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

EYESMATCH LTD.	§	
	§	
v.	§	CASE NO. 2:23-CV-363-JRG-RSP
	§	
SAMSUNG ELECTRONICS CO., LTD., SAMSUNG ELECTRONICS AMERICA, INC., and SAMSUNG RESEARCH AMERICA, INC.	§	

CLAIM CONSTRUCTION ORDER

On December 6, 2024, the Court held a hearing to determine the proper construction of disputed terms in United States Patents No. 8,982,109 and 8,982,110. Before the Court is the Opening Claim Construction Brief (Dkt. No. 42) filed by Plaintiff EyesMatch Ltd. ("EyesMatch"). Also before the Court are the Responsive Claim Construction Brief (Dkt. No. 47) filed by Defendants Samsung Electronics Co., Ltd., Samsung Electronics America, Inc., and Samsung Research America, Inc. ("Samsung"), Plaintiffs' reply (Dkt. No. 49), the parties' September 13, 2024 Joint Claim Construction and Prehearing Statement (Dkt. No. 41), and the parties' November 22, 2024 Joint Claim Construction Chart (Dkt. 53, Ex. A).

Having reviewed the arguments made by the parties at the hearing and in their claim construction briefing, having considered the intrinsic evidence, and having made subsidiary factual findings about the extrinsic evidence, the Court hereby issues this Claim Construction Order. *See Phillips v. AWH Corp.*, 415 F.3d 1303, 1314 (Fed. Cir. 2005) (en banc); *Teva Pharm. USA, Inc. v. Sandoz, Inc.*, 135 S. Ct. 831, 841 (2015).

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I. BACKGROUND

Plaintiffs allege infringement of United States Patents No. 8,982,109 ("the '109 Patent") and 8,982,110 ("the '110 Patent") (collectively, the "patents-in-suit"). Dkt. No. 42, Exs. 1–2.

The '109 Patent, titled "Devices, Systems and Methods of Capturing and Displaying Appearances," issued on March 17, 2015, and bears an earliest priority date of March 1, 2005. Plaintiff submits that the '109 Patent "uses software transformations to more accurately mimic the apparent behavior of a conventional mirror using a camera, a computer, and a display." Dkt. No. 42 at 1. The Abstract of the '109 Patent states:

> Systems, devices and methods enabling appearance comparison. The system includes at least one interactive imaging and display station. The station includes a mirror-display device capable of selectably 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.

The '110 Patent, titled "Method for Image Transformation, Augmented Reality, and Teleperence [*sic*]," issued on March 17, 2015, and bears an earliest priority date of March 1, 2005. Plaintiff submits that the '110 Patent "modifies a stream of images of a user so that the images appear to be captured from a different point of view, 'to create an image as if a user were looking into the eyes of another user in order to provide a convincing, live experience.'" *Id.* (citing '110 Patent at 7:39–41). The Abstract of the '110 Patent states:

> 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.

Defendants submit that "[t]he '110 Patent stems from a patent application that is a continuation-in-part of the application that led to the '109 Patent," and "[t]he '110 Patent incorporates by reference the disclosure of the '109 Patent." Dkt. No. 47 at 4 n.2 (citing '110 Patent at 1:65–2:2).

Defendant also submits: "A person of ordinary skill in the art ('POSA') in the field of art for the Asserted Patents 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." Dkt. No. 47 at 7–8 (citing Dkt. No. 47, Ex. 1, Sept. 13, 2024 Myler Decl. ¶ 29).

Shortly before the start of the December 6, 2024 hearing, the Court provided the parties with preliminary constructions with the aim of focusing the parties' arguments and facilitating discussion. Those preliminary constructions are noted below within the discussion for each term.

II. LEGAL PRINCIPLES

"It is a 'bedrock principle' of patent law that 'the claims of a patent define the invention to which the patentee is entitled the right to exclude.'" *Phillips*, 415 F.3d at 1312 (quoting *Innova/Pure Water Inc. v. Safari Water Filtration Sys., Inc.*, 381 F.3d 1111, 1115 (Fed. Cir. 2004)). Claim construction is clearly an issue of law for the court to decide. *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 970–71 (Fed. Cir. 1995) (en banc), *aff'd*, 517 U.S. 370 (1996). "In some cases, however, the district court will need to look beyond the patent's intrinsic evidence and to consult extrinsic evidence in order to understand, for example, the background science or the meaning of a term in the relevant art during the relevant time period." *Teva*, 135 S. Ct. at 841 (citation omitted). "In cases where those subsidiary facts are in dispute, courts will need to make subsidiary factual findings about that extrinsic evidence. These are the 'evidentiary underpinnings' of claim construction that we discussed in *Markman*, and this subsidiary factfinding must be reviewed for clear error on appeal." *Id.* (citing 517 U.S. 370).

To determine the meaning of the claims, courts start by considering the intrinsic evidence. *See Phillips*, 415 F.3d at 1313; *see also C.R. Bard, Inc. v. U.S. Surgical Corp.*, 388 F.3d 858, 861 (Fed. Cir. 2004); *Bell Atl. Network Servs., Inc. v. Covad Commc'ns Group, Inc.*, 262 F.3d 1258, 1267 (Fed. Cir. 2001). The intrinsic evidence includes the claims themselves, the specification, and the prosecution history. *See Phillips*, 415 F.3d at 1314; *C.R. Bard*, 388 F.3d at 861. Courts

give claim terms their ordinary and accustomed meaning as understood by one of ordinary skill in the art at the time of the invention in the context of the entire patent. *Phillips*, 415 F.3d at 1312–13; *accord Alloc, Inc. v. Int'l Trade Comm'n*, 342 F.3d 1361, 1368 (Fed. Cir. 2003).

The claims themselves provide substantial guidance in determining the meaning of particular claim terms. *Phillips*, 415 F.3d at 1314. First, a term's context in the asserted claim can be very instructive. *Id.* Other asserted or unasserted claims can aid in determining the claim's meaning because claim terms are typically used consistently throughout the patent. *Id.* Differences among the claim terms can also assist in understanding a term's meaning. *Id.* For example, when a dependent claim adds a limitation to an independent claim, it is presumed that the independent claim does not include the limitation. *Id.* at 1314–15.

"[C]laims 'must be read in view of the specification, of which they are a part.'" *Id.* at 1315 (quoting *Markman*, 52 F.3d at 979). "[T]he specification 'is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term.'" *Phillips*, 415 F.3d at 1315 (quoting *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996)); *accord Teleflex, Inc. v. Ficosa N. Am. Corp.*, 299 F.3d 1313, 1325 (Fed. Cir. 2002). This is true because a patentee may define his own terms, give a claim term a different meaning than the term would otherwise possess, or disclaim or disavow the claim scope. *Phillips*, 415 F.3d at 1316. In these situations, the inventor's lexicography governs. *Id.* The specification may also resolve the meaning of ambiguous claim terms "where the ordinary and accustomed meaning of the words used in the claims lack sufficient clarity to permit the scope of the claim to be ascertained from the words alone." *Teleflex*, 299 F.3d at 1325. But, "[a]lthough the specification may aid the court in interpreting the meaning of disputed claim language, particular embodiments and examples appearing in the specification will not generally be read into

the claims." *Comark Commc'ns, Inc. v. Harris Corp.*, 156 F.3d 1182, 1187 (Fed. Cir. 1998) (quoting *Constant v. Advanced Micro-Devices, Inc.*, 848 F.2d 1560, 1571 (Fed. Cir. 1988)); *accord Phillips*, 415 F.3d at 1323.

The prosecution history is another tool to supply the proper context for claim construction because a patent applicant may also define a term in prosecuting the patent. *Home Diagnostics, Inc. v. Lifescan, Inc.*, 381 F.3d 1352, 1356 (Fed. Cir. 2004) ("As in the case of the specification, a patent applicant may define a term in prosecuting a patent."). "[T]he prosecution history (or file wrapper) limits the interpretation of claims so as to exclude any interpretation that may have been disclaimed or disavowed during prosecution in order to obtain claim allowance." *Standard Oil Co. v. Am. Cyanamid Co.*, 774 F.2d 448, 452 (Fed. Cir. 1985).

Although extrinsic evidence can be useful, it is "less significant than the intrinsic record in determining the legally operative meaning of claim language." *Phillips*, 415 F.3d at 1317 (citations and internal quotation marks omitted). Technical dictionaries and treatises may help a court understand the underlying technology and the manner in which one skilled in the art might use claim terms, but technical dictionaries and treatises may provide definitions that are too broad or may not be indicative of how the term is used in the patent. *Id.* at 1318. Similarly, expert testimony may aid a court in understanding the underlying technology and determining the particular meaning of a term in the pertinent field, but an expert's conclusory, unsupported assertions as to a term's definition are entirely unhelpful to a court. *Id.* Generally, extrinsic evidence is "less reliable than the patent and its prosecution history in determining how to read claim terms." *Id.*

The Supreme Court of the United States has "read [35 U.S.C.] § 112, ¶ 2 to require that a patent's claims, viewed in light of the specification and prosecution history, inform those skilled

in the art about the scope of the invention with reasonable certainty." *Nautilus, Inc. v. Biosig Instruments, Inc.*, 134 S. Ct. 2120, 2129 (2014). "A determination of claim indefiniteness is a legal conclusion that is drawn from the court's performance of its duty as the construer of patent claims." *Datamize, LLC v. Plumtree Software, Inc.*, 417 F.3d 1342, 1347 (Fed. Cir. 2005) (citations and internal quotation marks omitted), *abrogated on other grounds by Nautilus,* 134 S. Ct. 2120. "Indefiniteness must be proven by clear and convincing evidence." *Sonix Tech. Co. v. Publ'ns Int'l, Ltd.*, 844 F.3d 1370, 1377 (Fed. Cir. 2017).

III. AGREED TERMS

The parties submit in their September 13, 2024 Joint Claim Construction and Prehearing Statement (Dkt. No. 41 at 1), as well as in their briefing (Dkt. No. 47 at 8) and in their November 22, 2024 Joint Claim Construction Chart (Dkt. 53, Ex. A at 1), that the parties agree the preamble of Claim 1 of the '109 Patent is limiting.

IV. DISPUTED TERMS

1. "transformation mapping" and "mapping transformation"

"transformation mapping" **"mapping transformation"** ('109 Patent, Claims 1[c], 2, 3, 6, 7, 12, 13, 16; '110 Patent, Claims 1[f], 2)	
Plaintiff's Proposed Construction	**Defendants' Proposed Construction**
"a selected set of image transformations"	"at least modifying the point of view (POV) and field of view (FOV) prior to displaying the image"

Dkt. No. 41, Ex. A at 1; Dkt. No. 42 at 3; Dkt. No. 47 at 8; Dkt. No. 49 at 1; Dkt. No. 53, Ex. A at 3.

Shortly before the start of the December 6, 2024 hearing, the Court provided the parties with the following preliminary construction: "selected set of image transformations."

(a) The Parties' Positions

Plaintiff argues that "[t]he plain language of the claims . . . demonstrates that the transformation mapping / mapping transformation is a set of image transformations that the system has selected to achieve the desired visual effect, *i.e.*, 'a selected set of image transformations.'" Dkt. No. 42 at 4. Plaintiff also argues that "Defendant's proposal to construe these terms to require *both* modifying the point of view (POV) of an image, *and* modifying the field of view (FOV), cannot be squared with the claim language or the specification, as they describe embodiments applying mapping transformations that modify the point of view, or the field of view, but not both." *Id.* at 5. Plaintiff urges that "[n]othing in Claim 1 of the 109 Patent (reciting 'transformation mapping') or Claim 1 of the 110 Patent (reciting 'mapping transformation') requires that the mapping include both an FOV and a POV transformation, although of course both can be part of a transformation mapping." *Id.* at 6.

Defendants respond that "Plaintiff never identifies what are the 'selected' transformations, leaving the term completely unbounded." Dkt. No. 47 at 8. Defendants also argue that "*all embodiments* in the Asserted Patents suffer from projection distortion necessitating FOV and POV transformation to 'mimic the reflection of a mirror,'" arguing that the patentee disparaged any other embodiments. *Id.* at 10. Defendants urge that "the specification unambiguously requires both a change in POV and FOV to mimic a mirror as claimed," and "Plaintiff's citations to specific examples of POV and FOV transformations and how they can be calibrated or implemented does not change this conclusion." *Id.* at 12.

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Plaintiff replies that "Defendants' own proposed construction should be rejected because it excludes embodiments disclosed in the specification of the 109 Patent, violates the principle of claim differentiation, and is unhelpful in understanding the disputed term." Dkt. No. 49 at 1; *see id.* at 1–4. Plaintiff argues, for example, that the specification expresses a preference for particular embodiments but does not set forth any relevant disclaimer. *Id.* at 3.

At the December 6, 2024 hearing, Defendants reiterated their argument that they are proposing the transformations that are necessary to generate an image that mimics a mirror.

(b) Analysis

Claim 1 of the '109 Patent, for example, recites (emphasis added):

> 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.

The specification discloses:

> 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.

'109 Patent at 15:48–55 (emphasis added).

As to "point of view" ("POV") and "field of view" ("FOV"), Plaintiff agrees with the description by Defendants' expert that "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," and "the camera angle of view, i.e., the field of view or FOV corresponds to the angle of the field captured by the camera." Dkt. No. 47, Ex. 1, Sept. 13, 2024 Myler Decl. ¶ 104; Dkt. No. 42 at 5 (citing *id.*).

The specification discloses that "[p]erforming 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." '109 Patent at 16:2–5.

> Once the target and reference images are obtained, the distorted target images that were taken from the tilted camera are registered to the reference image(s) using the pointers, so as to represent how the user would appear at a mirror positioned at the location of the screen. The output of the registration is a transformation operator, e.g., a set of pointers, each having two coordinates: one in the input image and one in the reference image. Various transformations can be tested over multiple target and reference images. For example, multiple distortion functions can be applied to get the best matching performance. The principle functions would be projection, resize, XY translation (offset) and left-to-right flip. The best transformation combination is selected and mapping transformation is created for each calibration point. This mapping transformation is the factory calibration according to which live images in the field would be transformed to mimic a mirror image. It should be appreciated that the mapping may include different transformations for each pixel or each section of the live image, so as to provide the best representation of a mirror reflection.

Id. at 21:61–22:13. The specification further discloses:

> Using the matching of the pointers of the input images to the reference images, at 1265 the transformation parameters that lead to the best image matching can be determined and selected. The parameters that can be used for the transformation include the following. A highly effective transformation parameter is a tilt transformation. Tilt transformation corrects the distortion in the image caused by the camera being tilted downwards. The tilt transformation modifies an input image taken with the camera looking downwards and transforms the image to appear as if the camera was pointed straight horizontally (Video engine can also correct azimuth error). Another transformation parameter is elevation translation. The elevation spatial translation transformation linearly modifies offset in an image taken with a

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> camera positioned externally to the screen, e.g., above the screen, and transforms the image to appear as if the image was taken from the screen location at the user's eyes level (match the eye height to the image in the screen height) Horizontal translation can also be appl[ied] to correct mis[]alignments between the camera and the center of the screen). Another important transformation for mimicking mirror is scale. As explained above, in an actual mirror reflection the user sees very little change in body image size as the user gets closer to the mirror. Conversely, in a camera image the size changes considerably with distance. A scale transformation reduces the effect of size change with distance to the screen, so that the user sees almost constant size of himself in the screen, regardless of distance to the screen. Depending on the position and FOV of the camera, an x-y translation of the image may also be required.

'109 Patent at 23:44–24:3.

> The transformation mapping can be one that includes angle, tilt, azimuth, scale, spatial translation (i.e., elevation linear offset or horizontal offset) etc.

Id. at 29:38–40.

Also regarding particular transformations, dependent Claims 2 and 3 of the '109 Patent, for example, recite: "2. The method of claim 1, wherein the transformation mapping renders an image appearing to have been taken from a camera positioned at eye-level height and pointing horizontally"; and "3. The method of claim 1, wherein the transformation mapping comprises at least a tilt transformation and an elevation transformation." Dependent Claim 2 of the '110 Patent recites that "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."

On one hand, the specification explains, positioning the camera at the user's eye level (as in Figure 6 of the '109 Patent) is "not practical" because the display screen would be between the camera and the user. *See* '109 Patent at 14:20–22 ("it is not practical to locate a camera behind a

regular screen, simply because it will block the camera's view") & 14:24–25 ("too expensive and complex to implement"). Figure 6 is reproduced here:

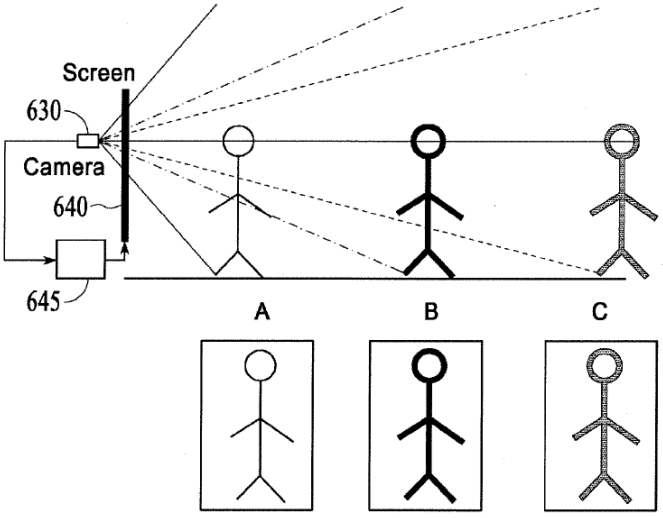

FIG. 6

On the other hand, the claims do not require the camera to be offset from the user's eye level, and a quick review of Figure 6 reveals that if the camera could be placed within or in front of the display, if the display were semi-transparent (akin to a teleprompter), or if the display were sufficiently small, then the camera could be at or near the user's eye level and, presumably, there then might not be any need for a POV transformation. Indeed, although the specification expresses concern that this might be "too expensive and complex to implement," the specification itself suggests that, "[i]n theory, it is possible to overcome this problem by using a semitransparent screen or multiple pinholes with multiple cameras." *Id.* Thus, a fair reading of the disclosure regarding Figure 6 is that the specification expresses a preference for other embodiments but does not disavow the Figure 6 embodiment.

Further, no disclaimer is apparent in the provisional patent application that would warrant requiring both POV and FOV transformations. Moreover, even if limiting statements were

present, such statements might have an impact on the effect of the provisional but would not warrant a narrow construction of these disputed terms in the issued patents. *Cf. Sycamore IP Holdings LLC v. AT&T Corp.*, No. 16-CV-588, 2017 WL 1045949 (E.D. Tex. Mar. 16, 2017) (Bryson, J., sitting by designation) ("While it may or may not be the case that new matter was added to the non-provisional application, that is an issue that goes to the priority date to which the . . . patent is entitled; it does not govern the construction of the . . . patent, at least with respect to terms the meaning of which is clear in the non-provisional application that issued as the . . . patent. * * * . . . [T]he result would be the denial of priority to the date of the provisional application, not a construction of the . . . patent that is contrary to what is clearly conveyed by the claims and specification of that patent.").

At the December 6, 2024 hearing, Defendants argued that *Sycamore IP* is distinguishable because, in Defendants' view, the provisional application contained disparagement and then the non-provisional specification "doubled down" on disparagement of the above-discussed Figure 6 embodiment. Defendant reiterated and expounded upon its reliance in its briefing on *Openwave Sys., Inc. v. Apple, Inc.*, 808 F.3d 509, 514 (Fed. Cir. 2015), in which the Federal Circuit gave effect to "remarks that disparage and, therefore, disclaim" certain devices. As noted above, however, the discussion in the specification regarding the Figure 6 embodiment, including that the embodiment is regarding as being "expensive," "complex," or "not practical," does not amount to disparagement but rather expresses a preference.

Finally, even assuming for the sake of argument that all of the disclosed embodiments involve transforming both POV and FOV, the claim scope should not be limited to the disclosed embodiments. *See Phillips*, 415 F.3d at 1323.

The Court therefore hereby construes "transformation mapping" and "mapping transformation" to mean **"selected set of image transformations."**

2. "it appears to mimic a reflection of a mirror"

"it appears to mimic a reflection of a mirror" ('109 Patent, Claims 1[c], 13, 16)	
Plaintiff's Proposed Construction	**Defendants' Proposed Construction**
"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 approximately double the distance from the camera and the reflection maintains approximately the same size regardless of the user movement"[1]

Dkt. No. 41, Ex. A at 3; Dkt. No. 42 at 9; Dkt. No. 47 at 12; Dkt. No. 53, Ex. A at 10.

Shortly before the start of the December 6, 2024 hearing, the Court provided the parties with the following preliminary construction: "an image where the user sees their reversed reflection appearing at approximately double the distance from the camera and the reflection maintains approximately the same size regardless of the user movement."

(a) The Parties' Positions

Plaintiff argues: "The full phrase in which this term appears is 'applying a transformation mapping to the image to modify the image such that it appears to mimic a reflection of a mirror.' The 'appears to mimic' follows 'such that,' meaning that this language describes the outcome of the 'transformation mapping' that is applied, not an independent technical requirement to be construed, let alone construed narrowly as Defendants contend." Dkt. No. 42 at 9 (citations omitted). Plaintiff also argues that "Defendants' construction would baselessly require absolute

[1] Defendants added the word "approximately" to their proposal in their Responsive Claim Construction Brief. *See* Dkt. No. 47 at 12 & n.9.

fidelity to the optical characteristics of a mirror," and "the specification repeatedly confirms that the transformation mapping approximates what a user would see if they were looking in a mirror, to create a 'convincing' mirror appearance, not that it replicates a mirror exactly." *Id.* at 10–11 (citation omitted).

Defendants respond that "[u]nder Plaintiff's construction, *any* . . . reflective surface, such as a polished metal or a car glass window, would meet the scope of the term even though the reflection may look *nothing* like a mirror." Dkt. No. 47 at 13. Defendants also argue that "Plaintiff misleadingly cherry picks the specification to argue that certain disclosed embodiments do not include the characteristics in Defendants' construction." *Id.* at 14.

Plaintiff replies that Defendants' proposal "excludes embodiments in which the user's image is smaller than the 'true size of the user on a mirror placed at the camera location.'" Dkt. No. 49 at 4 (citing '109 Patent at 21:1–6). Plaintiff also argues that Defendants' proposal of "approximately" does not remedy this problem because "'[s]maller' is not approximately the same size or distance." *Id.* at 5. Further, Plaintiff argues that Defendants' proposal "is not only grammatically incorrect in the context of the claim limitations but wholly unhelpful to the jury in understanding what the term means." *Id.* at 5–6 (citations omitted).

(b) Analysis

Claim 1 of the '109 Patent recites (emphasis added):

> 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.

As a threshold matter, the parties agree that a mirror image is "reversed" relative to a normal camera image. *See, e.g.,* '109 Patent at 14:40–41 ("the image needs to be flipped vertically [(flipped across a central vertical axis)], to support the right-to-left behavior of the mirror"); *see also id.* at 24:47–49 ("the controller 'flips' the image about a central vertical axis (left to right) prior to displaying it on screen 12").

The specification further discloses:

> When a user looks at himself in the mirror, 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 is illustrated in FIG. 5A, wherein the user standing at distance Dl sees himself at a distance equal to twice Dl. Similarly, as shown in FIG. 5B, a user standing at distance D2 will see himself at a distance 2xD2. In addition, the angle of the user's Field of View (FOV) changes when the user changes the distance, e.g., gets closer, to the mirror. The FOV is limited by the specular reflecting angle(β) from the mirror to the user's eye and to the edge of the visible image on all sides of the mirror (four sides for a rectangular or square mirror). In FIG. 5B the bottom of the vertical FOV is illustrated as double the angle(β) formed by the lines connecting the user's eyes to the bottom of the mirror and reflecting to the user's shoes. Consequently, as illustrated in FIG. 5B, when the user approaches the mirror, the FOV angle increases, which is why he continues to see the same size reflection (FOVl<FOV2), so that *the user actually sees himself roughly at the same size*, but closer. This is a noticeable difference from a camera, wherein as the user gets closer to the camera, he appears larger in the image. This is mainly because the POV of a camera is fixed and is determined mainly by the size of the camera lens, or focal length.

'109 Patent at 2:5–27 (emphasis added); *see id.* at Figs. 5A, 5B.

> We now present discussions relating to embodiment of using an image captured by a camera, e.g., a digital still or video camera, and manipulating the image such that when it is projected on a screen it resembles a mirror image, i.e., an image the user would have seen if the screen was actually a standard mirror.

> * * *
>
> 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. According to one embodiment, this is solved by using the camera's zoom (digital and/or mechanical). Traditional cameras have fixed FOV or mechanically tunable FOV. In order to create an adaptive, i.e., continuously variable, FOV the system needs to manipulate the resolution, or to control the camera zoom and focus in real-time, based on user tracking.
>
> Additionally, the image needs to be flipped vertically, to support the right-to-left behavior of the mirror. This image transformation may be performed relatively easily by manipulating the pixels addresses of a digital image.
>
> As explained with respect to FIG. 1, the mirror can be smaller than the user and still show a full body reflection. This can be achieved in combination of proper selection of FOV and proper selection of the size screen. The idea is to project an image on the screen, which has a FOV giving 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.
>
> * * *
>
> To enable generating a *convincing* (augmented) mirror experience from a camera a [*sic*] located in front of the user and in spatial offset from the screen, a computerized method is used to manipulate the captured image prior to its presentation on the screen. The computerized method may operate in real time or not in real time, depending on the operational mode of the screen.

'109 Patent at 14:6–51 & 15:41–47 (emphasis added); *id.* at 15:48–55 ("*fit with* the view point that would occur with a conventional mirror").

> [T]he system scales the image to maintain the IPD [(interpupillary distance)] constant and matching the expected IPD. In this manner, when the user moves away or closer to the camera, the size of the user in the image projected on the monitor screen would remain about the same, *thus mimicking* a reflection on a mirror. As can be understood, the system can use other standard measurements, such as distance between ears, etc., but using the eyes would make it simpler since the system can recognize the eyes pretty easily.

Id. at 30:6–14 (emphasis added).

The specification also discloses that the image might purposefully be scaled to be "slightly smaller" than the "true size of a supposed reflection at a mirror," perhaps so as "to fit the screen if preferred (depend [sic, depending] on the size of the screen)." '109 Patent at 21:1–6.

Further, the specification refers, for example, to "utilizing the *estimated* distance to the user," which weighs at least somewhat against Defendants' proposal of "same size." *Id.* at 18:50–57 (emphasis added).

Plaintiff's proposal of "a reflective surface," however, is vastly overbroad and, as Defendants point out, would encompass for example what a person might see when looking at a car window. At the December 6, 2024 hearing, Plaintiff argued that absolute fidelity to a mirror is not even disclosed as an embodiment, but Plaintiff's proposed construction does not give effect to the word "mirror," which is used in these claims as a noun that refers to conventional physical mirrors. This is particularly problematic in light of the specification explaining that in the prior art "the combination of a camera and a screen" is "not convincing" and "not yet accepted as a reliable image of the individual as if he was looking at himself in a conventional mirror." *Id.* at 1:63–2:1; *see id.* at 2:49–50 ("so far no system has been provided for imitating a mirror convincingly").

In light of Plaintiff's proposal being overbroad, and considering that "mimic" is being used here in an unusual context, "some construction of the disputed claim language will assist the jury to understand the claims." *TQP Dev., LLC v. Merrill Lynch & Co.*, No. 2:08-CV-471-WCB, 2012 WL 1940849, at *2 (E.D. Tex. May 29, 2012) (Bryson, J., sitting by designation).

Defendant's revised proposal attempts to accommodate the above-noted imprecision by using the word "approximately." As discussed during the December 6, 2024 hearing, the specification uses the word "roughly." '109 Patent at 2:19–23 (quoted above). In light of the

specification's usage of "roughly," the Court adopts Defendant's proposed construction except that the word "approximately" is replaced with the word "roughly."

The Court accordingly hereby construes "it appears to mimic a reflection of a mirror" to mean **"an image where the user sees their reversed reflection appearing at roughly double the distance from the camera and the reflection maintains roughly the same size regardless of the user movement."**

3. "determining distance to a user appearing in the [live video feed/image]"

"determining distance to a user appearing in the [live video feed/image]" ('109 Patent, Claims 1[g] (live video feed), 11 (image))	
Plaintiff's Proposed Construction	**Defendants' Proposed Construction**
Plain and ordinary meaning as understood by a person of ordinary skill in the art	"determining the distance from the camera to a user appearing in the image"[2]

Dkt. No. 41, Ex. A at 4; Dkt. No. 42 at 13; Dkt. No. 47 at 16.

Shortly before the start of the December 6, 2024 hearing, the Court provided the parties with the following preliminary construction: "determining the distance from the camera to a user appearing in the live video feed" / "determining the distance from the camera to a user appearing in the image."

(a) The Parties' Positions

Plaintiff argues that "Defendants' proposed construction impermissibly narrows this claim term to 'measuring' th[e] distance, which is contrary to embodiments in the 109 Patent specification in which the distance to a user appearing in the image is calculated or estimated." Dkt. No. 42 at 13–14.

[2] Defendants previously proposed: "measuring the distance from the camera to the user." (Dkt. No. 41, Ex. A at 4.)

Defendants respond: "Plaintiff states this term means 'determining the distance from the camera to a user appearing in the image.' Br. at 13. Defendants agree and adopt this meaning for the term." Dkt. No. 47 at 16. Defendants also assert that determining a specific distance is required and that "from the camera" is supported by the specification and by Plaintiff's claim amendments in a related patent application in Europe. *See id.* at 17–18.

Plaintiff argues that although the construction should now be considered agreed-upon, "Defendants go further and attempt to adjudicate whether various approaches for 'determining the distance from the camera to a user appearing in the image' are within the ostensibly agreed construction." Dkt. No. 49 at 6. Plaintiff argues that "[s]uch argument is an infringement issue and outside the scope of claim construction." *Id.* (citation omitted)

(b) Analysis

The specification discloses, for example, that "[i]n various implementations, the method further comprises calculating distance to a user appearing in the image by tracking the distance between the user's eyes or the head size, and scaling the image accordingly." '109 Patent at 29:59–62; *see id.* at 29:62–30:8 (scaling based on interpupillary distance).

Through the course of briefing, the parties reached agreement to adopt Defendants' current proposed construction, including that the distance is "from the camera to the user." *See* Dkt. No. 53, Ex. A at 2.

Plaintiff's briefing expresses concern as to what Plaintiff characterizes as Defendants' additional commentary relating to an infringement analysis rather than to claim construction. *See* Dkt. No. 47 at 17 ("Defendants disagree that the embodiment Plaintiff relies on to support its construction (which simply compares the distance between a user's pupils with an expected value,

rather than determining a distance), corresponds to this term or even falls within the scope of the claims.") (citations omitted).

The Court adopts the agreed-upon construction and merely notes that any disputes regarding the application of this construction are factual disputes regarding infringement that do not present any further legal question for claim construction. *See PPG Indus. v. Guardian Indus. Corp.*, 156 F.3d 1351, 1355 (Fed. Cir. 1998) ("after the court has defined the claim with whatever specificity and precision is warranted by the language of the claim and the evidence bearing on the proper construction, the task of determining whether the construed claim reads on the accused product is for the finder of fact"); *see also Acumed LLC v. Stryker Corp.*, 483 F.3d 800, 806 (Fed. Cir. 2007) ("[t]he resolution of some line-drawing problems . . . is properly left to the trier of fact") (citing *PPG*, 156 F.3d at 1355); *Eon Corp. IP Holdings LLC v. Silver Spring Networks, Inc.*, 815 F.3d 1314, 1318–19 (Fed. Cir. 2016) (citing *PPG*, 156 F.3d at 1355; citing *Acumed*, 483 F.3d at 806). Shortly before the December 6, 2024 hearing, the Court provided the parties with its preliminary constructions adopting the parties' agreement, and at the hearing the parties presented no objection or oral argument regarding these constructions.

The Court accordingly hereby construes these terms as set forth in the following chart:

Term	Construction
"determining distance to a user appearing in the live video feed"	**"determining the distance from the camera to a user appearing in the live video feed"**
"determining distance to a user appearing in the image"	**"determining the distance from the camera to a user appearing in the image"**

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4. "non-ordered steps"

"non-ordered steps" ('109 Patent, Claims 1[pre], 1[f], 1[h])	
Plaintiff's Proposed Construction	**Defendants' Proposed Construction**
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

Dkt. No. 41, Ex. A at 6; Dkt. No. 42 at 14–15; Dkt. No. 47 at 18; Dkt. No. 53, Ex. A at 13.

Shortly before the start of the December 6, 2024 hearing, the Court provided the parties with the following preliminary construction: "Plain meaning [Note: Steps B, C, and D are non-ordered steps insofar as B, C, and D may be performed in any order with regard to one another (even though B, C, and D, collectively, must be performed after A and before E).]."

(a) The Parties' Positions

Plaintiff argues that "[a] POSITA would understand that the language of the claim logically gives order to certain of the steps while others may be performed in any order." Dkt. No. 42 at 15.

Defendants respond that "[t]he 'non-ordered steps' term renders claim 1 indefinite because the term creates an irreconcilable inconsistency and yields a nonsensical result, thereby failing to provide notice of what is claimed." Dkt. No. 47 at 18 (citation and footnote omitted). Defendants argue that because "a method claim ordinarily includes steps without an ordering," "'non-ordered steps' in the preamble would be superfluous if it only applied to steps 1[b], 1[c], and 1[d]." *Id.* at 20 (citation omitted). Defendants urge that "it is well-settled Federal Circuit law that the

specification does not allow a court to rewrite the claim to fix its nonsensical result and save it from invalidity." *Id.* at 22 (citation omitted).

Plaintiff replies that Defendants fail to show any irreconcilable inconsistency, and "no . . . deletion of 'non-ordered steps' is required to give the claim language meaning; as Plaintiff has explained, a POSA would understand that the term refers to steps 1(b) through 1(d), as the claim language and specification confirm." Dkt. No. 49 at 7 & 8.

(b) Analysis

Courts apply a two-part test to determine whether a particular order of steps is required: "First, we look to the claim language to determine if, as a matter of logic or grammar, they must be performed in the order written," and "[i]f not, we next look to the rest of the specification to determine whether it directly or implicitly requires such a narrow construction." *Altiris, Inc. v. Symantec Corp.*, 318 F.3d 1363, 1369–70 (Fed. Cir. 2003) (citation omitted).

Here, Claim 1 of the '109 Patent recites (emphasis added; lettering added):

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

The parties agree the preamble of Claim 1 of the '109 Patent is limiting. Dkt. No. 41 at 1; Dkt. No. 47 at 8; Dkt. No. 53, Ex. A at 1.

Steps (b), (c), and (d) operate upon "the image," which is obtained in step (a), so step (a) must be performed before steps (b), (c), and (d).

Also, step (e) recites "displaying the image on the monitor *after performing the flipping, transformation mapping, and resizing*," so steps (b), (c), and (d) must be performed before step (e). Element (f) further clarifies this issue by referring back to the above listing in step (e) as the "non-ordered steps."

Defendants argue that this gives rise to irreconcilable inconsistency within the claim because the preamble, which the parties agree is limiting, refers to "non-ordered steps." Defendant urges that "the plain language yields a nonsensical result," citing *Chef America* and other cases for the proposition that the Court cannot read "non-ordered" out of the claim and that the inconsistency gives rise to indefiniteness. Dkt. No. 47 at 20–21 (citing, e.g., *Chef Am., Inc. v. Lamb-Weston, Inc.*, 358 F.3d 1371, 1374 (Fed. Cir. 2004)). Defendant also argues that because method steps ordinarily can be performed in any order unless the claim language requires otherwise, the recital of "non-ordered steps comprising" would be superfluous if it applied only to steps (b), (c), and (d). Dkt. No. 47 at 20.

On balance, the preamble merely reinforces the "general rule" that "[u]nless the steps of a method [claim] actually recite an order, the steps are not ordinarily construed to require one." *Mformation Techs., Inc. v. Research in Motion Ltd.*, 764 F.3d 1392, 1398 (Fed. Cir. 2014) (quoting *Interactive Gift Express, Inc. v. Compuserve, Inc.*, 256 F.3d 1323, 1342 (Fed. Cir. 2001)). Although this may be inartful drafting, Defendants do not persuasively demonstrate that the claim, read as a whole, fails to "inform those skilled in the art about the scope of the invention with

reasonable certainty." *Nautilus*, 134 S. Ct. at 2129; *see, e.g., VLSI Tech. LLC v. Intel Corp.*, 53 F.4th 646, 653 (Fed. Cir. 2022) ("While a construction that introduces redundancy into a claim is disfavored, it is not foreclosed."; "th[e] language from the claims is best viewed not as redundant, but merely as clumsily drafted") (citation omitted). The opinion of Defendants' expert in this regard is unpersuasive. *See* Dkt. No. 47, Ex. 1, Sept. 13, 2024 Myler Decl. ¶ 83.

The Court therefore hereby expressly rejects Defendants' indefiniteness argument, and the Court hereby expressly finds that steps (b), (c), and (d) are the "non-ordered steps" and that steps (b), (c), and (d) may be performed in any order with regard to one another (even though steps (b), (c), and (d) must be performed after step (a) and before step (e)). Because this is reasonably clear on the face of the claim, and because the parties' experts will be bound by the Court's analysis here, the finder of fact need not be instructed on this in an explicit claim construction.

The Court accordingly hereby construes "non-ordered steps" to have its **plain meaning**.

5. "varying rate at which the non-ordered steps are performed on the series of images according to the distance"

"varying rate at which the non-ordered steps are performed on the series of images according to the distance" ('109 Patent, Claim 1[h])	
Plaintiff's Proposed Construction	**Defendants' Proposed Construction**
Plain and ordinary meaning as understood by a person of ordinary skill in the art	"varying rate at which two or more of the non-ordered steps are performed on the series of images"[3]

Dkt. No. 41, Ex. A at 5; Dkt. No. 42 at 17; Dkt. No. 47 at 22; Dkt. No. 53, Ex. A at 14.

[3] Defendants previously argued that this term is indefinite. *See* Dkt. No. 41, Ex. A at 5.

Shortly before the start of the December 6, 2024 hearing, the Court provided the parties with the following preliminary construction: "varying rate at which one or more non-ordered steps are performed on the series of images according to the distance."

(a) The Parties' Positions

Plaintiff argues that "[t]here is no uncertainty here; a POSITA would understand that the rate at which these non-ordered image transformation steps are performed may be varied by performing any one of them (and therefore the loop) at a different rate." Dkt. No. 42 at 19.

Defendants respond that "varying the rate cannot mean varying the rate of *just one* of the non-ordered steps as EyesMatch currently proposes." Dkt. No. 47 at 22. Defendants argue: "[T]he claim language recites 'varying rate at which the non-ordered steps are performed.' The term 'steps' is plural and the term 'are' invokes the plural. Thus, based on the claim language alone, varying the rate of more than one step is required." *Id.* at 23. Defendants further argue: "The problem with EyesMatch's theory is that the claim does not recite varying the rate for when a group or a loop 'is' performed. The claim language requires the plural: varying rate at which the non-ordered *steps are* performed, and thus requires varying the rate on more than one step." *Id.*

Plaintiff replies that "[n]othing in the claim language or the specification requires varying two or more of the non-ordered steps, and Defendants cite nothing to support it." Dkt. No. 49 at 9. Plaintiff argues:

> It is evident from the plain language of the claims that the rate at which the "non-ordered steps" 1(b) through 1(d) are performed can be varied by: performing none of the steps on a given image in the "series of images of a live video feed" (thereby failing to meet the claim) but performing all of them (and thereby meeting the claim language) on the next image, as opposed to performing all three steps on every image in the series. The rate could also be varied by omitting one of the steps (such as resizing) on a given image in the "series of images," or several of them, and then performing all three steps (and thereby meeting the claim language) on the next images. These all vary the rate at which the "non-ordered steps" 1(b) through 1(d) are performed.

Dkt. No. 49 at 9–10.

(b) Analysis

Claim 1 of the '109 Patent recites *no* requirement to perform multiple of (or all of) the following steps in a 1:1 ratio with respect to each other, such as by performing all three steps on the image before performing all three steps again on the same image (or a different image), and so forth:

> [b] flipping the image about a vertical axis so as to reverse right and left sides of the image;
>
> [c] applying a transformation mapping to the image to modify the image such that it appears to mimic a reflection of a mirror;
>
> [d] resizing the image to reduce variations caused by changes in object's distance to the camera

Thus, varying the rate of any individual one of these steps does not give rise to any contradiction or lack of reasonable clarity. Defendants' grammatical argument based on the reference to "the non-ordered steps" in the disputed term is unpersuasive. Defendants urge that "[t]he plain language of the claim is clear" that varying just one step is insufficient (Dkt. No. 47 at 22–23), but a reasonable reading of "varying the rate at which the non-ordered steps are performed" on its face is that "varying the rate" can apply to any or all of "the non-ordered steps." The opinions of Defendants' expert in this regard are unpersuasive. *See* Dkt. No. 47, Ex. 1, Sept. 13, 2024 Myler Decl. ¶¶ 73–74. This finding is also consistent with the specification, which for example discloses that the "frequency" or "speed" of transformation mapping may be varied:

> Another feature that may be implemented in any of the above described embodiments is the *frequency of transformation parameter update*. That is, at times the user may prefer a stable image when he is standing stationary in front of the screen that mimics the mirror. Having the transformation mapping engine change while user is stationary may create an uncomfortable feeling. On the other hand, when the user is moving faster toward or backward from the screen, it may be fine

> to update the transformation parameters faster. Accordingly, according to this feature, multiple behavior zones are established. According to one embodiment, the behavior zones are set according to distance only. For example, when the user is moving more than a set distance amount, the video engine is updated. According to one embodiment, if the user moved an amount of less than, say 25 cm, the *transformation mapping is performed at a lower speed*, say every x seconds, while if the user moved more than 25 cm, the transformation mapping is updating the parameters at a second, *faster speed*. According to another embodiment, the zones are set according to the user's movement speed. For example, if it is determined that the user is moving less than x cm/s, then a first transform updating frequency is implements, while if the user moves faster, a second, *faster updating frequency* is used.

'109 Patent at 27:41–49. Also of note, the step of "flipping the image about a vertical axis so as to reverse right and left sides of the image" does not appear to be affected by distance.

The Court therefore hereby expressly rejects Defendants' proposed construction. To whatever extent Defendants maintain any assertion that this term is indefinite (*see* Dkt. No. 41, Ex. A at 5), the Court hereby expressly rejects such assertion. Although Plaintiff proposes that this term be given its plain meaning, "[s]ome construction of the disputed claim language will assist the jury to understand the claims." *TQP*, 2012 WL 1940849, at *2. As noted above regarding the claim language, and as reinforced by the above-reproduced disclosure, Claim 1 of the '109 Patent does not require performing the steps in a 1:1 ratio with respect to each other, so varying a rate of one or more steps would suffice as "varying rate at which the non-ordered steps are performed."

The Court accordingly hereby construes "varying rate at which the non-ordered steps are performed on the series of images according to the distance" to mean **"varying rate at which one or more non-ordered steps are performed on the series of images according to the distance."**

6. "performing registration of the digital image with the reference image"

"performing registration of the digital image with the reference image" ('109 Patent, Claim 7[b])	
Plaintiff's Proposed Construction	**Defendants' Proposed Construction**
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"

Dkt. No. 41, Ex. A at 7; Dkt. No. 42 at 20; Dkt. No. 47 at 23; Dkt. No. 53, Ex. A at 15.

Shortly before the start of the December 6, 2024 hearing, the Court provided the parties with the following preliminary construction: "matching visible features of a captured image to corresponding visual features of the reference image."

(a) The Parties' Positions

Plaintiff argues that "Defendants' proposed construction inappropriately narrows the claim term by confining it to a single disclosed embodiment in which pointers are matched." Dkt. No. 42 at 20.

Defendants respond that "every embodiment for 'performing registration of the digital image with the reference image,' as claimed, requires matching pointers on a captured image to corresponding pointers on the reference image." Dkt. No. 47 at 24 (emphasis omitted) (citing '109 Patent at 17:29–46, 20:63–65, 21:8–10, 21:19–22, 21:61–22:1, 23:24–44, Figs. 10A–10B, 12, 16).

Plaintiff replies that "Defendants seek to inappropriately narrow this claim term by confining it to a single disclosed embodiment in which pointers are matched." Dkt. No. 49 at 10.

(b) Analysis

Claim 7 of the '109 Patent recites (emphasis added):

> 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.

Defendants argue that every embodiment for "performing registration of the digital image with the reference image," requires matching pointers on a captured image to corresponding pointers on the reference image. *See* '109 Patent at 17:29–46, 20:63–65, 21:8–10, 21:19–22, 21:61–22:1, 23:24–44, Figs. 10A–10B, 12, 16. For example, the specification discloses:

> According to yet another embodiment, a registration approach is used, which has been shown to provide rather accurate results. 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. Reference image can be generated from one multiple cameras with stitching. For example, 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. The registration will yield the best transformation to match the eyes and the full body based on multiple pointers. In one example, multiple pointers, e.g., white dotes [*sic*, dots], on a 2D or 3D calibration target, e.g., human/doll target will form a two-dimensional grid around central body. For example, circular stickers can be placed on the legs, on the chest, on the shoulders, on the eyes, etc. To improve accuracy, this registration can be repeated for multiple user locations/positions in front of the screen to account for, e.g., multiple spatial offsets from broadside, multiple heights, multiple distances, etc. For each location, the best mapping possible is created, assuming multiple distortions (projection, barrel, fisheye, or any combination, etc.) that can be corrected with multiple registration techniques (e.g., projection, affine transformation, similarity, polynomial, or any combination, etc.).
>
> * * *
>
> Once the reference image is obtained, another image is taken by placing the camera at its actual service location, e.g., above the screen, which will be referred to herein as the actual image. 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. From the registration information, the transformation that can best bring the distort[ed] image to the right eyes and body orientation is extracted. Also, based on actual installation geometry in the field, offsets or correction to the transformation can be added. Based on user distance and eyes point of view, an interpolation of the transformation at any location in front of the camera can be create[d].

'109 Patent at 17:29–54 & 21:22–26.

The disclosed "registration" thus determines an appropriate transformation between a "reference" image (obtained from a "reference" camera at a desired location relative to a user) and an "actual" image (obtained from a camera at a different, "service" location relative to a user) so that the transformed version of the "actual" image will appear to have been obtained from the "reference" camera. *See id.*

This disclosure involves using "pointers," such as "white dotes [sic, dots]," *id.*, but Plaintiff cites additional disclosure regarding registration in U.S. Patent Publication No. 2014/0225978 A1 (attached to Plaintiff's opening brief as Exhibit 6), which is listed among the "References Cited" on the face of the '109 Patent (and which issued as the '110 Patent). This reference is therefore intrinsic evidence. *See Powell v. Home Depot U.S.A., Inc.*, 663 F.3d 1221, 1231 (Fed. Cir. 2011) ("prior art cited in a patent or cited in the prosecution history of the patent constitutes intrinsic evidence"); *see also V-Formation, Inc. v. Benetton Group SpA*, 401 F.3d 1307 (Fed. Cir. 2005) (reference listed in patent among the "References Cited" was intrinsic evidence).

This intrinsic reference discloses that "registration mapping" can be performed by "identify[ing] element[s] in the image like head, hands, upper body[,] legs and match[ing] the movement of the avatar to these elements[']motion." Dkt. No. 42, Ex. 6 at [0168]. This remains true even if assuming for the sake of argument that Defendants are correct that the specification of the '109 Patent discloses only using pointers. Further, this disclosure in this intrinsic reference is probative of the meaning of the present "registration" term even if, as Defendants argue, the reference is read as not disclosing a "reference image," particularly when considering that the reference discusses "generat[ing] modified images that appear to be captured from a different point of view of the camera's actual point of view." *Id.* at Abstract.

The *Poly-America* and *Ultravision* cases cited by Defendants are unpersuasive in light of this evidence as well as in light of the general principle that, even if a patent describes only a single embodiment, the claims of the patent should not be limited to that embodiment. *Phillips*, 415 F.3d at 1323; *see Poly-Am., L.P. v. API Indus., Inc.*, 839 F.3d 1131, 1137 (Fed. Cir. 2016) ("[e]very embodiment described in the specification has inwardly extended short seals"); *see also Ultravision Techs., LLC v. Govision, LLC*, No. 22-1098, 2023 WL 2182285, at *4 (Fed. Cir. Feb. 23, 2023) ("[T]he specification's emphasis of a particular feature's importance to the invention can indicate what the patentee had claimed and disclaimed."). The opinion of Defendants' expert in this regard cites the specification with minimal analysis and thus is also unpersuasive. Dkt. No. 47, Ex. 1, Sept. 13, 2024 Myler Decl. ¶¶ 86–91. The Court hereby expressly rejects Defendants' proposed construction.

Although Plaintiff proposes that this term be given its plain meaning, "[s]ome construction of the disputed claim language will assist the jury to understand the claims." *TQP*, 2012 WL 1940849, at *2. Shortly before the start of the December 6, 2024 hearing, the Court provided the parties with its preliminary construction: "matching visible features of a captured image to corresponding visual features of the reference image." At the hearing, the parties presented no objection or oral argument regarding this construction.

The Court accordingly hereby construes "performing registration of the digital image with the reference image" to mean **"matching visible features of a captured image to corresponding visible features of the reference image."**

7. "adaptive transformation mapping"

"adaptive transformation mapping" ('110 Patent, Claim 1[c])	
Plaintiff's Proposed Construction	**Defendants' Proposed Construction**
"a selected set of image transformations based on what is detected in the stream of images"	"a transformation mapping whose parameters are continuously variable"

Dkt. No. 41, Ex. A at 8; Dkt. No. 42 at 22; Dkt. No. 47 at 26; Dkt. No. 53, Ex. A at 16.

Shortly before the start of the December 6, 2024 hearing, the Court provided the parties with the following preliminary construction: "continuously variable transformation mapping."

(a) The Parties' Positions

Plaintiff argues that "[t]he plain language of the claims confirms that the claimed transformation mapping is 'adaptive' because it is based on, and adapts to, what is detected in the captured images." Dkt. No. 42 at 22. Plaintiff also argues that "Defendants' attempt to limit 'adaptive' transformation mappings to continuously varied parameters in real-time would exclude embodiments in which transformation mapping is *not* performed in real time." *Id.* at 24.

Defendants respond that the specification of the '109 Patent defines "adaptive" as "continuously variable," and Defendants note that the '110 Patent incorporates-by-reference the '109 Patent. Dkt. No. 47 at 26. Defendants also argue that "[i]t is well settled that a claim need not read on all embodiments described in a patent." Dkt. No. 47 at 27.

Plaintiff replies that Defendants are relying on a disclosure regarding "adaptive FOV [(field of view)]," which Plaintiff argues is in a context different from "adaptive transformation mapping." Dkt. No. 49 at 11–12.

(b) Analysis

The disputed term appears in Claim 1 of the '110 Patent, which recites (emphasis 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.

On one hand, Plaintiff argues that the meaning of "adaptive" is self-evident in the context of this claim because, Plaintiff argues, the method can be said to be "adapting" to the "stream of images of the user" by detecting what is in the stream of images and operating accordingly.

On the other hand, the '110 Patent incorporates-by-reference the '109 Patent, and the specification of the '109 Patent discloses:

> 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. According to one embodiment, this is solved by using the camera's zoom (digital and/or mechanical). Traditional cameras have fixed FOV or mechanically tunable FOV. In order to create an *adaptive, i.e., continuously variable,* FOV the system needs to manipulate the resolution, or to control the camera zoom and focus in real-time, based on user tracking.

'109 Patent at 14:29–39 (emphasis added). Defendants argue that this constitutes a definition of "adaptive" as meaning "continuously variable," and Defendants cite the following disclosures as additional support:

> As explained with reference to FIG. 6, it may be too complex or expensive to place the camera behind the display at eye level. Therefore, in the following embodiments a practical method is provided 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 for the image distortions *adaptively* and in real time, so as to create similar user experience as we would get in the ideal setup. FIGS. 7 and 8 show some examples of the challenges of using the practical setup with the camera placed above the digital screen, i.e., not corresponding to the user's eye level.
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> * * *
>
> 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. 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*.
>
> * * *
>
> According to one embodiment, the computerized method further performs dynamic adaptive image stitching of images obtained from a plurality of cameras. According to this embodiment, the system incorporate[s] multiple cameras, e.g., positioned at different locations and/or based on multiple technologies/characteristics, so as to improve the image resolution, accuracy of the image, extend the FOV of a single camera, reduce distortion for different users and different orientation of user, and create a better model for the user body mesh to compensate the camera's distortion. For example, because the image loses resolution as the user moves away from the screen (fewer pixels capture the user's image), it make sense to optically zoom and refocus the camera. The problem is that it comes at the expense of shrinking the camera's FOV. In order to improve resolution while maintaining FOV, a stitching or dynamic zoom can be implemented concurrently.
>
> 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. In addition, it reduces the asymmetric distortion that can occur if the camera is mounted on the side of the screen.

Id. at 15:4–15, 15:48–58 & 16:8–31 (emphasis added).

In general, "the usage 'i.e.' ('id est' or 'that is'), 'signals an intent to define the word to which it refers.'" *TF3 Ltd. v. Tre Milano, LLC*, 894 F.3d 1366, 1372 (Fed. Cir. 2018) (quoting *Edwards Lifesciences LLC v. Cook Inc.*, 582 F.3d 1322, 1334 (Fed. Cir. 2009)); *see TF3*, 894

F.3d at 1372 ("'i.e.' is definitional when it 'comports with the inventors' other uses . . . in the specification and with each and every other reference") (quoting *SkinMedica, Inc. v. Histogen Inc.*, 727 F.3d 1187, 1202 (Fed. Cir. 2013)).

Plaintiff argues that the above-reproduced "i.e." disclosure relied upon by Defendants (*id.* at 14:29–39) relates to adaptive field-of-view correction, not "adaptive transformation mapping," and Plaintiff cites authority that "i.e." is not definitional when other disclosures in the specification suggest a broader meaning. *See Pfizer, Inc. v. Teva Pharms. USA, Inc.*, 429 F.3d 1364, 1375 (Fed. Cir. 2005) ("when read in the context of the entire . . . patent, the reference to 'saccharides (i.e., sugars)' does not constitute a definition of 'saccharides'"). Plaintiff also cites other disclosures regarding what Plaintiff refers to as adapting, such as that "when the user is moving faster toward or backward from the screen, it may be fine to update the transformation parameters faster." '109 Patent at 27:41–49; *see id.* at 27:64–28:4 ("transformed parameters can vary in a semi-real time"); *see also id.* at 29:59–30:33 (scaling image based on using "interpupillary distance (IPD)" or "other body parts").

The disclosures cited by Plaintiff, however, do not undermine the patentee's definition of "adaptive" as meaning "continuously variable." For example, the parties have not shown that "continuously variable" necessarily requires any particular rate, whether "real time," "semi-real time," or otherwise. Other usages of "adaptive" in the specification likewise are not inconsistent with the patentee's definition set forth by "i.e." *See* '109 Patent at 15:4–15, 15:48–58 & 16:8–31 (reproduced above).

At the December 6, 2024 hearing, Plaintiff reiterated its concern that "Defendants' attempt to limit 'adaptive' transformation mappings to continuously varied parameters in real-time would

exclude embodiments in which transformation mapping is not performed in real time." Dkt. No. 42 at 24.

Defendants responded at the hearing that Defendants do not contend that "continuously variable" means "real time."

Any remaining dispute regarding the application of "continuously variable" in the context of the accused instrumentalities presents a factual dispute regarding infringement rather than any legal question for claim construction. *See PPG*, 156 F.3d at 1355 ("after the court has defined the claim with whatever specificity and precision is warranted by the language of the claim and the evidence bearing on the proper construction, the task of determining whether the construed claim reads on the accused product is for the finder of fact"); *see also Acumed*, 483 F.3d at 806 ("[t]he resolution of some line-drawing problems . . . is properly left to the trier of fact") (citing *PPG*, 156 F.3d at 1355); *Eon*, 815 F.3d at 1318–19 (citing *PPG*, 156 F.3d at 1355; citing *Acumed*, 483 F.3d at 806).

The Court therefore hereby construes "adaptive transformation mapping" to mean **"continuously variable transformation mapping."**

8. "mirror tracking mode"

"mirror tracking mode" ('110 Patent, Claim 1[f])	
Plaintiff's Proposed Construction	**Defendants' Proposed Construction**
"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 approximately double the distance from the camera and the reflection maintains approximately the same size regardless of the user movement"[4]

Dkt. No. 41, Ex. A at 10; Dkt. No. 42 at 24; Dkt. No. 47 at 27; Dkt. No. 53, Ex. A at 17.

Shortly before the start of the December 6, 2024 hearing, the Court provided the parties with the following preliminary construction: "a mode of operation in which the user sees their reversed reflection appearing at approximately double the distance from the camera and the reflection maintains approximately the same size regardless of the user movement."

(a) The Parties' Positions

Plaintiff argues that "Defendants' proposed construction omits the word 'tracking' entirely and gives it no meaning," and "[i]nstead, Defendants propose the same wrong construction here as proposed for 'it appears to mimic a reflection of a mirror' in the 109 Patent," which "would improperly exclude disclosed embodiments." Dkt. No. 42 at 24–25.

Defendants respond that "[b]ased on the intrinsic evidence and for at least the basis underlying the 'it appears to mimic a reflection of a mirror' construction [discussed above], a POSA would understand 'mirror tracking mode' to include similar requirement to mimic the reflection of a mirror in this mode." Dkt. No. 47 at 28.

[4] Defendants added the word "approximately" to their proposal in their Responsive Claim Construction Brief. *See* Dkt. No. 47 at 27 & n.16.

Plaintiff replies by incorporating its arguments as to "it appears to mimic the reflection of a mirror," discussed above, and Plaintiff also argues that Defendants' proposal fails to give meaning to the word "tracking." Dkt. No. 49 at 13.

(b) Analysis

The disputed term appears in Claim 1 of the '110 Patent, which recites (emphasis 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.

The specification does not use the phrase "mirror tracking mode." The '109 Patent (which the '110 Patent incorporates-by-reference) discloses, for example:

> We now present discussions relating to embodiment of using an image captured by a camera, e.g., a digital still or video camera, and manipulating the image such that when it is projected on a screen it resembles a mirror image, i.e., an image the user would have seen if the screen was actually a standard mirror.
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> Whether the system operates in a display or mirror mode can be considered as a temporal issue: during mirror mode, the image that is being shown on the monitor is a transformed image of what the camera sees at that particular moment (or at a de minimis or unnoticeable earlier time), while during display mode the image that is being shown is a transformed image of what the camera or other camera saw earlier and is different than what the camera sees now. This issue also relates to perception: 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, while during the display mode the user observing the monitor has the perception of observing a video of events that took place in the past.

'109 Patent at 14:6–11 & 28:24–37. The '110 Patent discloses, for example:

> Some of the functionality of the trigger event is to calculate the image transformation based on geometric information, calibration, and/or *real-time user tracking*, e.g., location of the user, eyes, head, hands, position, movement and the like. The tracking can be done using one or more techniques such as background substation, pattern recognition, color segmentation, and the like.
>
> * * *
>
> [S]tills or video from device 601 can be input into an image grabbing module 602. The image grabbing module 602 can be controlled by a trigger event such as those previously described and processed by trigger event module 607, which can provide *tracking information* and rules to initiate an image grabbing process. Specifically, the image grabbing module 602 can grab the image from the input 601 and push it into the EyesMatch transformation module 603 with the additional *tracking information (real time geometric measurement)*. Based on the tracking information and the event requirement, the EyesMatch transformation module 603 can calculate a transformation to manipulate with the camera point of view, angle of view, and the like to create a calibrated image of the scene.

'110 Patent at 10:34–41 & 21:67–22:12 (emphasis added); *see* '109 Patent at 9:36–39 ("an automatic tracking algorithm which may follow, for example, the position of user 111 and/or imaging attributes such as focus, camera position, capturing angle, dynamic range and the like").

For essentially the same reasons set forth regarding the term "it appears to mimic a reflection of a mirror" (discussed above), the Court adopts Defendant's proposed construction except that the Court replaces "approximately" with "roughly." Because that construction inherently involves some element of tracking, as reinforced by the above-reproduced disclosures, Plaintiff's argument that Defendant's proposed construction fails to give meaning to the word "tracking" is unpersuasive.

The Court accordingly hereby construes "mirror tracking mode" to mean **"a mode of operation in which the user sees their reversed reflection appearing at roughly double the distance from the camera and the reflection maintains roughly the same size regardless of the user movement."**

9. "utilizes the angle of the images captured by the camera"

"utilizes the angle of the images captured by the camera" ('110 Patent, Claim 1[f])	
Plaintiff's Proposed Construction	**Defendants' Proposed Construction**
"utilizes the angle of the user's image captured by the camera"	Indefinite

Dkt. No. 41, Ex. A at 11; Dkt. No. 42 at 26; Dkt. No. 47 at 28; Dkt. No. 53, Ex. A at 18.

Shortly before the start of the December 6, 2024 hearing, the Court provided the parties with the following preliminary construction: "utilizes the camera angle of the camera that is generating the stream of images of the user."

(a) The Parties' Positions

Plaintiff argues that "Defendants contend that a POSITA would not understand what meaning 'the angle of the images captured by the camera' should be given, but this cannot be squared with the specification, which describes various attributes of the image, expressed as an angle, which include or describe the user's image, as Plaintiff's construction describes." Dkt. No. 42 at 26.

Defendants respond: "This term first appears in the last limitation of claim 1 of the '110 Patent without any prior recitation of 'an angle of images captured by the camera.' The term 'angle' appears in a preceding limitation of claim 1; however, this 'angle' is a 'different angle' and not 'the angle of the images captured by the camera' in this limitation." Dkt. No. 47 at 28.

Defendants argue that "[w]ith no clear antecedent basis, a POSA is left to guess as to what 'the angle of the images captured by the camera' means." *Id.* Defendants conclude that "this is not simply a question of breadth" but rather renders the claim indefinite. *Id.* at 30.

Plaintiff replies that "'[*t*]*he* images' finds antecedent basis in 110 Patent step 1(a), reciting 'operating the camera to generate a stream of images of the user,' which is further confirmed by the entirety of the claim language at issue, which recites that 'the processor utilizes the angle of the images *captured by the camera*.'" Dkt. No. 49 at 14. Plaintiff argues that "'the angle of the images' refers to a characteristic of the images captured by the camera, and the specification teaches that 'the angle' of these images encompasses the FOV and POV." *Id.* Plaintiff urges that "both angles [(FOV and POV)] of the user's image are amply disclosed in the specification." *Id.* at 15.

(b) Analysis

The disputed term appears in Claim 1 of the '110 Patent, which recites (emphasis 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.

On one hand, "a claim c[an] be indefinite if a term does not have proper antecedent basis where such basis is not otherwise present by implication or the meaning is not reasonably ascertainable." *Halliburton Energy Servs., Inc. v. M-I LLC*, 514 F.3d 1244, 1254 (Fed. Cir. 2008).

On the other hand, "[w]hen the meaning of the claim would reasonably be understood by persons of ordinary skill when read in light of the specification, the claim is not subject to invalidity upon departure from the protocol of 'antecedent basis.'" *See Energizer Holdings, Inc. v. Int'l Trade Comm'n*, 435 F.3d 1366, 1369–70 (Fed. Cir. 2006) (discussing *Bose Corp. v. JBL, Inc.*, 274 F.3d 1354, 1359 (Fed. Cir. 2001)).

Here, reading "the angle of the images captured by the camera" in the context of the entire claim—particularly the recitals of "generat[ing] modified images that appear to be captured from a different point of view of the camera's actual point of view" and "a different angle and a different distance than the actual images captured by the camera"—the claim is reasonably clear that "the angle" is an inherent aspect of the "images captured by the camera."

The specification of the '109 Patent (which the '110 Patent incorporates-by-reference) reinforces this understanding, disclosing for example the use of "tilt" and "triangulation":

> Another feature illustrated in FIG. 13 is distance calculation. Since the position and *tilt* of the camera 14 with respect to the screen 12 are known (e.g., due to fixed bracket attaching the camera to the top of the screen), the image captured by the camera 14 can be used for *triangulation* and distance calculation. For example, when a user appears in a frame of a live video stream captured by camera 14, *triangulation* to the tips of the user's shoes can be performed in order to calculate the user's distance to the screen 12.

'109 Patent at 24:63–25:4 (emphasis added); *see id.* at Fig. 13. This "tilt" is readily apparent in Figure 13, and because "tilt" and "triangulation" inherently involve angles, this disclosure reinforces that, in the context of the claimed invention, images captured by a camera are associated with an angle.

The '110 Patent likewise discloses:

> With the factory calibration module 109, some of the information needed to calculate the transformation to be applied on the image/video can be generated during factory calibration or can be calculated based on additional information on the actual orientation of the camera in the field, e.g., height above the floor or desk and the like, 3D point of view, lens field of view (FOV), and the like.

'110 Patent at 10:48–54.

The Court therefore hereby expressly rejects Defendants' indefiniteness argument because the disputed term is reasonably clear as referring to utilizing the camera angle of the camera that is generating the stream of images of the user. The opinions of Defendants' expert to the contrary are unpersuasive. *See* Dkt. No. 47, Ex. 1, Sept. 13, 2024 Myler Decl. ¶ 102 ("A POSITA understands that images are made up of pixel units and do not inherently include any angle-related information."); *see also id.* at ¶¶ 101–105.

Shortly before the start of the December 6, 2024 hearing, the Court provided the parties with its preliminary construction: "utilizes the camera angle of the camera that is generating the stream of images of the user." At the hearing, the parties presented no objection or oral argument regarding this construction.

The Court thus hereby construes "utilizes the angle of the images captured by the camera" to mean **"utilizes the camera angle of the camera that is generating the stream of images of the user."**

V. CONCLUSION

The Court adopts the constructions set forth in this opinion for the disputed terms of the patent-in-suit. The parties are ordered that they may not refer, directly or indirectly, to each other's claim construction positions in the presence of the jury. Likewise, the parties are ordered to refrain from mentioning any portion of this opinion, other than the actual definitions adopted by the Court,

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in the presence of the jury. Any reference to claim construction proceedings is limited to informing the jury of the definitions adopted by the Court.

SIGNED this 11th day of December, 2024.

ROY S. PAYNE
UNITED STATES MAGISTRATE JUDGE

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