IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

ROBOTICVISIONTECH, INC., Plaintiff, v. ABB INC., Defendant.	C. A. No. 22-cv-1257-GBW

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MEMORANDUM OPINION

Date: June 26, 2024

GREGORY B. WILLIAMS
UNITED STATES DISTRICT JUDGE

Before the Court is RoboticVisionTech, Inc. ("RVT") and ABB Inc's. ("ABB") joint request for construction of United States Patent Nos. 8,095,237 (the "'237 patent"), 6,816,755 (the "'755 patent"), and the 7,336,814 (the "'814 patent") (collectively, the "Asserted Patents"). *See* D.I. 98. The Asserted Patents generally relate to systems and methods for 3D vision guided robotics using a single camera. *See generally*, *e.g.*, '755 patent 1:7-30. The Court has reviewed the parties' briefing, D.I. 98, and construes the claims at-issue as set forth below.

I. LEGAL STANDARDS

"'[T]he claims of a patent define the invention to which the patentee is entitled the right to exclude.'" *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (en banc) (citation omitted); *Aventis Pharms. Inc. v. Amino Chemicals Ltd.*, 715 F.3d 1363, 1373 (Fed. Cir. 2013) (same). "[T]here is no magic formula or catechism for conducting claim construction." *Phillips*, 415 F.3d at 1324. The Court is free to attach the appropriate weight to appropriate sources "in light of the statutes and policies that inform patent law." *Id.* The ultimate question of the proper construction of a patent is a question of law, although "subsidiary factfinding is sometimes necessary." *Teva Pharm. USA, Inc. v. Sandoz, Inc.*, 574 U.S. 318, 326–27 (2015); *see Markman v. Westview Instruments, Inc.*, 517 U.S. 370, 372 (1996) ("the construction of a patent . . . is exclusively within the province of the court.").

"The words of a claim are generally given their ordinary and customary meaning as understood by a person of ordinary skill in the art when read in the context of the specification and

prosecution history." *Thorner v. Sony Comput. Entm't Am. LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012) (citing *Phillips*, 415 F.3d at 1313); *Unwired Planet, LLC v. Apple Inc.*, 829 F.3d 1353, 1358 (Fed. Cir. 2016) (similar). The "'only two exceptions to this general rule'" are (1) when a patentee defines a term or (2) disavowal of "'the full scope of a claim term either in the specification or during prosecution.'" *Thorner*, 669 F.3d at 1365 (citation omitted).

The Court "'first look[s] to, and primarily rel[ies] on, the intrinsic evidence,'" which includes the claims, written description, and prosecution history and "'is usually dispositive.'" *Personalized Media Commc'ns, LLC v. Apple Inc.*, 952 F.3d 1336, 1340 (Fed. Cir. 2020) (citation omitted). "[T]he specification ' . . . is the single best guide to the meaning of a disputed term.'" *Akzo Nobel Coatings, Inc. v. Dow Chem. Co.*, 811 F.3d 1334, 1340 (Fed. Cir. 2016) (citation omitted). "'[T]he specification may reveal a special definition given to a claim term by the patentee that differs from the meaning it would otherwise possess.' When the patentee acts as its own lexicographer, that definition governs." *Cont'l Cirs. LLC v. Intel Corp.*, 915 F.3d 788, 796 (Fed. Cir. 2019) (quoting *Phillips*, 415 F.3d at 1316). However, "'[the Court] do[es] not read limitations from the embodiments in the specification into the claims.'" *MasterMine Software, Inc. v. Microsoft Corp.*, 874 F.3d 1307, 1310 (Fed. Cir. 2017) (citation omitted)). The "written description . . . is not a substitute for, nor can it be used to rewrite, the chosen claim language." *SuperGuide Corp. v. DirecTV Enters., Inc.*, 358 F.3d 870, 875 (Fed. Cir. 2004).

The Court "should also consider the patent's prosecution history, if it is in evidence." *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 980 (Fed. Cir. 1995), *aff'd*, 517 U.S. 370; *Cont'l Cirs.*, 915 F.3d at 796 (same). The prosecution history may "'demonstrat[e] how the inventor understood the invention and whether the inventor limited the invention in the course of

prosecution . . . ." *SpeedTrack, Inc. v. Amazon.com*, 998 F.3d 1373, 1377 (Fed. Cir. 2021) (quoting *Phillips*, 415 F.3d at 1317).

The Court may "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*, 574 U.S. at 331. "Extrinsic evidence consists of all evidence external to the patent and prosecution history, including expert and inventor testimony, dictionaries, and learned treatises." *Markman*, 52 F.3d at 980; *Phillips*, 415 F.3d at 1317 (same). Extrinsic evidence may be useful, but it is "less significant than the intrinsic record in determining the legally operative meaning of claim language." *Cont'l Cirs.*, 915 F.3d at 799 (internal quotation marks and citations omitted). However, "[p]atent documents are written for persons familiar with the relevant field . . . . Thus resolution of any ambiguity arising from the claims and specification may be aided by extrinsic evidence of usage and meaning of a term in the context of the invention." *Verve, LLC v. Crane Cams, Inc.*, 311 F.3d 1116, 1119 (Fed. Cir. 2002); *see Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898, 899 (2014) (explaining that patents are addressed "to those skilled in the relevant art").

II. AGREED-UPON TERMS

The parties agree on the construction for the following twenty-seven (27) terms. D.I. 98.

Term	Claims	Agreed Construction
"transformation"	'237 patent, claims 1, 2, 9-11, 14, 15, 17, 20, 21, 25 '755 patent, claims 1, 6, 8, 15, 18, 19	"three-dimensional rotation & translation between two spaces"
"camera space"	'237 patent, claims 1, 2, 9-11, 14, 15, 17, 20, 21, 25 '755 patent, claims 1, 8, 18, 19	"a reference frame defined with respect to a point on, and therefore rigid to, the camera"
"training space"	'237 patent, claims 2, 9, 20, 25 '755 patent, claims 1, 18	"a reference frame defined with respect to a point on the calibration template, and aligned to its main axes"
"teaching object"	'237 patent, claims 12, 13, 21	"object used for teaching"
"calibration object"	'237 patent, claims 2-5, 7-11, 20, 25	"object used for calibration"
"object space"	'237 patent, claims 1, 12, 14, 17, 20, 25 '755 patent, claims 1, 8, 18, 19	"a reference frame defined with respect to, and therefore rigid to, the object"
"object frame"	'237 patent, claims 15-17 '755 patent, claims 1, 6, 8, 15, 18, 19	"a reference frame defined with respect to a point on, and therefore rigid to, the object"

"tool"	'237 patent, claims 10, 11, 15 '755 patent, claims 1, 6, 8, 15, 18, 19	"the tool the robot is using for performing the handling, cutting or other robotic operations, having an operating end or 'end-effector'"
"tool space" or "tool frame reference frame"	'237 patent, claims 10, 11, 15	"a reference frame defined with respect to a point on, and oriented along the direction of the end-effector and therefore rigid to, the tool"
"tool frame"	'755 patent, claims 1, 8, 18, 19	"a reference frame defined with respect to a point on, and oriented along the direction of the end-effector and therefore rigid to, the tool"
"robot space"	'755 patent, claims 1, 8, 18, 19	"a reference frame defined with respect to a point on the robot and therefore rigid to the robot"
""tool' position"	'755 patent, claims 1, 8, 18, 19	No construction necessary; not the same as "tool frame."
"means for calibrating the camera . . ." AND "means for estimating a pose of a target object . . ."	'237 patent, claims 20-28	Claims do not invoke 35 U.S.C. §112(6).
"position the camera so that it appears orthogonal to the object"	'755 patent, claims 1, 8, 18, 19	"position the camera so that it appears at a right angle to the object"
"calibration means for calibrating the camera . . ." "means for teaching the object features . . ." "means for carrying out object finding and positioning . . ."	'755 patent, claims 18, 19	Claims do not invoke 35 U.S.C. §112(6).

"pose"	'755 patent, claims 7, 17	"position and orientation"
"training object"	'814 patent, claims 1, 7, 13, 19, 23, 25- 29, 33, 35, 38	"object used for training"
"intrinsic parameters"	'237 patent, claims 2, 8, 20, 25 '755 patent, claims 1, 8, 18, 19	"parameters intrinsic to camera, such as focal length, image center, real pixel size, and radial and tangential distortion of the camera lens."
"determining a number of additional views to be obtained based at least in part on the number of image sensors, the number of features identified, the number of features having an invariant physical relationship associated thereto, and a type of the invariant physical relationship associated with the features, sufficient to provide a system of equations and unknowns where the number of unknowns is not greater than the number of equations"	'814 patent, claims 1, 7, 13, 19, 23, 33	"determining a number of additional views to be obtained based on at least all of the following: (1) the number of image sensors, (2) the number of features identified, (3) the number of features having an invariant physical relationship associated thereto, and (4) the type of invariant physical relationship associated with the features. The number of additional views is sufficient to provide a system of equations and unknowns where the number of unknowns is not greater than the number of equations."
"determining a number of additional views to be obtained based at least in part on the number of image sensors acquiring at least one image and the number of features of the training object identified"	'814 patent, claim 35	"determining a number of additional views to be obtained based on at least all of the following: (1) the number of image sensors acquiring at least one image, and (2) the number of features of the training object identified."

"local model"	'814 patent: claims 23, 27, 28, 33, 35, 37, 38	A model that contains information about certain features and that corresponds to an image sensor.
"extrinsic parameters"	'237 patent, claims 2, 9, 20, 25	Parameters describing the camera's position and orientation.
"finding the 'Object Space to Camera Space' transformation in the same way as step d)"	'755 patent, claims 8, 19 (step iii)	Not indefinite.
"processor-readable medium storing instructions for facilitating machine-vision of objects having invariant physical relationships between a number of features on the objects, by..."	'814 patent, claim 7	Not indefinite. Plain and ordinary meaning.
"target object"	'237 patent, claims 1, 17, 20, 24, 25, 28; '755 patent, claims 8, 19; '814 patent, claims 7, 22, 28, 29, 33, 38	The object that the robot will be manipulating or otherwise interacting with after calibration.
Equations or inequalities	'814 patent, claims 5, 11, 17, 20, 24, 36	Not indefinite. Plain and ordinary meaning.
"112 ¶ 4 issues"	'237 patent, claims 14, 22-23, 26, 27	No construction necessary.

III. DISPUTED TERMS

The following ten (10) terms are in dispute, require construction, and are construed as set forth below for the following reasons:

1. **"Preamble: "A [method] useful in three-dimensional pose estimation for use with a single camera mounted to a moveable portion of a robot" ('237 patent, claim 1)"**

Term No.	Claim Term	Plaintiff's Proposed Construction	Defendants' Proposed Construction	Court's Construction
1	"Preamble: "A [method] useful in three-dimensional pose estimation for use with a single camera mounted to a moveable portion of a robot" ('237 patent, claim 1)	Preamble is not limiting. Plain and ordinary meaning, which does not exclude methods that use more than one camera or those that are not used in three- dimensional pose estimation.	Preamble is limiting. Excludes methods that use more than one camera and those that are not used in three-dimensional pose estimation (*i.e.*, estimating position and orientation of object)	Preamble is limiting. Plain and ordinary meaning, which does not exclude methods that use more than one camera or those that are not used in three-dimensional pose estimation. A single camera must perform each step of the claimed method.

The parties dispute whether claim 1 of the '237 patent covers methods that use more than one camera, or are used for tasks other than three-dimensional pose estimation.

ABB argues that the preamble is limiting, and requires that the method of claim 1 of the '237 patent (1) employ a single camera, and (2) be used in three-dimensional pose estimation. D.I. 98 at 8. RVT disagrees, and argues that the preamble is not a limitation, because it merely indicates that the claimed method is *useful* for 3D-pose estimation using a single camera. *Id.* In other words,

RVT argues, "choosing to add more cameras or choosing to use the method for 2D-pose estimation does not take the method outside the scope of this open-ended comprising claim." *Id.*

The Court agrees with ABB that the preamble is limiting. The invention described in the '237 patent is "a method and apparatus for single image three dimensional vision guided robotics" using a single camera. *See, e.g.*, D.I. 76-6, 15, 52-53 ("Applicants' claims are directed to methods ... that employ single camera three-dimensional (3-D) vision for robotic guidance."). The "single camera" that captures the "single image" is recited only in the preamble. Also, many of the dependent claims of the '237 patent rely on the "single camera" recited in the preamble for antecedent basis. Thus, the preamble is limiting because it is necessary to give "life, meaning, and vitality" to the claims. *Pitney Bowes, Inc. v. Hewlett-Packard Co.*, 182 F.3d 1298, 1305 (Fed. Cir. 1999).

Accordingly, the Court finds that a single camera must be used to perform each limitation of the claimed method. Both parties appear to agree that the claimed method requires that one camera perform each limitation of the claimed method. *Compare* D.I. 98 at 19 (RVT's Reply) ("One of skill in the art would understand the claim to cover a multi-camera system wherein one or more of the cameras uses the claimed single-camera method instead of a stereo vision method.") *with id.* (ABB's Sur-Reply) ("A process with additional steps is still within the claim scope. What is not within the claims—to use RVT's phrasing—are methods using 'cameras in the plural' or 'two cameras.'"). However, the parties disagree with respect to whether that limitation is properly reflected in the parties' proposed constructions. RVT argues that ABB's construction reads out methods that add more cameras (even if one of those cameras practices the claimed single-camera method), while ABB argues that RVT's proposed construction does not require a single camera to practice each limitation of the claimed method. Accordingly, to make clear that the claimed

method (1) requires a single camera to perform each step of the claimed method, but (2) is not limited to only those methods that employ a single camera, the Court construes the preamble as "Plain and ordinary meaning, which does not exclude methods that use more than one camera or those that are not used in three-dimensional pose estimation. A single camera must perform each step of the claimed method."[1]

2. "a single camera operable to capture a number of images of a calibration object" ('237 patent, claims 20, 25)

Term No.	Claim Term	Plaintiff's Proposed Construction	Defendants' Proposed Construction	Court's Construction
2	"a single camera operable to capture a number of images of a calibration object" ('237 patent, claims 20, 25)	Plain and ordinary meaning, which is that there must be "one camera that can capture one or more images of a calibration object." But it does not exclude apparatuses that have other cameras.	Excludes apparatuses that have more than one camera.	Plain and ordinary meaning, which is that there must be "one camera that can capture one or more images of a calibration object." But it does not exclude apparatuses that have other cameras.

For the reasons stated above (§III.1), the Court adopts RVT's proposed construction of "a single camera operable to capture a number of images of a calibration object." The claims

[1] The Court is not convinced by ABB's argument that the preamble "excludes methods that ... are not used in three- dimensional pose estimation (i.e., estimating position and orientation of object)." While the preamble explains that the claimed method is useful for 3D pose estimation, nothing in the plain language of the claim suggests that the claimed method can be used only for 3D pose estimation. *See generally* '237 patent.

require the apparatus to possess a single camera that performs each of the steps of the claimed method, but do not exclude apparatuses that contain multiple cameras.

3. **Preamble: "A method of [system for] three-dimensional handling of an object by a robot using a tool and one camera mounted on the robot" ('755 patent, claims 1, 8, 18, 19)**

Term No.	Claim Term	Plaintiff's Proposed Construction	Defendants' Proposed Construction	Court's Construction
3	Preamble: "A method of [system for] three-dimensional handling of an object by a robot using a tool and one camera mounted on the robot" ('755 patent, claims 1, 8, 18, 19)	Preamble is not limiting. Plain and ordinary meaning, which does not exclude methods or systems that use more than one camera or do not use a tool.	Preamble is limiting. Excludes methods/systems that use more than one camera and do not use a tool.	Preamble is limiting. A single camera must perform each limitation of the claimed method.

The Court agrees with ABB that the preamble of the '755 patent is limiting. D.I. 98 at 20-21. The preamble recites "a robot using a tool and one camera mounted on the robot," and the claims rely on the "tool" and "camera" for antecedent basis. *E.g.*, '755 patent, claim 1. Thus, the preamble is limiting because it is necessary to give "life, meaning, and vitality" to the claims. *Pitney Bowes,* 182 F.3d at 1305 (Fed. Cir. 1999). And, for the same reasons described in §III.1 of the Court's Opinion with respect to the '237 patent, the Court finds that the claimed method of the '755 patent requires a single camera to perform each step of the claimed method, but is not limited to only those methods that employ a single camera.

The Court does not find it necessary to specify that the claimed method "excludes methods/systems that ... do not use a tool." The plain language of the claims recite methods/systems that use a tool. *E.g.*, claim 1 ("calibrating the camera by finding," *inter alia*, "the

position of the camera relative to the tool of the robot ('hand-eye' calibration)"). As a result, incorporating that limitation into the Court's construction of the preamble is unnecessary, because it would be redundant. Accordingly, the Court construes the preamble as limiting, and specifies that "a single camera must perform each limitation of the claimed method."

4. "an image" and "the image" in the carrying out step (iii) ('755 patent, claims 1, 8, 18, 19)

Term No.	Claim Term	Plaintiff's Proposed Construction	Defendants' Proposed Construction	Court's Construction
4	"an image" and "the image" in the carrying out step (iii) ('755 patent, claims 1, 8, 18, 19)	Plain and ordinary meaning, which is "an image" but it does not limit the claim to only one image.	Limited to "no more than one image."	Multiple images may be taken as part of the "carrying out step (iii)," but a single image must be used to locate the at least six features.

The object finding and positioning step of the invention described in the '755 patent involves capturing an image of a target object, using that image to identify multiple features of the object, and calculating the object location as the transformation between the 'object space' and the 'camera space.' *Id.*, 8:1-33. Because the invention uses only a single camera, the robot moves around the object until it can obtain an image from which a sufficient number of features can be identified. *E.g.*, '755 patent, 10:51-53. Once enough features are identified, "the positions of features from the image" are used to compute "the object location as the transformation between

the 'object space' and 'camera space.'"[2] *Id.*, 10:54-58. Thus, the transformation is computed using feature positions from one image taken by the one camera.

The claims require "at least 6 visible features" to be identified from "an image." *See id.*, claim 1. The relevant portion of claim 1 (step iii)), for example, states:

> iii) carrying out object finding and positioning by
>
> a) positioning the robot in a predefined position above the bin containing the object and capturing an image of the object;
>
> b) if an insufficient number of selected features are in the field of view, moving the robot until at least 6 features can be located;
>
> c) with the positions of features from the image and their corresponding positions in "Object Space" as calculated in the training step, computing the object location as the transformation between the "Object Space" and "Camera Space"

'755 patent, claim 1. The parties dispute whether the claims require that those "at least 6 features" be identified from a single image. RVT argues that "the term 'a' or 'an' in patent parlance means 'one or more.'" (citing *Baldwin Graphic Sys., Inc. v. Siebert, Inc.*, 512 F.3d 1338, 1342 (Fed. Cir. 2008)). RVT also argues that the claim language contemplates "the camera mov[ing] and tak[ing] successive images of the object until it captures enough features (as recited in limitations (iii)(a) and (b))." D.I. 98 at 23. ABB disagrees, and argues that the method allows for "capturing multiple images until an acceptable one is found," but requires that "step (iii)'s computations are performed using only one image." *Id.* at 24.

The Court agrees with ABB that step iii)'s computations are performed using only one image, and that multiple images can be captured until a suitable single image is found. "*Baldwin*

[2] The "object space" is "the 3D position of each feature relative to a coordinate system rigid to the object," *id.*, 2:2-4, and the "camera space" is "a reference frame defined with respect to a point on, and therefore rigid to, the [one] camera 16." *Id.*, 3:63-64.

does not set a hard and fast rule that 'a' always means one or more than one." *Harari v. Lee*, 656 F.3d 1331, 1341 (Fed. Cir. 2011). Instead, the Court reads the limitation in light of the claim and specification to discern its meaning. *Id.* (citing *Insituform Techs., Inc. v. Cat Contracting, Inc.*, 99 F.3d 1098, 1105–06 (Fed.Cir.1996)). "When the claim language and specification indicate that 'a' means one and only one, it is appropriate to construe it as such even in the context of an open-ended 'comprising' claim." *Harari v. Lee*, 656 F.3d at 1341.

The claims of the '755 patent indicate that the features are identified using a single image. *E.g.*, '755 patent, claim 1. The claims recite a method for computing the object location as the transformation between the "Object Space" and "Camera Space" by "capturing *an image* of the object" and using "the positions of features from *the image*." *Id.* (emphasis added). The Court is not persuaded by RVT's argument that step iii.b) contemplates using multiple images because step iii.b) does not explicitly recite that all 6 features must be identified in one image. The specification describes the steps "[t]o carry out object finding and positioning," *id.*, 8:1-2, specifies that "an image of the object [] is snapped," *id.*, 8:7, and that "[t]he position (in the image [] and in the Object Space) of the found features (at least 6) are used to calculate the transformation between the Object Space and the Camera Space." *Id.*, 8:17-20. Thus, the specification shows that the patentee used "an image" and "the image" in the claims to refer to a single image. *Id.*

Accordingly, the Court construes "an image" and "the image" in the carrying out steps of claims 1, 8, 18, 19 of the '755 patent as: "Multiple images may be taken as part of the 'carrying out step (iii),' but a single image must be used to locate the at least six features."

5. "number of image sensors" ('814 patent, claims 1, 5, 7, 11, 13, 17, 23, 24, 33, 35, 36)

Term No.	Claim Term	Plaintiff's Proposed Construction	Defendants' Proposed Construction	Court's Construction
5	"number of image sensors" ('814 patent, claims 1, 5, 7, 11, 13, 17, 23, 24, 33, 35, 36)	Plain and ordinary meaning, which is "one or more image sensors." This limitation does not exclude stereo vision or parallax.	Excludes stereo vision (*i.e.*, using two cameras and parallax to determine 3D coordinates of features) and structured light.	Plain and ordinary meaning, which is "one or more image sensors."

ABB argues that "the claims should not be interpreted to encompass the use of stereo vision and structured light for machine vision because the '814 patent disparages and disclaims those solutions." D.I. 98 at 26. RVT disagrees, and argues that the claims merely require "acquiring a number of images of a first view of a training object from a number of image sensors." *Id.* at 25 (citing '814 patent). As a result, RVT argues, "the limitation does not exclude stereo vision or parallax, as long as the system also acquires images from one or more image sensors." *Id.* at 26.

It is unclear to the Court whether ABB's argument is (1) that the methods of stereo vision and structured light are excluded from the scope of the claims (i.e. that the invention is not directed towards a method or system that determines 3D features using stereo vision or structured light), or (2) that the scope of the claims does not include methods and systems that perform the claimed invention, while also incorporating other methods or systems that use stereo vision and structured light.

The Court agrees with ABB that the '814 patent disparages "stereo camera pairs" and "structured light" as having "many drawbacks," being "impractical for industrial applications," and being inaccurate, costly, and complex. *See* '814 patent, 1:46-53, 1:64-24. The specification also explains that the invention described in the '814 patent seeks to "eliminate[] the need for

stereo camera pairs and the need for the use of structured light" to "increase accuracy, simplify setup and maintenance and reduce hardware costs." *Id.*, 2:8-10, *see also id.*, 2:29-34. Thus, the Court agrees with ABB to the extent that ABB argues that the claims of the '814 patent do not encompass methods or systems that use stereo vision or structured light to perform the limitations of the claimed method or system. However, the Court finds that methods or systems that perform the claimed invention, but also incorporate stereo vision or structured light are not outside the scope of the claims. *See* D.I. 98 at 20-21 ("A process with additional steps is still within the claim scope.").

The Court declines to include RVT's proposed construction of "[t]his limitation does not exclude stereo vision or parallax," because such language is likely to confuse the jury. Stereo vision and parallax are functions of how a set of cameras are configured, rather than properties of the cameras themselves. *Compare* '814 patent, 1:35-45 (discussing stereo configuration) *with* 7:58-63 ("The image sensors [] may take any of a variety of forms capable of capturing or acquiring a two-dimensional image of the object []. In typical applications the image sensors [] will take the form a video cameras or digital still cameras."). Accordingly, the Court construes the term "number of image sensors" as its plain and ordinary meaning, which is "one or more image sensors."

6. **"determining [a] transformation for the target object based at least in part on a position of at least some of the located features using only the single captured image" ('237 patent, claim 1)**
"determining an object space-to-camera space transformation based at least in part on a position of at least some of the located features in solely the capture image" ('237 patent, claim 20)
"determining an object space-to-camera space transformation based at least in part on a position of at least some of the located features using the captured image without any additional captured images" ('237 patent, claim 25)

Term No.	Claim Term	Plaintiff's Proposed Construction	Defendants' Proposed Construction	Court's Construction
6	"determining [a] transformation for the target object based at least in part on a position of at least some of the located features using only the single captured image" ('237 patent, claim 1) "determining an object space-to-camera space transformation based at least in part on a position of at least some of the located features in solely the capture image" ('237 patent, claim 20) "determining an object space-to-camera space transformation based at least in part on a position of at least some of the located features using the captured image without any additional captured images" ('237 patent, claim 25)	Plain and ordinary meaning, which is "determining . . . an object space-to-camera space transformation for the target object based at least in part on a position of at least some of the located features using only the single captured image."	Determining an object space-to-camera space transformation for the target object based at least in part on the position of at least some of the located features using no more than one captured image. Determining object space-to-camera space transformation cannot use multiple images.	Plain and ordinary meaning, which is "determining . . . an object space-to-camera space transformation for the target object based at least in part on a position of at least some of the located features using only the single captured image." Determining object space-to camera space transformation can use multiple images but at least one image must identify the position of each of the located features.

Generally, the claims of the '237 patent recite capturing an image of a target object, locating a number of features in that image, and determining an object-space-to-camera-space transformation using the image and an algorithm. *See*, *e.g.*, *id.*, claim 1. Specifically, the claims

require that the "object-space-to-camera-space transformation" (i.e. the "3D rotation and translation between [those] two spaces," *see supra* at §II) for the target object be determined "based at least in part on a position of at least some of the located features using only the single captured image." *Id*; *see also id.*, claims 20, 25.

The parties dispute whether multiple images can be used to determine the object-camera transformation. D.I. 98 at 28. ABB argues that the transformation must be determined using only a single image, because the claims recite "using only the single captured image." *E.g.* '237 patent, claim 1. RVT disagrees, and argues that the transformation is determined only "at least in part on a position of at least some of the located features." *Id.* Thus, because only part of the transformation must be based on features located in a particular image, "the transformation can also be based in part on other information, including other features and other images." D.I. 98 at 29.

The Court agrees with RVT to the extent that RVT argues that multiple images can be used to determine the object-camera transformation. The specification of the '237 patent describes embodiments where multiple images are used to determine the transformation. For example, Figure 7 depicts an embodiment where an object-camera transformation is computed using images made in a "training session" of an object in a "calibration position." '237 patent, 5:46-65. Then, in the carrying out step—where that target object is used during operation—a second image of the object is taken and compared to the information calculated during the training session to "compute the transformation between the 'Object Space' and 'Camera Space.'" *Id.*

The Court is not convinced by ABB's argument that RVT's proposed construction is inconsistent with the prosecution history. ABB argues that RVT distinguished the prior art on the grounds that the prior art used multiple images, while RVT's invention uses "the captured image,

singular, not plural." D.I. 98 at 30 (citing D.I. 76-6 at 111). Accordingly, ABB contends that only a single image can be used in the claimed object-camera transformation determination. While RVT did distinguish the prior art on the grounds that the prior art required the capture of multiple images, the Court agrees with RVT that it did so to show that, in the invention described by the '237 patent, the position of each feature used in the determination of the object-camera transformation is found in a single image. For example, one prior art reference, Parker, relied on multiple infrared sensors to identify features. *See* D.I. 76-6 at 53. Another reference, Wei, relied on stereo vision to identify features. *Id.* at 74; *see also id.* at 111 ("[Wei] appears to simpl[y] capture the same features from multiple different orientations. Notabl[y], claim 44 recites selecting six features from *the captured image*, singular, *not* plural.") (emphasis in original).

However, the Court disagrees with RVT to the extent that RVT argues that the determination of the object-camera transformation can be based on features of the target object that are not identified in the single captured image. D.I. 98 at 29. ("[T]he transformation can also be based in part on other information, including other features and other images."). Nothing in the claims, specification, or prosecution history suggests using something other than the position of the features identified in the single captured image to determine the object-camera transformation for the target object, and the "position of features is found in a single image." *Id.* at 32; *see generally*, '237 patent. Accordingly, the Court finds that the "single captured image" must identify the position of each of the features of the target object that are used to determine the object-space-to-camera space transformation.

7. **"pose" ('237 patent, claims 20, 22-28) and "three dimensional pose estimation"/"three-dimensional poses"/"three-dimensional object pose"/"pose estimating"/"pose estimation for objects"/"pose estimation" ('814 patent, claims 6, 12, 18, 22, 28, 29, 33, 38, 39)**

Term No.	Claim Term	Plaintiff's Proposed Construction	Defendants' Proposed Construction	Court's Construction
7	"pose"	Position and orientation (the same as the agreed upon construction for "pose" in the '755 patent).	Three-dimensional position and orientation	Three-dimensional position and orientation
	"three-dimensional pose estimation" "three-dimensional poses" "three-dimensional object pose" "pose estimating" "pose estimation for objects" "pose estimation"	Pose (position and orientation) that does not exclude surface analysis (i.e., three-dimensional location of points on surface of object).	"Pose" means position and orientation and excludes surface analysis (*i.e.*, three-dimensional location of points on surface of object).	Pose means position and orientation, and does not exclude surface analysis as part of three-dimensional pose estimation.

With respect to the claims of the '237 patent, the parties dispute whether "pose" covers both 2D and 3D pose. D.I. 98 at 34. With respect to the claims of the '814 patent, the parties dispute whether "surface analysis" is within the scope of "pose estimation." *Id.* The Court addresses each patent in turn.

The Court agrees with ABB that "pose" should be construed as "three-dimensional position and orientation" in the claims of the '237 patent. The '237 patent's title, abstract, field of invention, and description show that the patentee lexicographically defined "pose" as "three-dimensional pose." *See* '237 patent, Title ("Method and Apparatus for Single Image 3D Vision Guided Robotics"), Abstract ("A method of three-dimensional object location"), 1:13-15 ("The invention relates to the field of ... single image three dimensional vision guided robotics."). The

specification also explains that there is "a need for a method for calculating the 3D pose of objects using only standard video camera equipment," *id.*, 1:48-50, and one of the three "main steps" of the invention is "finding the three-dimensional pose of the object." *Id.*, 2:60-67.

The Court is not convinced by RVT's argument that the construction of "pose" in the '755 patent dictates the construction of "pose" in the '237 patent. D.I. 98 at 34. (citing *Omega Eng'g, Inc. v. Raytek Corp.*, 334 F.3d 1314, 1334 (Fed. Cir. 2003) ("[T]he same claim term in the same patent or related patents carries the same construed meaning."). The parties agreed that the proper construction of "pose" in the '755 patent is "position and orientation." However, in the '755 patent, "pose" is preceded by "3D" each time "pose" appears in the claims. Thus, each claim of the '755 patent that recites "pose," recites "3D pose." As a result, construing "pose" as "3D pose" would be redundant with respect to the '755 patent. In the '237 patent, however, such a construction would not be redundant because some claims omit the 3D prefix. However, it is clear from the context of those claims of the '237 patent that "pose" refers to 3D pose, because each claim that discusses pose—even if it omits the 3D prefix—recites "estimating a pose ... by... determining ... a transformation"—which is a necessarily "three-dimensional" concept. *See generally* '237 patent, 3:3-4, 13:63-63, 14:47-48; *supra* at §II ("transformation" means "three-dimensional rotation & translation between two spaces").

With respect to the '814 patent, the parties dispute whether "pose" excludes "surface analysis." During prosecution, RVT stated that the prior art reference Franke was "directed to surface analysis (i.e., three dimensional location of points), not pose estimation." D.I. 76-5 (Reply to Office Action, June 8, 2007) at 6-7. Thus, RVT explained, Franke was not directed to "three dimensional orientation" and did not "teach simultaneously solving the system of equations to determine three-dimensional poses (i.e., location and orientation)." *Id.*

RVT argues that it did not disclaim surface analysis by making those statements because RVT's invention is capable of performing pose estimation. Thus, unlike the prior art, RVT's invention does more than just surface analysis. D.I. 98 at 35. ABB disagrees, and argues that RVT's position that a system for performing surface analysis can also do pose estimation is mere attorney argument that does not find support in the record. *Id.* at 37.

The Court is not convinced that RVT clearly and unmistakably disclaimed surface analysis. *See Elbex Video, Ltd. v. Sensormatic Elecs. Corp.*, 508 F.3d 1366, 1371-72 (Fed. Cir. 2007) ("the disavowal must 'be both clear and unmistakable'"). The parties' dispute regarding whether surface analysis can be performed as a part of 3D pose estimation appears to be a dispute about infringement, rather than the proper scope of the term "three-dimensional pose estimation." *See* D.I. 98 at 47 ("This disagreement is not over how 3D pose estimation works. It is instead about RVT's unsubstantiated accusations against a product that inspects the surface of an object for quality control purposes."). Accordingly, the Court gives the term its plain and ordinary meaning, and finds that RVT did not clearly and unmistakably disclaim that surface analysis can be performed as a part of 3D pose estimation. The Court notes, however, that RVT did disclaim any argument that surface analysis alone is 3D pose estimation. D.I. 98 at 35 ("These statements do not disclaim surface analysis. Rather, they point out that pose estimation is not the same as surface analysis."). Thus, the Court construes "three-dimensional pose estimation" as "Pose means position and orientation, and does not exclude surface analysis as part of three-dimensional pose estimation."

8. "first view," "second view," and "additional views" ('814 patent, claims 1, 7, 13, 19, 23, 25, 26, 33, 35)

Term No.	Claim Term	Plaintiff's Proposed Construction	Defendants' Proposed Construction	Court's Construction
8	"first view," "second view," and "additional views" ('814 patent, claims 1, 7, 13, 19, 23, 25, 26, 33, 35)	Plain and ordinary meaning, which is that "each view is a different view" but the views need not to be obtained in any particular order.	Obtaining "first view" occurs before determining "additional views" or obtaining "second view"	Obtaining the "first view" occurs before determining "additional views." claims 1, 7, 13, 19 Obtaining the "second view" can occur before or after obtaining the "first view," but either the first view or the second view must be obtained before determining "additional views." claims 23, 25, 26, 33, 35

The claims of the '814 patent require capturing multiple views of an image. Specifically, the claims require "acquiring a number of images of a first view of a training object," "determining a number of additional views to be obtained," and either (a) "acquiring at least one image of each of the number of additional views of the training object," claims 1, 7, 13, 19, or (b) "acquiring at least one image of a second view of the training object," claims 23, 25, 26, 33, 35. RVT argues that these steps can be performed in any order. D.I. 98 at 39. ABB disagrees, and argues that the first view must be obtained prior to obtaining the "additional" or "second" views. *Id.*

With respect to the claims that recite capturing a "first view" and "additional views" the Court agrees with ABB that the "additional views" cannot be obtained before the first view is captured. These claims recite a specific sequence. First, "images of a first view" are acquired. *See, e.g.*, '814 patent, 1:59-60. Then, "a number of features" in the images "of the first view" are identified. *Id.*, 61-62. Next, a determination of "a number of additional views to be obtained" is made based on "the number of features identified" in the first image. *Id.*, 63-65. The images of the additional views are then acquired. As such, the additional views cannot be captured before the first view, because the number of additional views is determined based at least in part on what was identified in the first view. Accordingly, claims 1, 7, 13, 19 of the '814 patent require the "first view" to be captured before the "additional views."

However, with respect to the claims that recite capturing a "second view," the Court finds that the first and second view are not ordered. "The use of the terms 'first' and 'second' is a common patent-law convention to distinguish between repeated instances of an element or limitation." *3M Innovative Props. Co. v. Avery Dennison Corp.*, 350 F.3d 1365, 1371 (Fed. Cir. 2003). Also, there is a presumption against imposing an order of steps unless the order is necessitated by the patent. *See Altiris, Inc. v. Symantec Corp.*, 318 F.3d 1363, 1369-70 (Fed. Cir. 2003). Nothing in these claims regarding the "second view" refers back to the "first view" or otherwise requires that the first view be captured before the second view. *See generally*, '814 patent, claims 23, 25, 26, 33, 35. Although these claims also refer to capturing "additional views" based on "the number of features identified" in a first image, the claims also recite identifying features from both the first and second view. *Id.* As a result, either the first or the second view could be the "view" from which features are identified to determine the number of additional views to be obtained. Thus, claims 23, 25, 26, 33, 35 of the '814 patent require either the "first view" or

the "second view" to be captured before the "additional views," but do not require that the first view be captured before the second view.

9. "Means for training, comprising" ('237 patent, claim 21)

Term No.	Claim Term	Plaintiff's Proposed Construction	Defendants' Proposed Construction	Court's Construction
9	"means for training, comprising" ('237 patent, claim 21)	Not indefinite. § 112(6) does not apply. Plain and ordinary meaning	Indefinite – claim covers both an apparatus and method steps of using the apparatus Claim does not invoke 35 U.S.C. §112(6)	Not indefinite. § 112(6) does not apply. Plain and ordinary meaning

Claim 21 recites a robotic-vision apparatus with a "means for training, comprising" a series of steps that include "capturing" an image, "selecting" features from that image, and "determining" object-space coordinates and an object space-to-camera-space transformation based on the image. '237 patent, 14:1-13. ABB contends that this claim is indefinite because it uses functional language in the present participle tense and thus covers both an apparatus and method steps of using the apparatus. D.I. 98 at 44-45; *see Sound View Innovations, LLC v. Facebook, Inc.*, 2017 U.S. Dist. LEXIS 76412, at *22 (D. Del. May 19, 2017); *see also IPXL Holdings, L.L.C. v. Amazon.com, Inc.*, 430 F.3d 1377, 1384 (Fed. Cir. 2005) (explaining that claims that "recite[] both a system and the method for using that system" are indefinite because it is unclear whether infringement requires the method to be performed).

The Court finds that claim 21 of the '237 patent is not indefinite. Claims that use "functional language to describe the capabilities of [a] claimed system" do not impermissibly claim

a method and an apparatus. *MasterMine Software, Inc. v. Microsoft Corp.*, 874 F.3d 1307, 1316 (Fed. Cir. 2017). A person of ordinary skill in the art would understand that the "apparatus" recited in claim 21 comprises a physical structure (the "means for training") whose capabilities are recited by the claimed steps. *See* '237 patent, claim 21. The Court is not convinced that RVT's use of the present participle tense or RVT's failure to include "capable of" in the introductory clause of claim 21 renders claim 21 indefinite. *See UltimatePointer, L.L.C. v. Nintendo Co., Ltd.*, 816 F.3d 816, 826-827 (Fed. Cir. 2016) (holding that claims to "'a handheld device including: an image sensor, said image sensor generating data' were not indefinite because the claims "claim[ed] an apparatus with particular capabilities" and did not "recite functionality divorced from the cited structure").

10. "steps ii) and iii)" ('755 patent, all claims)

Term No.	Claim Term	Plaintiff's Proposed Construction	Defendants' Proposed Construction	Court's Construction
10	"steps ii) and iii)" ('755 patent, all claims)	Not indefinite. Plain and ordinary meaning, which is that "carrying out object finding and positioning" is separate and different from "teaching the object features."	Indefinite – the "carrying out object finding and positioning" step, to the extent it can be understood, is performed in the same way as the training step providing the same result.	Not indefinite.

ABB argues that steps ii) and iii) of the '755 patent are indefinite because they are impossible. D.I. 98 at 48. Specifically, ABB argues that the "finding and positioning step" (step iii)) either (1) recites locating the position of the training object, rather than the location of the target object (claims 8 and 19), or (2) ambiguously refers to an image, without specifying whether

that image is the image captured during the "training" step (step ii)) or the image captured during the finding and positioning step (claims 1 and 18). *Id.*

The specification explains that locating the target object during the finding and positioning step requires acquiring an image of the target object during that step and comparing it to an image taken during the training step. *See, e.g.*, '755 patent, 8:34-47 (describing how to calculate the "Object Space" to "Camera Space" transformation based in part on an image acquired during the finding and positioning step). ABB argues that claims 8 and 19 fail because those claims only recite acquiring one image—specifically, the image acquired during the training step. Thus, ABB argues, the image referred to in step iii)—which "carry[s] out object finding and positioning" with, *inter alia*, "the positions of features from *the image* and their corresponding position in 'Object Space' as calculated in the training session," (emphasis added)—must be the image taken during training. As a result, "step iii) does not result in the finding and positioning of an object," rendering claims 8 and 19 indefinite. D.I. 98 at 49.

Claims 1 and 18 of the '755 patent also recite using "positions of features from the image and their corresponding positions in 'Object Space' as calculated in the training step," to compute "the object location." *Id.* But unlike claims 8 and 19, these claims further recite "capturing an image of the object" during step iii). *Id.* However, ABB argues that these claims are also indefinite, because "the image" to which step iii) refers is ambiguous—"[i]t could refer to either the image taken during the training step ii) or the image captured during the finding and positioning step iii)." D.I. 98 at 30.

The Court is not convinced that claims 8 and 19 or claims 1 and 18 are indefinite. To be definite, a claim must "inform, with reasonable certainty, those skilled in the art about the scope

of the invention." *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898, 910 (2014). A nonsensical claim is invalid as indefinite. *See Synchronoss Techs., Inc. v. Dropbox, Inc.*, 987 F.3d 1358, 1367 (Fed. Cir. 2021) (affirming claims were indefinite when the claims "contain an impossibility").

With respect to claims 8 and 19 of the '755 patent, a person of ordinary skill in the art would understand that an image is captured during step iii), and that this is the image to which the claims refer in step iii). *Id.* Step iii) of claims 8 and 19 describes "positioning the robot in a predefined position above the bin containing the target object" and "if an insufficient number of selected features are in the field of view, moving the robot until at least 6 features can be located." *Id.* A person of ordinary skill in the art would understand that the "field of view" refers to the camera mounted on the robot, *see, e.g.*, '755 patent, 2:46, and that locating the "at least 6 features" within that field of view would require capturing an image of the object. '755 patent, claims 8, 19.

With respect to claims 1 and 18, a person of ordinary skill in the art would understand that the finding and positioning step requires comparing the image captured during the training step with the image captured during the finding and positioning step. D.I. 98 at 51 (citing Kurfess Decl., ¶¶ 32-33). It is clear from the structure of the claim language, read in light of the specification, that "'the image' referred to in step iii) is the image captured in step iii)— 'not the image captured during the teaching step.' *Id.* The Court is not convinced by ABB's argument that *Southwall Techs., Inc. v. Cardinal IG Co.*, 54 F.3d 1570, 1579 (Fed. Cir. 1995) requires the Court to construe "an image" in a manner that leads to a nonsensical claim. *Southwall* dealt with the proper construction of a term of art—"sputter-deposited dielectric," *id.*—while in the instant

action, it is readily apparent from the context of the claims that the "image" referred to in step iii) is the image captured during step iii).

Accordingly, the Court finds that claims 1 and 18 and claims 8 and 19 are not indefinite.

V. CONCLUSION

The Court will construe the disputed claim terms as described above. The Court will issue an Order consistent with this Memorandum Opinion.

Date: June 26, 2024

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

ROBOTICVISIONTECH, INC., Plaintiff, v. ABB INC., Defendant.	C. A. No. 22-cv-1257-GBW

ORDER

AND NOW, this 26th day of June 2024, having reviewed and considered the parties' respective claim construction arguments set forth in the parties' joint claim construction briefing, D.I. 98, **IT IS HEREBY ORDERED** that the disputed terms of United States Patent Nos. 8,095,237 (the "'237 patent"), 6,816,755 (the "'755 patent"), and the 7,336,814 (the "'814 patent") are construed as follows:

Term No.	Claim Term	Court's Construction
1	"transformation" '237 patent, claims 1, 2, 9-11, 14, 15, 17, 20, 21, 25 '755 patent, claims 1, 6, 8, 15, 18, 19	"three-dimensional rotation & translation between two spaces"
2	"camera space" '237 patent, claims 1, 2, 9-11, 14, 15, 17, 20, 21, 25 '755 patent, claims 1, 8, 18, 19	"a reference frame defined with respect to a point on, and therefore rigid to, the camera"
3	"training space" '237 patent, claims 2, 9, 20, 25 '755 patent, claims 1, 18	"a reference frame defined with respect to a point on the calibration template, and aligned to its main axes"
4	"teaching object" '237 patent, claims 12, 13, 21	"object used for teaching"
5	"calibration object" '237 patent, claims 2-5, 7-11, 20, 25	"object used for calibration"

Term No.	Claim Term	Court's Construction
6	"object space" '237 patent, claims 1, 12, 14, 17, 20, 25 '755 patent, claims 1, 8, 18, 19	"a reference frame defined with respect to, and therefore rigid to, the object"
7	"object frame" '237 patent, claims 15-17 '755 patent, claims 1, 6, 8, 15, 18, 19	"a reference frame defined with respect to a point on, and therefore rigid to, the object"
8	"tool" '237 patent, claims 10, 11, 15 '755 patent, claims 1, 6, 8, 15, 18, 19	"the tool the robot is using for performing the handling, cutting or other robotic operations, having an operating end or 'end-effector'"
9	"tool space" or "tool frame reference frame" '237 patent, claims 10, 11, 15	"a reference frame defined with respect to a point on, and oriented along the direction of the end-effector and therefore rigid to, the tool"
10	"tool frame" '755 patent, claims 1, 8, 18, 19	"a reference frame defined with respect to a point on, and oriented along the direction of the end-effector and therefore rigid to, the tool"
11	"robot space" '755 patent, claims 1, 8, 18, 19	"a reference frame defined with respect to a point on the robot and therefore rigid to the robot"
12	""tool' position" '755 patent, claims 1, 8, 18, 19	No construction necessary; not the same as "tool frame."
13	"means for calibrating the camera . . ." AND "means for estimating a pose of a target object . . ." '237 patent, claims 20-28	Claims do not invoke 35 U.S.C. §112(6).
14	"position the camera so that it appears orthogonal to the object" '755 patent, claims 1, 8, 18, 19	"position the camera so that it appears at a right angle to the object"
15	"calibration means for calibrating the camera . . ." "means for teaching the object features . . ." "means for carrying out object finding and positioning . . ." '755 patent, claims 18, 19	Claims do not invoke 35 U.S.C. §112(6).
16	"pose" '755 patent, claims 7, 17	"position and orientation"
17	"training object" '814 patent, claims 1, 7, 13, 19, 23, 25- 29, 33, 35, 38	"object used for training"

Term No.	Claim Term	Court's Construction
18	"intrinsic parameters" '237 patent, claims 2, 8, 20, 25 '755 patent, claims 1, 8, 18, 19	"parameters intrinsic to camera, such as focal length, image center, real pixel size, and radial and tangential distortion of the camera lens."
19	"determining a number of additional views to be obtained based at least in part on the number of image sensors, the number of features identified, the number of features having an invariant physical relationship associated thereto, and a type of the invariant physical relationship associated with the features, sufficient to provide a system of equations and unknowns where the number of unknowns is not greater than the number of equations" '814 patent, claims 1, 7, 13, 19, 23, 33	"determining a number of additional views to be obtained based on at least all of the following: (1) the number of image sensors, (2) the number of features identified, (3) the number of features having an invariant physical relationship associated thereto, and (4) the type of invariant physical relationship associated with the features. The number of additional views is sufficient to provide a system of equations and unknowns where the number of unknowns is not greater than the number of equations."
20	"determining a number of additional views to be obtained based at least in part on the number of image sensors acquiring at least one image and the number of features of the training object identified" '814 patent, claim 35	"determining a number of additional views to be obtained based on at least all of the following: (1) the number of image sensors acquiring at least one image, and (2) the number of features of the training object identified."
21	"local model" '814 patent: claims 23, 27, 28, 33, 35, 37, 38	A model that contains information about certain features and that corresponds to an image sensor.
22	"extrinsic parameters" '237 patent, claims 2, 9, 20, 25	Parameters describing the camera's position and orientation.
23	"finding the 'Object Space to Camera Space' transformation in the same way as step d)" '755 patent, claims 8, 19 (step iii)	Not indefinite.
24	"processor-readable medium storing instructions for facilitating machine-vision of objects having invariant physical relationships between a number of features on the objects, by..." '814 patent, claim 7	Not indefinite. Plain and ordinary meaning.

Term No.	Claim Term	Court's Construction
25	"target object" '237 patent, claims 1, 17, 20, 24, 25, 28; '755 patent, claims 8, 19; '814 patent, claims 7, 22, 28, 29, 33, 38	The object that the robot will be manipulating or otherwise interacting with after calibration.
26	Equations or inequalities '814 patent, claims 5, 11, 17, 20, 24, 36	Not indefinite. Plain and ordinary meaning.
27	"112 ¶ 4 issues" '237 patent, claims 14, 22-23, 26, 27	No construction necessary.
28	"Preamble: "A [method] useful in three-dimensional pose estimation . for use with a single camera mounted to a moveable portion of a robot" '237 patent, claim 1	Preamble is limiting. Plain and ordinary meaning, which does not exclude methods that use more than one camera or those that are not used in three-dimensional pose estimation. A single camera must perform each step of the claimed method.
29	"a single camera operable to capture a number of images of a calibration object" '237 patent, claims 20, 25	Plain and ordinary meaning, which is that there must be "one camera that can capture one or more images of a calibration object." But it does not exclude apparatuses that have other cameras.
30	Preamble: "A method of [system for] three-dimensional handling of an object by a robot using a tool and one camera mounted on the robot" '755 patent, claims 1, 8, 18, 19	Preamble is limiting. A single camera must perform each limitation of the claimed method.
31	"an image" and "the image" in the carrying out step (iii) '755 patent, claims 1, 8, 18, 19	Multiple images may be taken as part of the "carrying out step (iii)," but a single image must be used to locate the at least six features.
32	"number of image sensors" '814 patent, claims 1, 5, 7, 11, 13, 17, 23, 24, 33, 35, 36	Plain and ordinary meaning, which is "one or more image sensors."

Term No.	Claim Term	Court's Construction
33	"determining [a] transformation for the target object based at least in part on a position of at least some of the located features using only the single captured image" '237 patent, claim 1 "determining an object space-to-camera space transformation based at least in part on a position of at least some of the located features in solely the capture image" '237 patent, claim 20 "determining an object space-to-camera space transformation based at least in part on a position of at least some of the located features using the captured image without any additional captured images" '237 patent, claim 25	Plain and ordinary meaning, which is "determining . . . an object space-to-camera space transformation for the target object based at least in part on a position of at least some of the located features using only the single captured image." Determining object space-to camera space transformation can use multiple images but at least one image must identify the position of each of the located features.
34	"pose" '237 patent, claims 20, 22-28	Three-dimensional position and orientation
	"three-dimensional pose estimation" "three-dimensional poses" "three-dimensional object pose" "pose estimating" "pose estimation for objects" "pose estimation" '814 patent, claims 6, 12, 18, 22, 28, 29, 33, 38, 39	Pose means position and orientation, and does not exclude surface analysis as part of three-dimensional pose estimation.
35	"first view," "second view," and "additional views" '814 patent, claims 1, 7, 13, 19, 23, 25, 26, 33, 35	Obtaining the "first view" occurs before determining "additional views." ('814 patent, claims 1, 7, 13, 19) Obtaining the "second view" can occur before or after obtaining the "first view," but either the first view or the second view must be obtained before determining "additional views." ('814 patent, claims 23, 25, 26, 33, 35)

Term No.	Claim Term	Court's Construction
36	"means for training, comprising" '237 patent, claim 21	Not indefinite. § 112(6) does not apply. Plain and ordinary meaning
37	"steps ii) and iii)" '755 patent, all claims	Not indefinite.

Date: June 26, 2024

GREGORY B. WILLIAMS
UNITED STATES DISTRICT JUDGE