the camera” to be indefinite. The term “utilizes the angle of the images captured by the camera” appears in claim 1 of the '110 Patent. As I explain below, this term is indefinite because, when read in light of the '110 Patent specification, this term would fail to inform a POSITA of scope of the invention with reasonable certainty.

102. First, a POSITA would understand that that *an image does not have an angle* and relatedly that *a camera cannot capture an angle*. A POSITA understands that images are made up of pixel units and do not inherently include any angle-related information. Thus, there can be no “angle of the images captured by the camera,” as claimed.

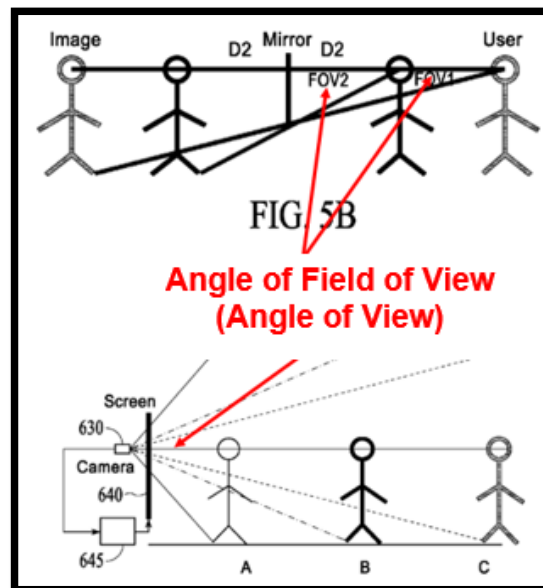
103. Second, if a POSITA were to disregard the fact above, to the extent that any “angle of image” could be determined, at best, a POSITA might understand this term to mean one of three possibilities: 1) the camera angle at which an image was taken, i.e., the point of view or POV (*see, e.g., id.* at 9:26-27, 9:39-40; 10:52-53; *see also* partial and annotated Fig. 13 below), 2) the camera angle of view, i.e., the field of view or FOV (*see, e.g., id.* at 10:53-54, 11:14-16, 18:62-63; *see also* partial, combined, and annotated Figs 5B and 6 below), or 3) a different angle entirely (*see, e.g.,* '109 Patent at 2:12-16, 2:43-46, describing a “specular reflecting angle”). The specification and claims of the '110 Patent are not clear. A POSITA would be unable to determine with reasonable certainty which angle could correspond to “the angle of the images captured by the camera.”

104. As depicted in Figure 13 below, the camera angle at which an image was taken, i.e., the point of view or POV, corresponds to the perspective from which the camera captures images

of the user. As depicted in the combined partial Figures 5B and 6, the camera angle of view, i.e., the field of view or FOV corresponds to the angle of the field captured by the camera.



'110 Patent at Fig. 13 (partial, annotated).



'110 Patent at Fig. 5B and Fig. 6 (partial) (combined and annotated)

105. The ambiguity *as to which angle could correspond to* “the angle of the images captured by the camera” is further apparent by the difference between the *element 1[e]*, which relates to a different point of view (“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”), and *element 1[f]*, which relates to changing an imaging perspective (“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”). A POSITA would not understand that the “angle of the images captured by the camera” is the angle of the point of view, because the claim language clearly uses the words “different point of view” when in reference to angle of the point of view. The patent specification does not state that changing the “imaging perspective” is that same as changing the point of view. In fact, I could not find the use of term “imaging perspective” anywhere in the ’109 or ’110 Patents’ specifications apart from this claim. Thus, changing the “imaging perspective” could also refer to a different angle such as the angle of the field of view or another type of angle.

106. Thus, a POSITA would understand from the ’110 Patent that there are at least three possible angles referenced throughout the ’110 Patent (and the ’109 Patent, which is incorporated into the ’110 Patent) that relate to both a camera and an image captured by the camera, and which therefore could plausibly correspond to the claimed “angle of the images captured by the camera.” It is unclear to a POSITA what is meant by the claimed “angle of the images captured by the camera.”

107. Based on a review of the intrinsic evidence, a POSITA could not determine with certainty which of these angles correspond to the claimed “angle of the images captured by the camera.” Therefore, for at least these reasons, the ’110 Patent fails to provide reasonable certainty concerning the meaning of “utilizes the angle of the images captured by the camera.” Therefore, this term is indefinite.

VII. CONCLUSION

This declaration is based on information currently available to me. I reserve the right to continue my investigation and study, which may include a review of documents and information that may be produced or that have been produced so recently that I have not had an opportunity to analyze them, as well as testimony from depositions for which transcripts are not yet available or that may yet be taken in this case. Therefore, I expressly reserve the right to expand or modify my opinions as my investigation and studies continue, and to supplement my opinions before or during any claim construction hearing, in response to any additional documents or information that become available to me, any matters raised by EyesMatch and/or opinions provided by EyesMatch's expert(s), or in light of any relevant orders from the Court.

I declare under the penalty of perjury under the laws of the United States that the foregoing is true and correct, executed, this 13th day of September, 2024.

Dated: 9/13, 2024



Dr. Harley R. Myler, Ph.D.