

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CANON INC., CANON U.S.A., INC.,
and AXIS COMMUNICATIONS AB,,
Petitioner,

v.

AVIGILON FORTRESS CORPORATION,
Patent Owner.

Case IPR2017-01833
Patent 6,970,083 B2

Before KRISTEN L. DROESCH, GEORGIANNA W. BRADEN, and
KIMBERLY McGRAW, *Administrative Patent Judges*.

McGRAW, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

I. INTRODUCTION

In this *inter partes* review, instituted pursuant to 35 U.S.C. § 314, Canon Inc., Canon USA, Inc., and Axis Communications AB, (collectively “Petitioner”) challenges the patentability of claims 1–29 of U.S. Patent No. 6,970,083 B2 (Ex. 1001, “the ’083 patent”), assigned to Avigilon Fortress Corp. (“Patent Owner”).

We have jurisdiction under 35 U.S.C. § 6. This Final Written Decision, issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73, address issues and arguments raised during trial. For the reasons discussed below, we determine Petitioner has shown by a preponderance of the evidence that claims 1–29 of the ’083 patent are unpatentable. Additionally, we deny-in-part and dismiss-in-part Patent Owner’s Motion to Exclude, and we deny Patent Owner’s Contingent Motion to Amend.

A. Procedural History

Petitioner filed a Petition (Paper 1, “Pet.”) requesting an *inter partes* review of claims 1–29 (“the challenged claims”) of U.S. Patent No. 6,970,083 B2 (Ex. 1001, “the ’083 patent”). See Pet. 1. The Petition was supported by a Declaration of Nikolaos Papanikolopoulos, Ph.D. (Ex. 1002). Patent Owner filed a Preliminary Response. Paper 7 (“Prelim. Resp.”). On February 5, 2018, we instituted *inter partes* review of the challenged claims. Paper 8 (“Dec. on Inst.”).

Thereafter, Patent Owner filed a Patent Owner Response (Paper 12, “PO Resp.”) supported by a Declaration of Alan Bovik, Ph.D. (Ex. 2014). In addition, Patent Owner’s Response cites to a 37 C.F.R. § 1.132 Declaration of Kenneth R. Castleman (Ex. 1013) that was submitted originally in connection with the reexamination proceeding of the ’083 patent. Petitioner

filed a Reply to the Patent Owner Response (Paper 17, “Reply”), supported by declaration testimony of Dr. Papanikolopoulos (Ex. 1036). Patent Owner filed a Contingent Motion to Amend (Paper 13, “Mot. to Amend”) supported by declaration testimony of Dr. Bovik (Ex. 2015). Petitioner filed an Opposition to Patent Owner’s Contingent Motion to Amend (Paper 16, “Opp. to Mot. to Amend”), supported by a second declaration of Dr. Papanikolopoulos (Ex. 1036) to which Patent Owner filed a Reply (Paper 19, “Reply to Opp. to Mot. to Amend”). Patent Owner also filed a Motion to Exclude Evidence (Paper 24), to which Petitioner filed an Opposition (Paper 26) and Patent Owner filed a Reply (Paper 28).

Oral hearing was requested by both parties. Papers 23, 25. A consolidated oral hearing for this proceeding and Cases IPR2017-01835 and IPR2017-01837 was held on October 19, 2018. A transcript of the consolidated hearing has been entered into the record. Paper 30 (“Tr.”).

B. Related Proceedings

The parties identify Case IPR2017-01835 and Case IPR2017-01837 concerning U.S. Patent No. 6,696,945 B2 (“the ’945 patent”),¹ as related matters. *See* Pet. 82; Paper 6, 1 (Patent Owner’s Mandatory Notices).

C. The ’083 Patent

The ’083 patent, titled “Video Tripwire,” issued November 29, 2005, from U.S. Patent Application No. 10/704,645, filed on November 12, 2003. Ex. 1001, at [54], [45], [21], [22]. The ’083 patent is drawn to systems and methods in which a video tripwire, also called a virtual tripwire, is placed in

¹ The ’083 patent is a continuation-in-part of U.S. Application No. 09/972,039, which issued as the ’945 patent.

digital video using computer-based video processing techniques. *Id.* at 2:60–63. The video tripwire is monitored in order to detect intrusions, record events, compile statistics, and trigger responses. *Id.* at 2:63–66. An embodiment of the method is illustrated in Figure 5 of the '083 patent, reproduced below.

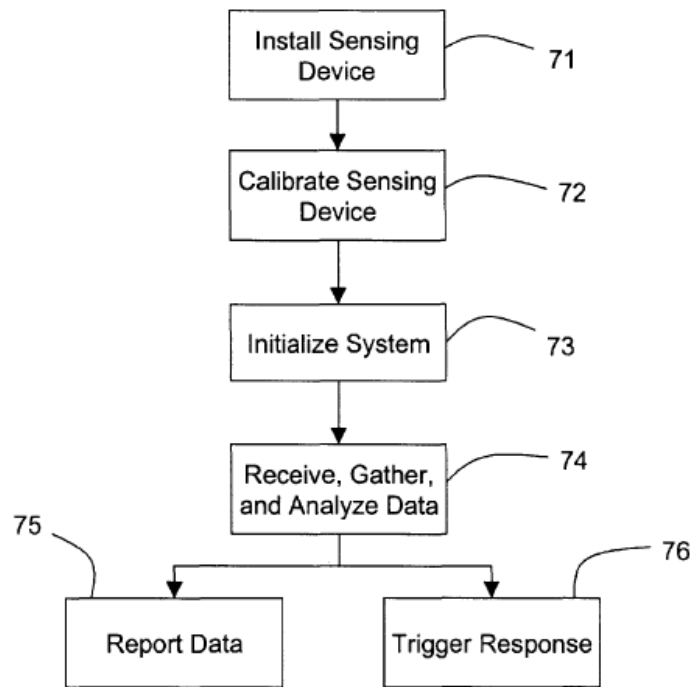


Figure 5

The flow chart of Figure 5, shown above, illustrates a method of the '083 patent in which a sensing device, such as a video camera, is installed (step 71). *Id.* at 6:11–13. The sensing device is then calibrated so as to determine the size of objects at various locations in the image area (step 72). *Id.* at 6:21–33; *see also id.* at 6:33–9:2 (further describing calibration steps). Next, the system is initialized (step 73), during which the user can enter parameters relating to how the system will gather, respond to, and report

data. *Id.* at 9:3–6. The '083 patent explains that a “user may superimpose one or more lines of interest on the image; these lines will serve as one or more tripwires.” *Id.* at 9:7–9. “The lines may be of any orientation and may be placed almost anywhere in the image; the exception is that the line may not occur too close to image boundaries because the object (e.g., person) crossing the line must be at least partially visible on both sides of the line for detection to occur.” *Id.* at 9:7–13. “Other parameters that may be initialized include . . . a direction of crossing each line as a criterion for event detection (for example, to determine when a person enters an area, as opposed to when it is desired to determine when a person either enters or exits the area).” *Id.* at 9:19–24. After initialization (step 73), the system “collects and analyzes data” (step 74). *Id.* at 10:16–17. For example, if a tripwire event specified by the user is detected, the event is logged along with accompanying information. *Id.* at 10:19–21. The tripwire event can trigger an alarm or other response (step 76). *Id.* at 10:23–25.

Figure 11, reproduced below, shows a flowchart depicting an exemplary embodiment of a step of detecting a tripwire crossing. *Id.* at 4:42–43.

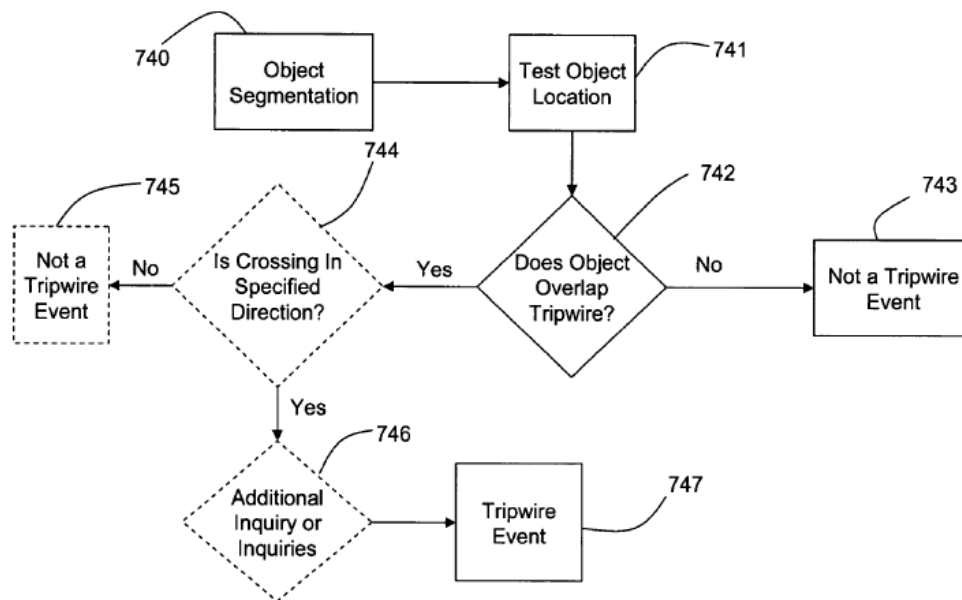


Figure 11

Figure 11, shown above, illustrates a technique for analyzing and detecting tripwire events. *Id.* at 10:26–28. Foreground (“FG”) objects are first determined from the video using object segmentation 740. *Id.* at 10:28–29. The location of a FG object is then tested 741 to determine if it “overlaps” a line representing a tripwire 742. *Id.* at 10:31–33. An object is determined to cross a tripwire if the bottom portion of the object overlaps a tripwire line. *Id.* at 10:35–36. If it is determined that no overlap occurs, there is no tripwire event 743. *Id.* at 10:36–38.

1. Illustrative Claims

Of the challenged claims, claims 1, 7, 12, 25, 26, and 28 are independent. Claims 1, 7, and 26 are illustrative of the claims at issue and are reproduced below, with bracketed material and formatting added for clarity.

1. [a] A video tripwire system comprising:
[b] a sensing device producing video output; and

- [c] a computer system, including a user interface, for performing calibration and
 - [d] for gathering and processing data based on video output received from the sensing device,
 - [e] the user interface comprising input means and output means, said input means including a graphical user interface, wherein the computer system displays processed data, and
 - [f] wherein said graphical user interface is adapted to enable a user to draw a video tripwire on at least one of a video image of said video output or a snapshot taken from said video output.
7. [a] A video tripwire user interface comprising:
- [b] a graphical user interface adapted to enable a user to draw a video tripwire on at least one of a video image and a snapshot from a video stream.
26. A method of implementing a video tripwire system comprising:
- [b] calibrating a sensing device to determine sensing device parameters for use by the system;
 - [c] initializing the system, including entering at least one virtual tripwire, said at least one virtual tripwire comprising at least one of a curved tripwire, a multi-segment tripwire, and a multiple parallel tripwire;
 - [d] obtaining data from the sensing device;
 - [e] analyzing the data obtained from the sensing device to determine if the at least one virtual tripwire has been crossed; and
 - [f] triggering a response to a virtual tripwire crossing.

D. Instituted Grounds

We instituted an *inter partes* review of the challenged claims on all of Petitioner's requested grounds as set forth in the table below.

Reference(s)	Basis	Challenged Claims
Autoscope ²	§ 102(b) ³	1–29
Autoscope and Togashi ⁴	§ 103(a)	1–6, 25, and 28–29
Winter ⁵	§ 102(b)	1–25, 28, and 29
Winter and Olson ⁶	§ 103(a)	1–6 and 25–29
Winter, Olson, and Togashi	§ 103(a)	1–6, 25, and 28–29

II. DISCUSSION

A. Principles of Law

To prevail in challenging Patent Owner’s claims, Petitioner has the burden of demonstrating by a preponderance of the evidence that the claims are unpatentable. 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d). That burden never shifts to the Patent Owner. *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed.Cir.2015).

A claim is anticipated under 35 U.S.C. § 102 only if “each and every element as set forth in the claim is found, either expressly or inherently

² *The Autoscope 2004 Supervisor User Guide* (1999) (Ex. 1003, “Autoscope”).

³ The Leahy–Smith America Invents Act, Pub. L. No. 112–29, 125 Stat. 284 (2011) (“AIA”), amended 35 U.S.C. §§ 102 and 103. Because the ’083 patent has an effective filing date before the effective date of the applicable AIA amendments, we refer to the pre-AIA version of §§ 102 and 103.

⁴ Japanese Patent Application Publication No. H3-242592 (pub. Oct. 29, 1991) (Ex. 1006, “Togashi”). Citations to this reference are to its English translation (Ex. 1007).

⁵ U.S. Patent No. 5,875,305, iss. Feb. 23, 1999 (Ex. 1004, “Winter”).

⁶ Thomas J. Olson et al., *Moving Object Detection and Event Recognition Algorithms for Smart Cameras*, Proceedings of 1997 Image Understanding Workshop, 159–175 (May 11–14, 1997) (Ex. 1005, “Olson”).

described, in a single prior art reference.” *Verdegaal Bros. v. Union Oil Co.*, 814 F.2d 628, 631 (Fed. Cir. 1987). A claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time of the invention to a person having ordinary skill in the art. *KSR Int’l Co. v. Teleflex, Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) objective evidence of nonobviousness, i.e., secondary considerations.⁷ See *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). The level of ordinary skill in the art may be reflected by the prior art of record. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001).

Additionally, a determination of obviousness cannot be made with conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness. *KSR*, 550 U.S. at 418; *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006). We must be careful not to allow hindsight reconstruction of references to reach the claimed invention without any explanation as to how or why the reference would produce the claimed invention. *Kinetic Concepts, Inc. v. Smith & Nephew, Inc.*, 688 F.3d 1342, 1368 (Fed. Cir. 2012) (quoting *Innogenetics, N.V. v. Abbott Labs.*, 512 F.3d 1363, 1374 n.3 (Fed. Cir. 2008)); see also *KSR*, 550 U.S. at 421 (“A factfinder should be

⁷ The record does not contain evidence or argument of objective evidence of non-obviousness.

aware, of course, of the distortion caused by hindsight bias and must be cautious of arguments reliant upon *ex post* reasoning.”).

We analyze the asserted grounds of unpatentability in accordance with the above-stated principles.

B. Level of Ordinary Skill in the Art

In determining whether an invention would have been obvious at the time it was made, we consider the level of ordinary skill in the pertinent art at the time of the invention. *Graham*, 383 U.S. at 17. Petitioner contends a person of ordinary skill in the art at the time of the alleged invention of the ’083 patent (a “POSITA”) would have had one of the following: (i) a bachelor’s degree in electrical engineering, computer engineering, or computer science with at least three years of experience working in image processing, (ii) a master’s degree in electrical engineering, computer engineering, or computer science with at least two years of experience working in image processing, or (iii) a Ph.D. in electrical engineering, computer engineering, or computer science, focusing on image processing or other equivalent experience. Pet. 23 (citing Ex. 1002 ¶ 57). Petitioner’s declarant further states, *inter alia*, that these descriptions are approximate and additional educational experience could make up for less work experience and vice versa. Ex. 1002 ¶ 57.

Patent Owner does not dispute Petitioner’s proposed definition. *See generally* PO Resp. Patent Owner’s Declarant, Dr. Bovik, however, provides his own assessment and states that a POSITA for the ’083 patent would have a bachelor’s degree in computer science, computer engineering, electrical engineering, or an equivalent degree, and at least two years of experience in the design and programming of video systems. Ex. 2014 ¶ 20. Dr. Bovik

further states that a POSITA would be familiar with the fundamentals of graphical user interfaces, image (e.g., video) capture devices, image (e.g., video) processing, and network protocols. *Id.*

Based on our review of the '083 patent, the types of problems and solutions described in the '083 patent and cited prior art, and the testimony of Dr. Bovik and Dr. Papanikolopoulos, we adopt and apply Dr. Bovik's definition of a person of ordinary skill in the art at the time of the claimed invention for purposes of this Decision. We note, however, that our analysis would be the same under either parties' definition of a POSITA.

C. Claim Construction

In an *inter partes* review, we construe claim terms in an unexpired patent according to their broadest reasonable construction in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b)(2017); *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2144–46 (2016) (upholding the use of the broadest reasonable interpretation standard).⁸ Consistent with the broadest reasonable construction, claim terms are presumed to have their ordinary and customary meaning as understood by a person of ordinary skill in the art in the context of the entire

⁸ The Office recently promulgated changes to the claim-construction standard applied in *inter partes* review proceedings. *Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings before the Patent Trial and Appeal Board*, 83 Fed. Reg. 51,340 (Oct. 11, 2018) (to be codified at 37 C.F.R. pt. 42). Because the Petition was filed before November 13, 2018, the effective date of the rule change, those changes do not apply to this proceeding. *Id.* at 51,345 (“The Office will continue to apply the BRI standard for construing unexpired patent claims ... in AIA proceedings where a petition was filed before the effective date of the rule.”).

patent disclosure. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). “Although an inventor is indeed free to define the specific terms used to describe his or her invention, this must be done with reasonable clarity, deliberateness, and precision.” *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994). To act as its own lexicographer, a patentee must “clearly set forth a definition of the disputed claim term” other than its plain and ordinary meaning. *Thorner v. Sony Computer Ent. Am. LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012). Additionally, the Board may not “construe claims during [an *inter partes* review] so broadly that its constructions are unreasonable under general claim construction principles.” *Microsoft Corp. v. Proxyconn, Inc.*, 789 F.3d 1292, 1298 (Fed. Cir. 2015).

Statements made during prosecution are relevant to understanding the meaning of claim terms and can give rise to prosecution history estoppel or prosecution disclaimer. Nevertheless, because prosecution history “often produces ambiguities created by ongoing negotiations between the inventor and the PTO, . . . the doctrine of prosecution disclaimer only applies to unambiguous disavowals.” *Shire Dev., LLC v. Watson Pharm., Inc.*, 787 F.3d 1359, 1366 (Fed. Cir. 2015).

Petitioner proposes constructions for several claim phrases, namely: “video tripwire” (claims 1–29), “virtual tripwire” (claims 25–26), “calibration” (claims 1–6, 25, 28–29), “calibrating” (claims 26–27), “input means” (claims 1–6, 25), “output means” (claims 1–6, 25), “at least one virtual tripwire has been crossed” (claims 26–27), and “virtual tripwire crossing” (claims 26–27). *See, e.g.*, Pet. 8–12. In its Preliminary Response, Patent Owner proffered a construction for “video tripwire,” “virtual tripwire,” “at least one virtual tripwire has been crossed,” and “virtual

tripwire crossing.” *See* Prelim. Resp. 22–36. Patent Owner also contended that the remaining terms identified by the Petitioner should be construed according to their “plain and ordinary meaning.” *Id.* at 35–36.

In our Decision on Institution, we determined that only “video tripwire” and “virtual tripwire” required construction and only to the extent to determine whether these terms exclude alarm regions or area-based detection systems as argued by Patent Owner. Dec. on Inst. 12. In its Response, Patent Owner again proposes a construction for the terms “video tripwire” recited in claims 1–29, “virtual tripwire” recited in claims 25–27, and also proffers a construction for “a computer system . . . for performing calibration” as recited in claims 1 and 25. PO Resp. 15–33. Patent Owner states that no other construction is material to resolving the Petition. *Id.* at 33–34.

For this Final Written Decision, we provide constructions for the terms “video tripwire”, “virtual tripwire,” “computer system . . . for performing calibration and for gathering and processing data based on video output received from the sensing device,” “input means,” and “output means.”

1. “*video tripwire*” and “*virtual tripwire*”

Petitioner and Patent Owner both agree that the terms “video tripwire” (claims 1–29) and “virtual tripwire” (claims 25, 26) are synonymous as they are used interchangeably in the specification and claims, but each proffer a different construction for the terms (referred collectively as “video tripwire”). *See* Pet. 8; PO Resp. 15.

Petitioner contends that video tripwire should be construed as “an element of any type in a video image that can be monitored to detect the

crossing of objects.” Pet. 8 (citing Ex. 1002 ¶¶ 63–65; Ex. 1001, Abstract, 9:4–15, 9:24–25, 9:34–36). Patent Owner responds that video tripwires “do not include alarm regions or area-based detection systems” and that the broadest reasonable interpretation of video tripwire is “a line boundary on an image or video that when traversed by a representative portion of a detected object, can trigger alarms or events.” PO Resp. 18 (citing 9:6–9, 9:12–14, 9:24–35, 10:31–33, Fig. 11; Ex. 2005, 16–17); *see generally id.* at 15–31.

Patent Owner further contends that the video tripwire described by the ’083 patent can be a “mathematical line having zero width” “(i.e. not containing any pixels)” and can “represent a one dimensional (‘1D’) zero-width boundary. *Id.* at 8 (citing Ex. 2005, 16; Ex. 1013 ¶ 55; Ex. 2014 ¶ 38); *see also id.* at 27 (stating Petitioner mischaracterizes the ’083 patent “by arguing line tripwires are not 1D”); *see also e.g., id.* at 43 (distinguishing Autoscope by stating “[u]nlike area-based tripwires like those in *Autoscope*, line based tripwires are 1D. Thus as an area-based system, *Autoscope* functions in a fundamentally different way than the claimed line-based tripwires and does not teach a tripwire that is “a line boundary on an image or video that when traversed by a representative portion of a detected object, can trigger alarms or events”) (citations omitted); *see also id.* at 27 (stating that area-based systems are dependent upon an analysis of an area comprised of pixels).

Patent Owner further asserts “tripwires and area-based systems” are “fundamentally different.” PO Resp. 8 (citing Ex. 1013 ¶ 55). Patent Owner asserts that tripwires are distinguishable from any of the prior art area-based system “as the focus is no longer testing pixels within a designated area to

determine whether an object is found within an area.” *Id.* (citing Ex. 1013 ¶ 155; Ex. 2014 ¶ 38).

We disagree with Patent Owner’s arguments that the broadest reasonable interpretation of “video tripwire” excludes alarm regions or area-based detection systems that test pixels within a designated area to determine whether an object is within that area. We also disagree with Petitioner’s arguments that a tripwire must be a one dimensional line.

First, a construction of a video tripwire as excluding area-based systems is inconsistent with the specification of the ’083 patent and the ordinary and customary meaning of the term as would be understood by one of ordinary skill in the art. For example, the ’083 patent itself indicates that the term video tripwire—which is used interchangeably with virtual tripwire (*see, e.g.*, Ex. 1001, 2:60–62)—encompasses alarm regions and area-based detection systems. The ’083 patent cites to U.S. Patent No. 5,801,943 (Ex. 1022, “Nasburg ’943”) and U.S. Patent No. 5,696,503⁹ (collectively “Nasburg”), as disclosing “the concept of a video trip wire.” Ex. 1001, 2:37–47. The video tripwires disclosed in Nasburg ’943 encompasses alarm regions and area-based detection systems. For example, Nasburg ’943 describes “tripwire sensors” as images of a loop that are electronically placed over areas on a roadway video to detect the crossing of vehicles in the video. Ex. 1022, 1:33–38. Nasburg ’943 further states that a “video processor determines how many vehicles pass through the designated area by detecting changes within a detection box (image of a loop) as a vehicle

⁹ Neither party submitted a copy of U.S. Patent No. 5,585,503 as an exhibit into the record.

passes through it.” *Id.* at 1:38–41. Therefore, we find that the ’083 patent explicitly refers to video tripwires as encompassing area-based systems.

Patent Owner states that the ’083 patent does not cover area-based tripwires because “the ’083 patent explicitly differentiated its invention from Nasburg.” PO Resp. 16 (citing Ex. 1001, 2:43–51). We disagree with this argument because the ’083 patent does not differentiate the Nasburg references on the basis of area-based versus line-based tripwires. Rather, the ’083 patent asserts the Nasburg references track and detect vehicles, while the ’083 patent detects both rigid (e.g., vehicles) and non-rigid (e.g., human) objects. Additionally, the ’083 patent states that Nasburg references mentions the “concept” of a video tripwire but does not disclose how to implement such a tripwire. Specifically, the ’083 patent states:

Nasburg deals with the tracking of vehicles using multiple sensors, including video sensors. “Finger prints” are developed for vehicles to be tracked and are used to subsequently detect the individual vehicles. While Nasburg does mention the concept of a video tripwire, there is no disclosure as to how such a video tripwire is implemented. Nasburg further differs from the present invention in that it is focused exclusively on detecting and tracking vehicles. In contrast, the present invention, as disclosed and claimed below, is aimed toward detecting arbitrary moving objects, both rigid (like a vehicle) and non-rigid (like a human).

Ex. 1001, 2:40–52. Therefore, we find the citations to the Nasburg references in the ’083 patent support our construction that the term “video tripwire” does not exclude area-based systems.

We also note that Nasburg’s use of “tripwire” as encompassing area-based systems is consistent with how the term “tripwire” is used by others in

the art. For example, various papers and reports describe the “area-based”¹⁰ Autoscope System as a “trip-line based system.” A report prepared by the Washington State Transportation Center describes Autoscope as a “tripwire imaging system.” Ex. 1017, 28. Another report prepared by the Texas Transportation institute describes Autoscope as a “trip-wire” system that uses “a narrow line of pixels across a traffic image to detect passing vehicles.” Ex. 1018, 33. A paper published in The Journal of Intelligent Transportation Systems states that in “trip-line based systems [such as Autoscope], count and speed detectors are used to measure traffic volumes, vehicle speeds.” Ex. 1021, 5, 9, Fig. 1. Thus, we find that our construction of video tripwire as not excluding area-based systems also is consistent with how the term is used in the art.

Patent Owner asserts that other portions of the '083 patent support a construction of video tripwire that excludes area-based systems or requires the tripwire to be a one dimensional line¹¹. *See, e.g.*, PO Resp. 3, 8–9, 13, 15, 18, 22 (citing Ex. 1001, 1:58–61, 2:56–59, 5:38–46, 9:6–9, 9:12–14, 9:24–35, 10:31–33, 10:63–67, Fig. 11). We have reviewed each of the cited portions of the '083 patent identified by the Patent Owner and determine that none of the cited material supports a construction of video tripwire that

¹⁰ Patent Owner asserts that the Autoscope System, which is described in one of the asserted references “is not a line based tripwire system,” but rather is an “area-based system” that uses zone-based detectors. PO Resp. 36

¹¹ Patent Owner describes a one-dimensional line as a “mathematical line having zero width (i.e. not containing any pixels).” PO Resp. 8 (citing Ex. 1013 ¶ 55), 27 (citing Ex. 1013 ¶¶ 55–61 as explaining the concept of a tripwire as a 1D line with zero width).

excludes area-based systems or requires the tripwire to be a one dimensional line.

For example, Patent Owner cites to column 2, lines 56 through 59, and column 9, lines 25 through 35 to support its argument that the tripwire of the '083 patent “is not confined to the shape of a *straight* one-dimensional line and could be curved” and that the '083 patent uses a “line-based detection algorithm.” PO Resp. 3, 21–22 (citing Ex. 1001, 2:56–59, 9:25–35; Ex. 2014 ¶ 35) (emphasis added). These cited portions of the '083 patent do not limit video tripwire to a one dimensional line or discuss line-based detection algorithms. Rather, these portions of the '083 patent merely state that a goal of the invention is to combine advantages of tripwires with those of video surveillance systems (Ex. 1001, 2:25–35) or that embodiments of the invention “may include different types of tripwires,” including tripwires that are curved, follow a contour of a region, are a multi-segment tripwire, comprise multiple parallel tripwires that require an object to cross all of the tripwires in a particular order (Ex. 1001, 9:24–35).

Patent Owner also asserts that the '083 patent describes a line-based technique in which a user clicks on one end of a line $[x_1, y_1]$ and then drags the pointer to the other end of a line $[x_2, y_2]$ and then “software solves for the values of m and b in the equation for a straight line . . . for example, $y = mx + b$.” PO Resp. 8–9 (citing Ex. 2014 ¶ 39; Ex. 1001, 5:38–46). Patent Owner asserts that if “a given pixel of an object is $[x, y]$, and y is less than $mx + b$, then the pixel is on one side of the line; if y is greater than $mx + b$, then the pixel is on the other side.” *Id.* at 8 (citing Ex. 2014 ¶ 39).

Column 5, lines 38 through 46 of the '083 patent, however, merely describes a figure that illustrates “analysis system 5 coupled to

communication medium 2 and to user interface 6” and states the analysis system comprises various components including a receiver, computer system, and memory and that the receiver has means for performing demodulation, decoding, etc. Ex. 1001, 5:35–46. We find that this discussion in the ’083 patent does not support Patent Owner’s assertions nor disclose a line-based technique in software solving for $y = mx + b$. Therefore, Patent Owner has not pointed to a teaching in the ’083 patent sufficient to limit the broadest reasonable interpretation of video tripwire to require the tripwire be a one-dimensional line.

We further find that none of the other cited portions of the ’083 patent support a construction of video trip wire that exclude area-based systems or requires the tripwire to be a one dimensional line. *See, e.g.*, Ex. 1001, 1:58–61 (discussing conventional physical tripwires as, *inter alia*, extending only in straight lines), 9:6–9 (stating that a user may superimpose one or more lines of interest on an image and these “lines will serve as one or more tripwires”), 9:12–14 (stating in one embodiment the tripwire is on the ground in the image), 9:24–35 (stating that embodiments of the invention “may include different types of tripwires,” including tripwires that are curved, follow a contour of a region, are a multi-segment tripwire, comprise multiple parallel tripwires that require an object to cross all of the tripwires in a particular order), 10:31–33 (describing Figure 11 and stating the location of a foreground object is then tested (step 741) to determine if it overlaps a line representing a tripwire (step 742)), 10:63–67 (discussing use of secondary “dummy” wires on either side the actual tripwire to determine the direction of a tripwire crossing by determining in what order the secondary tripwires are crossed when the actual tripwire is crossed).

Although some of these citations may describe the video tripwire of preferred embodiments as a line, the citations do not evidence a clear intent to redefine a video tripwire as excluding area based systems or limit a tripwire to a *one-dimensional* line. Rather, the '083 patent states a user may “superimpose one or more lines of interest on the image; these lines will serve as one or more tripwires,” thereby indicating that tripwires are not limited to one dimensional lines of zero width. *See* Ex. 1001, 9:6–8; *see also* Ex. 1001, 12:19–30 (stating the illustrated embodiments are “not intended to limit the broad aspect of the invention”); *id.* at 4:52–56 (stating that the invention is not intended to be limited to the specific terminology used to describe the preferred embodiments).

Patent Owner further relies upon statements made during prosecution of the parent application that issued as the '945 patent and during the reexamination of the '083 patent to support its argument that the '083 patent involves a “line-based detection algorithm” and is not an area-based detection system. *See, e.g.*, PO Resp. 1, 4, 18, 20–21 (citing Ex. 2005, 16, 17), 28–31 (citing Ex. 1013, 46, 48–50, 52, 53, 55). We have reviewed these statements and determine that these statements do not support the narrow construction of video tripwire proposed by Patent Owner. We find that these statements are not clear or unambiguous disavowals that would result in a disclaimer of claimed subject matter.

For example, Patent Owner quotes excerpts from the following statement made during prosecution of the related '945 patent and contends this statement “explicitly defined” video tripwire to not include “area/region-based” tripwires (*see* PO Resp. 18, 20–21):

Second, an alarm region as in Olson et al. [cannot] represent a linear boundary (e.g., a border or a perimeter). In other words, virtual tripwires may be used to define regions, but alarm regions [cannot] define a virtual tripwire.

Ex. 2005, 16–17.

We do not find this these sentences sufficient to constitute a clear or unambiguous disclaimer of “area/region-based systems” or limit video tripwires to a one dimensional line.”

Patent Owner also states that to the extent it is not clear from the ’083 patent and the prosecution history that the claim term video tripwire cannot cover area/region-based tripwires like those in the asserted prior art, Patent Owner clarified the scope of its invention during reexamination. *See, e.g.*, PO Resp. 24, 28–31.

We disagree with this argument because the Patent Office did not accept Patent Owner’s statements or determine that any of the claims under reexamination were patentable.

When granting the Request for *Inter Partes* Reexamination, the USPTO found the Request established a reasonable likelihood that the requester would prevail with respect to claims 1–29 of the ’083 patent. Ex. 1010, 12. The USPTO found that the Request raised numerous issues of unpatentability, including unpatentability over references that are asserted in present proceeding. *See, e.g., id.* at 5–11. The Reexamination was dismissed pursuant to 35 U.S.C. § 317(b) without a decision on the merits, however, because Patent Owner and the requesting party settled their civil action and entered a stipulated agreement. *See* Ex. 1016, 3–5 (dismissing Reexamination based on an Order of Dismissal entered by the district court

as a result of a stipulated agreement between Patent Owner and Bosch that Bosch did not sustain their burden of proving invalidity of any of the claims under reexamination); 35 U.S.C. § 317(b) (“Once a final decision has been entered against a party in a civil action arising [under 35 U.S.C. § 1338] that the party has not sustained its burden of proving the invalidity of any patent claim in suit . . . then . . . an inter partes reexamination requested by that party . . . may not thereafter be maintained by the Office”). As such, the USPTO never indicated any change from its position that there was a reasonable likelihood that claims 1–29 are unpatentable over area-based art, including art asserted in the present proceeding.

Therefore, for the foregoing reasons and based on the full record, we do not construe “video tripwire” or “virtual tripwire” as excluding area-based detection systems, as argued by Patent Owner. Nor do we construe “video tripwire” or “virtual tripwire” as limited to a one dimensional line having zero width. Nor do we expressly adopt Petitioner’s proposed construction, or provide further construction of the terms video tripwire or virtual tripwire, because further construction of the terms are unnecessary to resolve the issues in dispute.

2. *“computer system . . . for performing calibration”*

Petitioner contends the phrase “a computer system, including a user interface, for performing calibration” should not be construed as a means plus function limitation under 35 U.S.C. § 112 ¶ 6¹² because the claims do

¹² We refer to the pre-AIA version of 35 U.S.C. § 112, which recites an “element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the

not recite “means” and because one skilled in the art would understand “computer system” to have sufficient structure. *See, e.g.*, Pet. 10–11, 52. Nevertheless, Petitioner contends that if the “computer system . . . for performing calibration” phrase of claims 1 and 25 are construed under § 112 ¶ 6, then the phrase should be construed as a structure that performs (1) the manual calibration embodiment described at column 6, lines 39 through 56 and shown in Figure 11 of the ’083 patent (Pet. 26 (citing Ex. 1002 ¶¶ 137–141)) or (2) the automatic calibration embodiment described at column 7, lines 14 through 57 and shown in Figure 8 of the ’083 patent (Pet. 56 (citing Ex. 1002 ¶¶ 317–322)). In its Preliminary Response, Patent Owner did not opine on whether the “computer system” phrases should be construed under § 112 ¶ 6, instead merely stating that “‘calibration’ (claims 1–6, 25, 28–29) should be given [its’] plain and ordinary meaning.” Prelim. Resp. 35. In our Decision on Institution, we did not expressly discuss whether “computer system. . . for performing calibration” should be construed under 35 U.S.C. § 112 ¶ 6. Dec. on Inst. 16.

In its Response, Patent Owner asserts the “computer system for . . . performing calibration” limitations of claims 1 and 25 should be construed as means plus function elements. PO Resp. 32. Patent Owner asserts the structure of these elements is a processor that executes one of the three calibration algorithms disclosed in the ’083 patent, including both the (1) manual calibration method and (2) automatic calibration method

corresponding structure, material, or acts described in the specification and equivalents thereof”.

identified by Petitioner. PO Resp. 31–33 (citing, *inter alia*, Ex. 1001, 6:39–59; 7:14–57, Figs. 6, 8).

We agree with Patent Owner that the “computer system for . . . performing calibration” limitations of claims 1 and 25 should be construed according to § 112, sixth paragraph. In determining whether a claim term invokes § 112 ¶ 6, “the essential inquiry is not merely the presence of absence of the word ‘means’ but whether the words of the claim are understood by persons of ordinary skill in the art to have a sufficiently definite meaning as the name for structure.” *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1348 (Fed. Cir. 2015). The failure to use the word “means” creates a rebuttable presumption that § 112 ¶ 6 does not apply. *Id.* If, however, it is shown that “the claim term fails to recite sufficiently definite structure or else recites function without reciting sufficient structure for performing that function,” this presumption may be rebutted. *Id.* (citations omitted).

That is the case here. The claim terms at issue recite the function “performing calibration” but do not recite sufficient structure for performing that function because the claimed calibration function cannot be achieved by any general purpose computer or computer system without special programming. *See Aristocrat Techs. Austl. Pty Ltd. v. Int'l Game Tech.*, 521 F.3d 1328, 1333 (Fed. Cir. 2008) (stating that for a computer-implemented function, other than a generic function such as processing, receiving, or storing, the corresponding structure is a special purpose computer or processor programmed to implement the algorithm for performing the function disclosed in the specification). As result, the structure corresponding to a “computer system . . . for performing calibration” is not

simply a general purpose computer system by itself but rather a system having a special purpose computer programmed to perform the disclosed algorithm. *See Aristocrat*, 521 F.3d at 1333 (stating that to claim a means for performing a specific computer-implemented function and then to disclose only a general purpose computer as the structure designed to perform that function amounts to pure functional claiming).

As such, we conclude that the “computer system for performing calibration” limitation fails to recite sufficiently definite structure and that the presumption against means-plus-function claiming is rebutted and find that this limitation is subject to the provisions of 35 U.S.C. § 112 ¶ 6.

Construing a means-plus-function claim term is a two-step process. *Williamson*, 792 F.3d at 1351. We must first identify the claimed function. *See id.* Then, we must determine what structure, if any, disclosed in the specification corresponds to the claimed function. *See id.* Having found that the term “computer system for performing calibration” is subject to the application of § 112 ¶ 6 and having identified the function recited in the claim (calibration), we next determine what structure, if any, disclosed in the specification corresponds to the claimed function. *See id.*

For a computer-implemented function, other than a generic function such as processing, receiving, or storing, the corresponding structure is a special purpose computer or processor programmed to implement the algorithm for performing the function disclosed in the specification. *See Aristocrat*, 521 F.3d at 1333. The algorithm may be expressed as a mathematical formula, in prose, or as a flow chart, or in any other manner that provides sufficient structure. *Williamson*, 792 F.3d at 1352.

On a full record, we interpret “computer system . . . for performing calibration” as a processor for executing at least one of the three calibration methods disclosed in the ’083 patent at column 6, line 39 through column 7, line 57 and at Figures 6–8, and their equivalents. For the purposes of this Decision, only the (1) manual calibration method and (2) the automatic calibration method are relevant.

Both parties agree that the ’083 patent describes algorithms for executing these two calibration methods but the parties describe the algorithms for performing the calibration functions slightly differently. *Compare* Pet. 26–27, 56–57, with PO Resp. 32–33.

In describing the manual calibration method, an embodiment of which is shown in Figure 6, the ’083 patent states a user enters parameters relating to the sensing device. Ex. 1001, 6:39–42. “These parameters may include, *for example*,” focal length and angle of the sensing device and the height of sensing device from the ground. *Id.* at 6:42–45 (emphasis added). The system generates visual feed and then presents the visual feedback to the user. *Id.* at 6:45–49. The visual feedback provides scale information (e.g., the size of the person or other object of interest relative to its surroundings) that helps to verify that the calibration is correct; the user then decides if the appearance of the visual feedback is acceptable or if the parameters need to be adjusted; if the feedback is acceptable, the process is finished; otherwise, the process loops back for entry of new parameters. *Id.* at 6:49–56. In sum, based on our reading of the ’083 patent we interpret the algorithm for performing the manual calibration method as:

1. Receiving parameters relating to the sensing device;
2. Generating visual feedback; and

3. If visual feedback is accepted, finish the process, otherwise loop back to receive new parameters relating to the sensing device.

In describing the automatic calibration method shown in Figure 8, the '083 patent states video information is gathered by a sensing device over an extended period of time. *Id.* at 7:14–18, Fig. 8 (step 721B). After the data is gathered, objects are then segmented out for analysis. *Id.* at 7:18–19, Fig. 8 (step 722B). Histograms are then generated for the objects in various regions of the image. *Id.* at 7:19–21, Fig. 8 (step 723B). Step 724B of Figure 8 states the average size of person in the image regions is then determined and step 725B states the size of the person in different image regions is used to calibrate. *Id.*, Fig. 8. The '083 patent further explains that segmentation step (722B) is shown in Figure 10 and includes three steps, namely pixel-level background modeling (step 7221), foreground detection and tracking (step 7222), and object analysis (7223). In sum, based on our reading of the '083 patent, we interpret the algorithm for performing the automatic calibration function as:

1. Gathering video information from a sensing device;
2. Segmenting out objects;
3. Generating histograms of object in image regions;
4. Determining average size of object in image regions; and
5. Using the size of the object in different image regions to calibrate.

3. *“computer system . . . for gathering and processing data based on video output received from the sensing device”*

Petitioner contends the phrase “a computer system . . . for gathering and processing data based on video output received from the sensing device”

should not be construed as a means plus function limitation under 35 U.S.C. § 112 ¶ 6 because the claims do not recite “means” and because one skilled in the art would understand “computer system” to have sufficient structure.” *See, e.g.*, Pet. 10–11, 52. Nevertheless, Petitioner contends that if the “computer system . . . for gathering and processing data” phrase of claims 1 and 25 is construed under § 112 ¶ 6, then the gathering and processing data functions are described at 10:28–33 and in steps 740 and 742 of Figure 11 (Pet. 28, 52).

Patent Owner does not address if the “computer system for . . . gathering and processing data” phrase should be interpreted under 35 U.S.C. § 112 ¶ 6. Nor does Patent Owner provide a construction for this phrase in its Motion to Amend under § 112 ¶ 6. *See generally* Mot. to Amend.

We agree with Petitioner that this phrase should not be construed under § 112 ¶ 6. The function recited in the claim is gathering and processing data based on video output received from the sensing device. Gathering and processing data is a generic function that can be performed by a general purpose computer. *See Aristocrat*, 521 F.3d at 1333 (stating that for a computer-implemented function, other than a generic function such as processing, receiving, or storing, the corresponding structure is a special purpose computer or processor programmed to implement the algorithm for performing the function disclosed in the specification).

4. “input means”

Petitioner argues that the “input means” recited in independent claims 1 and 25 is a means-plus-function limitation under 35 U.S.C. § 112 ¶ 6 whose function is inputting data and the corresponding structure in the Specification of the ’083 patent is a mouse, a keyboard, a touch screen and a

graphical user interface. Pet. 12. Patent Owner does not dispute Petitioner's proposed construction.

We find the "input means" of claim 1 is a means-plus-function limitation under § 112 ¶ 6 because the claim uses the word "means," describes the function performed by the "means" and recites no structure for performing the function.

We adopt Petitioner's proposed construction and note that construction of this term is not material to resolving issues in dispute.

5. "output means"

Petitioner argues that the "output means" recited in independent claims 1 and 25 is a means-plus-function limitation under 35 U.S.C. § 112 ¶ 6 whose function is outputting data and the corresponding structure in the Specification of the '083 patent is a monitor, a printer, a display device, an alarm, an alerting device, and a graphical user interface. Pet. 11–12. Patent Owner does not dispute Petitioner's proposed construction. PO Resp. 33.

We find the "output means" of claim 1 is a means-plus-function limitation under § 112 ¶ 6 because the claim uses the word "means," describes the function performed by the "means" and recites no structure for performing the function.

We adopt Petitioner's proposed construction and note that construction of this term is not material to resolving the issues in dispute.

6. Other Claim Terms and Phrases

We determine that no further claim construction is required to resolve the issues in dispute. *See Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) ("[O]nly those terms need be construed that

are in controversy, and only to the extent necessary to resolve the controversy.”).

D. Overview of the Asserted Art

1. Autoscope

Autoscope (Ex. 1003), titled “AutoscopeTM 2004 Supervisor User Guide” is a user guide that provides information about the hardware and software that make up the Autoscope System. Ex. 1003, 1, 11. The Autoscope System is a traffic surveillance management system, comprising computer hardware, software, and cabling, that detects, calculates, and collects traffic data, such as vehicle presence and passage, vehicle speed, and incident detection. *Id.* at 18–19. In the Autoscope System, “[a]n image sensor, or camera, transmits live video signals to an Autoscope machine vision processor (MVP) that processes the images.” *Id.* at 20. “The MVP then records the results of its analysis” and the results “are available to human operators (through the Supervisor application) for further analysis.” *Id.*

The Supervisor application of the Autoscope System is used to “create detector layouts” that will direct the MVP how to monitor and collect traffic data at that location. *Id.* at 22, 24. The detector layouts are drawn by the user over a location on a video or still image of the camera feed. *Id.* at 22. The detector layouts appear as a line, box, or arrow. *Id.* at 22, 159. Each shape represents a detector type, calculation, or function, and specifies how the MVP monitors and collects traffic data at that location. *Id.* at 159.

For example, “Count detectors” are used to determine the total number of vehicles detected during a set time interval and appear as straight lines that lie perpendicular to a lane of traffic. *Id.* at 175. “Presence

detectors” are used to identify “the presence of a vehicle in the field of view” with “high accuracy.” *Id.* at 176. Presence detectors can also be used to process an image to detect vehicles travelling in the wrong direction or detect when vehicles are stopped. *Id.* “Presence detectors look like Count detectors (straight lines)” but “typically lie parallel to the flow of traffic.” *Id.* at 177. If directional capability is assigned to a detector, an arrow appears at the end of the detector and the detector will turn on only for vehicles moving in the direction the arrow points. *Id.*

2. *Winter*

Winter is a U.S. Patent titled “Video Information Management System Which Provides Intelligent Responses to Video Data Content Features.” Ex. 1004, [54]. Winter discloses an intelligent video information management (“IVIM”) system that includes video cameras 520, and video analysis and storage units 518, and a Video Recorder/PC (“VR/PC”) unit that has motherboard 580, front end video processing and video data compression hardware 582, and a screen display. *Id.* at 15:33–16:4, 17:53–64, Figs. 1A, 155. The screen display is “of the type that may be presented to the user in connection with setting parameters for executing a “‘perimeter violation’ image analysis tool.” *Id.* at 62:37–39; Figs. 90A-D, 155. The screen display “permit[s] the user to adjust parameters of an image analysis algorithm which determines whether a perimeter boundary has been crossed by a moving object.” *Id.* at 14:1–4; Fig. 155. A “drawing element (such as a box or line)” is “displayed over a video image.” *Id.* at 62:39–42. The drawing element “is indicative of a perimeter of an area in the scene represented by the video signal, the purpose of the image analysis algorithm being to detect entry of objects into the indicated area.” *Id.* at 62:41–45.

When the “user indicates that the parameter setting is done,” “end points of the line or box indicating the perimeter 1966 are determined . . . and the endpoints are then saved as parameters indicative of the perimeter location.” *Id.* at 62:53–57. If an object in the video feed, such as a person, crosses the perimeter, an “image analysis algorithm” detects that crossing and generates a response, such as the sounding of an alarm. *Id.* at 62:40–46, 64:27–61.

3. *Olson*

Olson, titled “Moving Object Detection and Event Recognition Algorithms for Smart Cameras,” is a report that was included in “Proceedings of Image Understanding Workshop” reportedly held in May 1997. Ex. 1005, 3, 4. Olson describes “algorithms for the core computations needed to build smart cameras” that can analyze video and detect moving objects and recognize events, such as a person entering or exiting a scene. *Id.* at 14, 17–20, Fig. 2. Olson states the algorithms make up an “Autonomous Video Surveillance (AVS) system . . . for moving object detection and event recognition.” *Id.* at 14. The system comprises smart cameras that communicate with a Video Surveillance Shell (VSS).” *Id.* at 21. “The VSS [] allows the user to specify alarm regions and conditions. Alarm regions are specified by drawing them on the map and using a mouse.” *Id.* at 21. Olson’s system “learns the image to-world mapping by watching humans move around in the scene.” *Id.* at 26. “Changes in the apparent size and position of humans in the image provide information about the existence and depth of world surfaces.” *Id.*

4. *Togashi*

Togashi is a Japanese Unexamined Patent Application Publication titled “Image Monitoring Device” that describes a device for detecting intruding objects, such as people, in a monitoring region. Ex. 1007, 2, 5. The device includes, *inter alia*, a “filming means [such as a camera] for filming an image in a monitoring region”, and “a detection means for processing the [digitized] image” and “detecting intruding objects in the monitoring region,” “wherein at least one linear area for detecting intruding objects is set on the image in the monitoring region, and intruding objects are detected by changes in the image in this linear area.” *Id.* at 3.

E. *Asserted Anticipation of Claims 1–29 by Autoscope*

Petitioner contends claims 1–29 are anticipated under § 102(b) by Autoscope and argues Autoscope discloses each and every limitation of the challenged claims. Pet. 24–54. Patent Owner opposes. *See generally* PO Resp. Having considered the parties contentions and supporting evidence, we determine Petitioner has demonstrated by a preponderance of the evidence that Autoscope anticipates claims 1–29 of the ’083 patent.

1. *Independent Claims 1, 7, 12, 25, 26, and 28*

a. *video tripwire (claims 1, 7, 12, 25, 26, and 28)*

Preamble language that merely states the purpose or intended use of an invention generally is not treated as limiting the scope of a claim. *See Boehringer Ingelheim Vetmedica, Inc. v. Schering–Plough Corp.*, 320 F.3d 1339, 1345 (Fed. Cir. 2003). When the limitations in the body of the claim rely upon or derive essential structure from the preamble, however, then the preamble acts as a necessary component of the claimed invention and is

limiting. *See Eaton Corp. v. Rockwell Int'l Corp.*, 323 F.3d 1332, 1339 (Fed. Cir. 2003).

The preamble of claims 1 and 25 recites a “video tripwire comprising,” the preamble of claim 7 recites a “video tripwire user interface comprising,” the preamble of claims 12 and 26 recites a “method of initializing a video tripwire system,” and the preamble of claim 28 recites “a video tripwire apparatus comprising.” Petitioner contends Autoscope discloses the preamble of each independent claim because Autoscope discloses full traffic surveillance management system that uses video tripwires, which “appear as line, box, or arrow shapes that overlay a region of a video or still image” to generate traffic measurements. Pet. 24 (citing Ex. 1003, 18, 193, 195, 199–200, 203–204).

Patent Owner responds that Autoscope does not disclose the “require[d] line-based ‘video tripwire’” because Autoscope is an “area-based system that uses tripwires made of zones rather than lines.” *Id.* at 39; *see also id.* at 3 (“all of the prior art identified in the Petition is limited to teaching alarm *regions* and/or alarm *areas* rather than tripwires. Tripwires are fundamentally different in both form and substance from regions and areas.”); *see generally* PO Resp. 39–44.

We disagree with Patent Owner’s argument. As stated above in Section II.C.1., we do not construe video tripwire as excluding area-based systems. Therefore, we disagree with Patent Owner’s argument that Autoscope does not disclose line-based video tripwires. We agree with Petitioner and find that Autoscope discloses traffic management system that that uses machine-vision technology to produce highly accurate traffic measurements. Pet. 24; Ex. 1003, 18. Autoscope’s tripwires “appear as line,

box, or arrow shapes that overlay a region of a video or still image” and generate these measurements. Ex. 1003, 159.

Based on our review of the entirety of the record before us, we agree with Petitioner and find that Autoscope discloses the preambles of independent claims 1, 7, 12, 25, 26, and 28.

b. a sensing device producing video output (claims 1, 25); apparatus adapted to be coupled to a sensing device, said sensing device to produce video output (claim 28)

Petitioner contends that Autoscope’s image sensor or video camera, which “transmits live video signals to an Autoscope machine vision processor (MVP) that processes the images” discloses the “sensing device producing video output” limitations recited in claims 1 and 25 and similarly recited in claim 28 (an “apparatus adapted to be coupled to a sensing device, said sensing device to produce video output”). Pet. 24–25 (citing Ex. 1002 ¶¶ 132–134; Ex. 1003, 20).

Patent Owner does not dispute these contentions. *See generally* PO Resp. Nonetheless, the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware*, 800 F.3d at 1378. We have reviewed the parties’ arguments and evidence and agree with Petitioner and find that Autoscope discloses the “sensing device producing video output” recited in claims 1 and 25 and an “apparatus adapted to be coupled to a sensing device, said sensing device to produce video output” recited in claim 28.

- c. *a computer system, including a user interface, for performing calibration (claims 1, 25) / said apparatus including a user interface, said apparatus adapted to perform calibration (claim 28)*

As stated above in Section II.C.2., we construe the “computer system . . . for performing calibration” phrase recited in claims 1 and 25 as a means-plus function limitation. Petitioner contends that under such a construction, Autoscope discloses a processor for performing the manual calibration method recited in the ’083, and thus discloses the means plus function calibration limitation of claims 1 and 25 and similar limitations recited in claim 28. Pet. 26–27. Petitioner states that Autoscope provides a calibration prompt, requiring a user to enter the sensing device parameter, namely camera height. Ex. 1003, 150. Autoscope presents the user with visual feedback of the camera’s view. Ex. 1003, 154. The user may adjust the camera height and gridlines. *Id.*

Patent Owner responds that Autoscope’s specialized algorithm for camera calibration does not disclose the manual calibration algorithm of the ’083 patent because Autoscope’s algorithm (1) does not require focal length, camera angle, or any parameters other than camera height and (2) requires drawing a calibration grid, which is not is taught by the ’083 patent. PO Resp. 47–48 (citing Ex. 2014 ¶ 57).

We disagree with Patent Owner’s argument. The ’083 patent states the sensing parameters “*may include, for example*” a number of sensing parameters but does not require any particular parameter. Ex. 1001, 6:41–45 (emphasis added). Moreover, the challenged independent claims do not require the specific parameters as argued by Patent Owner. Because the ’083 patent states the listed sensing parameters are examples and does not require that any particular parameter be used, we disagree that algorithm for manual

calibration requires entering use of the exemplary sensing device parameters. Nor does the '083 patent preclude other types of information from being received.

Based on the record before us, we find Autoscope discloses a processor that executes the first two steps of the algorithm for performing manual calibration, or its equivalent, by (1) receiving a user entered camera height (a sensing device parameter) and (2) generating visual feedback by presenting the user with visual feedback of the camera's view. *See, e.g.*, Ex. 1003, 154. We also find Autoscope discloses the third step of the algorithm for manual calibration by looping back to receive new parameters relating to the sensing device by allowing the user to adjust the camera height and, if no further adjustments are made, finishing the calibration processes. *Id.*

Based on our review of the entirety of the record before us, we agree with Petitioner and find that Autoscope discloses calibration limitations recited in claims 1, 25, and 28.

d. a computer system . . . for gathering and processing data based on video output received from the sensing device (claims 1, 25) / obtaining data from the sensing device (claim 26) / said apparatus . . . to gather and process data based on video output received from the sensing device (claim 28)

Petitioner contends Autoscope discloses this limitation as recited in claims 1 and 25 and similarly recited in claims 26 (“obtaining data from the sensing device”), 28 (apparatus adapted to . . . gather and process data based on video output received from the sensing device”). *See, e.g.*, Pet. 27–28. For example, Petitioner asserts Autoscope's MVP gathers and processes video signals from the video camera and reports them to a user interface in

the Supervisor software. *Id.* at 28; Ex. 1003, 20. Patent Owner does not dispute Petitioner’s contentions regarding these limitations. *See generally* PO Resp. Nonetheless, the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware*, 800 F.3d at 1378.

Based on our review of the entirety of the record before us, we agree with Petitioner and find that Autoscope discloses the limitations regarding gathering and processing data recited in claims 1, 25, 26, and 28.

e. the user interface comprising input means and output means, said input means including a graphical user interface, wherein the computer system displays processed data (claims 1, 25, 28)

Petitioner contends Autoscope’s disclosure of a computer having a GUI that displays a “particular camera’s roadway image” as well as a mouse and keyboard used for operator selection teaches the input means of claims 1, 25, and 28. Pet. 31 (citing Ex. 1003, 26, 128, 369). Patent Owner does not dispute Petitioner’s contentions regarding these limitations. *See generally* PO Resp. Nonetheless, the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware*, 800 F.3d at 1378.

Based on our review of the entirety of the record before us, we agree with Petitioner and find that Autoscope discloses the user interface having input and output means required by claims 1, 25, and 28.

f. entering parameters

Petitioner asserts that Autoscope allows the user to enter “detection parameters, such as detector lengths and coordinates of key points” and thus discloses the “entering parameters” recited in claim 12. Pet. 40 (citing Ex. 1003, 146–148, 206). Patent Owner does not dispute Petitioner’s contentions regarding this limitation. *See generally* PO Resp. Nonetheless, the burden

remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware*, 800 F.3d at 1378.

Based on our review of the entirety of the record before us, we agree with Petitioner and find that Autoscope discloses “entering parameters” as required by claim 12.

g. graphical user interface adapted to enable a user to draw a video tripwire on at least one of a video image of said video output or a snapshot taken from said video output (claims 1, 7, 28) / wherein the computer system includes software permitting a user to enter at least one virtual tripwire (claim 25) / initializing the system including entering at least one virtual tripwire (claim 26)

Petitioner contends Autoscope’s Supervisor Workstation, which allows users to draw video tripwire “detectors” over a particular camera’s roadway image in the Camera window, teaches the limitations relating to drawing or entering a video tripwire required by claims 1, 7, 12, 25, 26, 28. *See* Pet. 32 (citing Ex. 1003, 36, 128; Ex. 1002 ¶¶ 151–154).

Other than arguing Autoscope does not disclose a video tripwire, Patent Owner does not dispute Petitioner’s contentions regarding these limitations. *See generally* PO Resp. We disagree with Patent Owner’s argument regarding “video tripwire” because this argument relies upon its proposed construction of “video tripwire”, a construction that we do not adopt as discussed above in Section II.C.1.

Based on our review of the entirety of the record before us, we agree with Petitioner and find that Autoscope discloses the graphical user interface and software that allows a user to enter a video/virtual tripwire on a video image as required by claims 1, 7, 12, 25, and 26.

- h. the video tripwire comprising at least one of a curved video tripwire, a multi-segment video tripwire, and a multiple parallel video tripwire (claim 25) / said at least one virtual tripwire comprising at least one of a curved tripwire, a multi segment tripwire, and a multiple parallel tripwire (claim 26)*

Petitioner contends Autoscope's teaching of combining multiple presence detectors parallel to each other discloses a video tripwire comprising a multiple parallel video tripwire as recited by claim 25 and similarly by claim 26. Pet. 46–47 (citing Ex. 1003, 165, 169, 172). Patent Owner does not dispute Petitioner's contentions addressing these limitations. *See generally* PO Resp. Nonetheless, the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware*, 800 F.3d at 1378.

Based on our review of the entirety of the record before us, we agree with Petitioner and find that Autoscope discloses the limitations requiring a video or virtual tripwire comprising a multiple parallel video tripwire as required by claim 25 and 26.

- i. analyzing the data obtained from the sensing device to determine if the at least one virtual tripwire has been crossed; and triggering a response to a virtual tripwire crossing (claim 26).*

Petitioner contends Autoscope discloses presence and count detectors that are used to determine whether a vehicle has “crossed” under a detector. Pet. 48–49 (citing Ex. 1002 ¶¶ 268–272; Ex. 1003, 165, 176, 198, 201–203). Petitioner relies on the testimony of its declarant, Dr. Papanikolopoulos, to support its position. Dr. Papanikolopoulos testifies that Autoscope's presence detectors may be set to detect every time a vehicle passes under the detector. Ex. 1002 ¶¶ 270–271 (citing Ex. 1003, 176, 198, 201–203).

Patent Owner responds that because Autoscope is “an area based system,” Autoscope determines whether an object is within an area, not

whether a virtual tripwire, or any boundary, has been crossed. PO Resp. 51 (citing Ex. 2014 ¶ 61). Patent Owner asserts that detecting whether an object is “within” the area of interest is not the same thing as detecting a crossing. *Id.* (citing Ex. 2014 ¶ 61).

We disagree with Patent Owner’s argument. As stated above in Section II.C.1., we do not construe a video tripwire as excluding area-based systems that determine if an object is within an area. Additionally, we disagree that detecting if an object is within the area of interest is not the same thing as detecting a crossing because the ’083 patent expressly states that “an object is determined to cross a tripwire if the bottom portion of the object *overlaps* a tripwire line.” Ex. 1001, 9:19–21 (emphasis added); *see also id.* Fig. 11 (step 742), 10:35–36 (“an object is determined to *cross* a tripwire if the bottom portion of the object *overlaps* a tripwire line”) (emphasis added).

We find that Autoscope discloses “presence detectors” and “count detectors” that are drawn over the image of roadway and are used to detect the crossing of vehicles. *See, e.g.*, Ex. 1003, 128. These detectors can appear as, *inter alia*, a line or box. *Id.* at 159. Autoscope’s count detectors are used to count vehicles that cross in a particular direction. Ex. 1003, 198, 201–202. Autoscope’s presence detectors are used to “identify the existence of a vehicle in the field of view.” *Id.* at 203. They may be set to “turn ON every time a vehicle passes under the detector” or to detect “vehicles traveling in the wrong direction.” *Id.* at 176. Presence detectors may be placed parallel to each other in adjacent lanes so that “a vehicle that is changing lanes is more likely to cross under only one of the adjacently placed detectors.” *Id.* at 165.

Based on our review of the entirety of the record before us, we agree with Petitioner and find that Autoscope discloses limitations regarding analyzing data, determining of a tripwire has been crossed, and triggering a response as required by claim 26.

Therefore, based on the record developed during trial, we conclude that Petitioner has demonstrated by a preponderance of the evidence that the subject matter of independent claims 1, 7, 12, 25, 26, 28 are anticipated by Autoscope.

F. Asserted Anticipation of Dependent Claims 2–6, 11, 13–24, 27, and 29 by Autoscope

Petitioner contends Autoscope discloses the additional limitations in dependent claims 2–6, 11, 13–24, 27, and 29. Pet. 34–44, 49–51, 53–54. Other than arguments relating to the patentability of the independent claims, Patent Owner only presents arguments directed to the patentability of claims 11 and 19. PO Resp. 49–51. For the following reasons, we determine Petitioner has demonstrated by a preponderance of the evidence that Autoscope anticipates claims 2–6, 11, 13–24, 27, and 29 of the '083 patent.

Claims 11, 19

Claim 11, which depends from claim 7, further requires that the “graphical user interface is further adapted to enable a user to enter at least one video event rule.” Claim 19, which depends from claim 12, further requires the entering “of at least one video event rule.”

Petitioner asserts that drawing of presence and count detectors on Autoscope’s GUI discloses entering the video event rules as required by claims 11 and 19. Pet. 38–39 (citing Ex. 1002 ¶¶ 181–184; Ex. 1003, 21, 186, 195, 204–205). Patent Owner responds that the Petition fails to identify

where Autoscope discloses a “user interface that allows a user to enter video event rules” as required by claim 11 or the actual entering of a video event rule as required by claim 19. PO Resp. 49–50.

Upon consideration of the arguments and evidence of record, we disagree with Patent Owner and find Autoscope’s disclosures relating to count detectors and presence detectors teach the video event rule limitations of dependent claims 11 and 19.

The ’083 patent states that a video event rule “may comprise a prescribed action (such as a ‘human’ crossing a ‘virtual tripwire’ in a prescribed direction) and a prescribed response (such as logging the alert with text and video to a database and sending an e-mail to a particular email address).” Ex. 1001, 10:5–10. “Video event rules may encompass more complex activities involving other virtual video features, such as areas of interest, along with other classes of activities, such as loitering, leaving a bag behind, or stealing an item, and other types of response, such as activating a Digital Video Recorder (DVR) or sounding an audible alarm.” *Id.* at 10:10–15.

We find that counting vehicles moving in a particular direction (count detectors) and identifying the presence of a vehicle in the field of view (presence detectors) comprise a “prescribed action” and that transmitting an alarm to the Supervisor workstation or “extend[ing] a call to the controller” or constitutes “prescribed responses.” *See* Ex. 1003, 21, 176 (stating presence detectors can detect stopped vehicles and also stating that when certain conditions are met, such as when three vehicles are in the left lane, the MVP “outputs a signal to the traffic controller”).

We also find that Autoscope teaches how to enter both count detectors and presence detectors on Autoscope's graphical user interface through use of a mouse. *See* Ex. 1003, 195 (describing, *inter alia*, how to add and edit count detector parameters on a GUI, such as by drawing a count detector parallel to a stop bar or double clicking on a left mouse button); *id.* at 204–205 (describing how to add presence detectors to a GUI layout by, *inter alia*, “click[ing] on the down arrow icon at the top of the Camera window,” click on “Presence” shown in the list box, then place the pointer at a position where you wish to begin drawing the detector line and drag the pointer to the place where you wish the detector line to end); *see also id.* at 177 (describing how to add presence detectors to the GUI layout); *id.* at 186–187 (describing how to add Speed Alarms to the GUI layout).

Therefore, based on the record developed during trial, we conclude Petitioner has demonstrated by a preponderance of the evidence that the subject matter of claims 11 and 19 are anticipated by Autoscope.

Claims 2–6, 13–18, 20–24, 27, and 29

Petitioner provides detailed evidence and argument that Autoscope discloses each of the limitations of claims 2–6, 13–18, 20–24, 27, and 29. *See* Pet. 34, 37, 40, 44, 49, 51, 53, 54. Patent Owner presents no arguments separately directed to the patentability of claims these claims. We have reviewed the record and the parties' arguments and determine that Petitioner sufficiently identifies disclosure in Autoscope corresponding to the additional limitations of claims 2–6, 13–18, 20–24, 27, and 29. *Id.*

Therefore, based on the record developed during trial, we conclude that Petitioner has demonstrated by a preponderance of the evidence that the

subject matter of claims 2–6, 13–18, 20–24, 27, and 29 __ are anticipated by Autoscope.

G. Asserted Obviousness of Claims 1–6, 25, 28, and 29 over Autoscope and Togashi

Petitioner contends that claims 1–6, 25, 28, and 29 would have been obvious over the combined teachings of Autoscope and Togashi. Petitioner contends that to the extent Autoscope does not teach the gathering and processing data based on video output received from a sensing device limitations recited in independent claims 1, 25, 26, 28, Togashi makes up for any deficiencies. Pet. 28–30 (citing Ex. 1007, 2–3, Figs. 1, 8; Ex. 1002 ¶¶ 128, 147), 45 (citing Ex. 1002 ¶¶ 129, 233–238), 53 (citing Ex. 2002 ¶¶ 128, 298–303). Specifically, Petitioner contends that Togashi teaches a more detailed algorithm for detecting when an object overlaps a line (tripwire) by comparing the pixel luminance of the line between a background image at time $t=t_0$ and a new image at time $t=t_1$, generating a difference value for each pixel, binarizing each pixel into “0” or “1” based on a predetermined threshold value, and determining that an object overlaps the line if the number of pixels on the line having the value “1” is greater than a threshold number. *Id.* at 30 (citing Ex. 1007, 4, Figs. 3(a), 3(b), 3(c), 3(d)). Petitioner further contends that it would have been obvious to combine the teachings of Togashi and Autoscope system to achieve the benefits of using Togashi’s efficient algorithm (e.g., decreased computation time and data storage requirements) in Autoscope’s similar system. *Id.* at 29–30 (citing, *inter alia*, Ex. 1007, 2–3; Figs. 1, 8; Ex. 1002 ¶¶ 128, 147).

Patent Owner argues that Togashi does not cure any deficiencies of Autoscope because Togashi “is also an area-based system” and therefore

does not “disclose the claimed tripwire.” Prelim. Resp. 56–57. We disagree with Patent Owner’s argument because it is based upon a claim construction of video tripwire that excludes area-based systems, which we did not adopt.

Patent Owner also argues that a POSITA would not combine Autoscope with Togashi because Togashi is directed to tracking a person while Autoscope is directed to tracking vehicles that move at a much faster rate. PO Resp. 44–45. We disagree. We agree with Petitioner and find that both Autoscope and Togashi disclose video based surveillance systems that analyze video to determine when an object crosses a virtual tripwire in the image and tha Togashi provides a specific exemplary embodiment how to make that determination. Pet. 29. We also agree with Petitioner and find that Togashi teaches monitoring tripwire pixels for overlap and states that its algorithm requires only a small amount of computation, time, and data storage capacity. *Id.* (citing Ex. 1007, 3). We are also persuaded by the testimony of Dr. Papanikolopoulos, that a POSITA would have been motivated to combine the teachings of Togashi and Autoscope to take advantage of the efficiencies of Togashi. Ex. 1002 ¶ 128. We determine that Petitioner has provided sufficient articulated reasoning with rational underpinning to establish that a person of ordinary skill in the art would have modified the teachings of Autscope in view of Togashi to achieve the benefits taught by Togashi, e.g., to reduce the amount of computation, time, and storage data needed. *See KSR*, 550 U.S. at 418.

On the present record, we determine Petitioner has shown sufficiently the combination of Autoscope and Togashi teaches or suggests the limitations of independent claims 1, 25, and 28 and has provided articulated reasoning with rational underpinning for combining the references.

Petitioner has also shown sufficiently that the combination teaches the limitations of dependent claims 2–6, which depend directly or indirectly from claim 1, and claims 27 and 29, which depend from claims 26 and 28 respectively, would have been obvious over the combined teachings of Autoscope and Togashi. Patent Owner makes no additional arguments with respect to these claims. Accordingly, having considered the parties contentions and supporting evidence, we determine Petitioner has demonstrated by a preponderance of the evidence that claims 1–6, 25, and 28–29 would have been obvious over Autoscope and Togashi.

H. Asserted Anticipation of Claims 1–25, 28, and 29 by Winter and Asserted Obviousness of Claims 1–6 and 25–29 over Winter and Olson

Petitioner contends that claims 1–25, 28, and 29 are anticipated under § 102(b) by Winter and that claims 1–6 and 25–29 are unpatentable under § 103(a) over Winter and Olson. Pet. 54–89. Patent Owner opposes. PO Resp. 52–58.

Having considered the parties contentions and supporting evidence, for the foregoing reasons, we determine that Petitioner has demonstrated by a preponderance of the evidence that Winter anticipates claims 7–24, 28, and 29 of the '083 patent and that claims 1–6 and 25–29 are unpatentable over Winter and Olson. Petitioner has not demonstrated by a preponderance of the evidence that claims 1–6 and 25 are anticipated by Winter.

1. Independent Claims 1, 7, 12, 25, 26, and 28

a. video tripwire (claims 1, 7, 12, 25, 26, and 28)

The preamble of claims 1 and 25 recites a “video tripwire comprising,” the preamble of claim 7 recites a “video tripwire user interface comprising,” the preamble of claims 12 and 26 recites a “method of

initializing a video tripwire system,” and the preamble of claim 28 recites “a video tripwire apparatus comprising.” Petitioner contends that Winter discloses the preamble of each independent claim because Winter discloses a “perimeter violation” image analysis tool that is part intelligent video information system which detects significant features of an incoming video information stream, and takes appropriate action in response to detection of features of interest,” such as the entry of an object into an area indicated by the perimeter. Pet. 54–55 (citing Ex. 1004, 2:23–27, 62:40–46).

Patent Owner responds that Winter does not teach the claimed “video tripwire” recited in each of the challenged claims. PO Resp. 52–58.

According to Patent Owner, Winter is an “area-based system” that uses tripwires made of areas rather than lines and therefore does not disclose the claimed line-based tripwire system. *Id.* at 52; *see generally id.* at 52–58. We disagree with Patent Owner’s argument. As stated above in Section II.C.1., we do not construe video tripwire as excluding area-based systems.

Based on our review of the entirety of the record before us, we agree with Petitioner and find that Winter discloses the preamble of independent claims 1, 7, 12, 25, 26, and 28.

b. a sensing device producing video output (claims 1, 25); apparatus adapted to be coupled to a sensing device, said sensing device to produce video output (claim 28)

Petitioner contends that Winter’s video camera 520 is a “source of video data” and satisfies the “sensing device producing video output” limitations recited in claims 1 and 25 and similarly recited in claim 28 (an “apparatus adapted to be coupled to a sensing device, said sensing device to

produce video output”). Pet. 55 (citing Ex. 1002 ¶ 313; Ex. 1004, 3:33–39, Fig. 1A).

Patent Owner does not dispute these contentions. *See generally* PO Resp. We have reviewed the parties’ arguments and evidence and agree with Petitioner. Specifically, we find that Winter discloses the “sensing device producing video output” recited in claims 1 and 25 and an “apparatus adapted to be coupled to a sensing device, said sensing device to produce video output” recited in claim 28.

c. a computer system, including a user interface, for performing calibration (claims 1, 25) / said apparatus including a user interface, said apparatus adapted to perform calibration (claim 28)

Claim 28 recites apparatus including a user interface, said apparatus adapted to perform calibration (claim 28). Petitioner asserts Winter discloses this limitation because the computer system of Winter uses size and depth parameters to calibrate the system. Pet. 55 (citing Ex. 1004, 63:12–19; Ex. 1002 ¶¶ 314–15). Patent Owner does not dispute these contentions. *See generally* PO Resp. We have reviewed the parties’ arguments and evidence and agree with Petitioner and find that Winter discloses an apparatus including a user interface, said apparatus adapted to perform calibration as recited in claim 28.

As stated above in Section II.C.2., we construed the “computer system . . . for performing calibration” phrase recited in claims 1 and 25 as a means-plus function limitation. Petitioner provides insufficient argument that Winter discloses this limitation under this claim construction. *See* Pet. 55. Accordingly, we determine Petitioner has not shown by a preponderance of the evidence that Winter anticipates claim 1 and claim 25.

Petitioner asserts that if the “computer system . . . for performing calibration” limitations recited in independent claims 1 and 25 are construed as a means plus function limitation, then Olson teaches this limitation because Olson discloses the function of performing calibration using structure corresponding to the automatic calibration embodiment described at 7:14–57 and shown in Figure 8 of the ’083 patent. Pet. 56. Petitioner asserts that a POSITA would have combined Olson’s more advanced calibration process into the system of Winter to provide image-to-world mapping and enhance Winter’s system. Pet. 58–60 (citing, *inter alia*, Ex. 1002 ¶¶ 111–115, 120, 124–127, 319, 323–324).

Patent Owner responds that Olson’s specialized algorithm for camera calibration does not disclose the automatic calibration algorithm of the ’083 patent because Olson because (1) Olson’s calibration method requires both an image and a corresponding map for a “warp transformation” algorithm, which is not disclosed by the ’083 patent, (2) Olson’s method requires that the internal calibration parameters be known, which is not required by the ’083 patent, and (3) Olson’s camera roll angle is assumed to be zero, which is not a required assumption in the ’083 patent.

We disagree with these arguments because they rely on alleged differences between the calibration method of Olson and the ’083 patent. These differences, however, are not material to the algorithm for executing the automatic calibration method of the ’083 patent.

Patent Owner also argues that Olson does not disclose the segmentation step of the automatic calibration method because Olson uses “simple background subtraction and does not segment out objects in images when differencing the foreground and background, as required” by the

automatic calibration method of the '083 patent. PO Resp. 59–63 (citing Ex. 1005, 161, 171; Ex. 2014 ¶ 80). We disagree with this argument because we find that Olson does disclose the required segmentation step.

As explained above in Section II.C.2., we find that the algorithm for performing the automatic calibration function disclosed in the '083 patent requires:

1. Gathering video information from a sensing device;
2. Segmenting out objects;
3. Generating histograms of object in image regions;
4. Determining average size of object in image regions; and
5. Using the size of the object in different image regions to calibrate.

We find Petitioner has shown that Olson discloses each of these steps of the automatic calibration algorithm. For example, Petitioner has demonstrated persuasively that Olson gathers video information from a sensing device because the image from the video camera of Olson is portioned into a grid and each square of the grid is associated with a histogram that builds up a sample distribution for the apparent height of a human that passes through that location of the image, as required by the first step of the algorithm disclosed in the '083 patent. Pet. 56 (citing Ex. 1005, 27).

Petitioner also has persuasively demonstrated that Olson segments out objects, as required by the second step of the algorithm disclosed in the '083 patent. Pet. 56–57. Olson explains that “[p]rior to activation of the monitoring system, an image of the background...is captured to serve as the *reference image*” and that while in operation, the difference between the reference image and current video frame is “thresholded at an appropriate

value to obtain a binary image in which the ‘off’ pixels represent background pixels, and the ‘on’ pixels represent ‘moving object’ pixels.” Ex. 1005, 17 (emphasis original). We disagree with Patent Owner’s argument that Olson does not teach this segmentation step because Olson uses “simple background subtraction and does not segment out objects in images when differencing the foreground and background, as required” by the automatic calibration method of the ’083 patent. PO Resp. 59–63 (citing Ex. 1005, 161, 171; Ex. 2014 ¶ 80). Rather, we find that by segmenting pixels into “off” pixels that represent background pixels and “on” pixels that represent moving objects, Olson discloses the segmenting step described in the ’083 patent. *See* Ex. 1001, 8:27–42 (citing Olson in connection with the segmenting step).

Olson also discloses generating histograms of object in image regions, as required by the third step of the algorithm disclosed in the ’083 patent. Olson generates a histogram for each of the 6x16 regions in the image. Ex. 1005, 27. Figure 10 displays the histogram, in which the “pixel intensity corresponds to the median observed height for the corresponding location” and “[d]ark grey pixels are those for which no observations were recorded.” *Id.*

Olson also determines the average size of object in image regions. Olson’s histogram includes pixel intensities that correspond to the median height of a person in that region, as required by the fourth step of the algorithm disclosed in the ’083 patent. Ex. 1005, Fig. 10 (stating “Cell intensity is the median of the image heights of the observed humans when their feet were imaged in the cell. Dark grey regions contain no data.”) Figure 11 of Olson depicts a “depth map” that is superimposed on the image

that is created using the height data of Figure 10 and converting it into depth. *Id.* at 27, Fig. 11.

Olson also uses the size of the object in different image regions to calibrate because it uses the depth of each region, which was obtained through the height data, to provide an image-to-world mapping, as required by the fifth step of the algorithm disclosed in the '083 patent. Ex. 1005, 26–27.

Therefore, we find Petitioner has shown by a preponderance of the evidence that the combined disclosures of Winter and Olson teach a “computer system . . . for calibrating” as recited in claims 1 and 25.

We further find Petitioner has provided articulated reasoning with rational underpinning for combining the teachings of Winter and Olson. We disagree with Patent Owner that a POSITA would not combine the teachings of Winter and Olson because they have “different implementations.” PO Resp. 64. Petitioner has shown persuasively that a POSITA would have combined Olson’s more advanced calibration method with Winter’s teachings to provide image to world mapping and enhance the operation of Winter’s system. Pet. 58–60 (citing Ex. 1002 ¶¶ 124, 127, 324). Winter recognizes the benefits of knowing the real world size of objects within the video scene. *See* Ex. 1004, 63:12–32 (recognizing size as a relevant parameter for the perimeter violation detection tool). We agree with Petitioner that this disclosure of Olson would have motivated a POSITA to employ Olson’s method, which represents object sizes more accurately, in Winter. *See* Ex. 1002 ¶ 324.

For the foregoing reasons, we find Petitioner has not shown by a preponderance of the evidence that Winter discloses the calibration

limitations recited in claims 1 or 25, but has shown by a preponderance of the evidence that Winter discloses the calibration requirements of claim 28.

We also find Petitioner has shown by a preponderance of the evidence that the combined disclosures of Winter and Olson teach the calibration limitations of claims 1 and 25.

d. a computer system . . . for gathering and processing data based on video output received from the sensing device (claims 1, 25) / obtaining data from the sensing device (claim 26) / said apparatus . . . to gather and process data based on video output received from the sensing device (claim 28)

Petitioner contends Winter discloses the “computer system . . . for gathering and processing data based on video output” limitation as recited in claims 1 and 25 and similarly recited in claims 26 (“obtaining data from the sensing device”), 28 (apparatus adapted to . . . gather and process data based on video output received from the sensing device”). *See, e.g.*, Pet. 60–62.

Petitioner asserts that Winter discloses the gathering and processing limitations of the independent claims. We agree with Petitioner that Winter’s Video Recorder/PC (“VR/PC”) unit possesses “video data compression and recording techniques,” “performs data management, routing and analysis functions,” and “implements unique user interface features that make the unit’s capabilities conveniently available for selection and operation by the user” Pet. 60 (citing Ex. 1004, 17:53–64). Patent Owner does not dispute Petitioner’s contentions regarding these limitations. *See generally* PO Resp. Nonetheless, the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware*, 800 F.3d at 1378.

Based on our review of the entirety of the record before us, we agree with Petitioner and find that Autoscope discloses the limitations regarding gathering and processing data recited in claims 1, 25, 26, and 28.

e. “entering parameters”

Petitioner asserts that Winter allows users to set parameters for execution of a “perimeter violation” image analysis too. Pet. 83 (citing Ex. 1004, 62–33–65; Ex. 1002 ¶ 449). Winter states that an interface may be presented to the user “in connection with setting parameters for execution” of a perimeter violation image analysis too. Ex. 1004, 62:37–39. Patent Owner does not dispute Petitioner’s contentions regarding this limitation. *See generally* PO Resp. Nonetheless, the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware*, 800 F.3d at 1378.

Based on our review of the entirety of the record before us, we agree with Petitioner and find that Autoscope discloses “entering parameters” as required by claim 12.

f. the user interface comprising input means and output means, said input means including a graphical user interface, wherein the computer system displays processed data (claims 1, 25, 28)

Petitioner contends Winter’s disclosure of a GUI engine that interprets signals that were input using a computer mouse by a user using a mouse and generates objects to be displayed on a display monitor discloses the user input means and output required by claims 1, 25, and 28. Pet. 64 (citing Ex. 1004, 58:47–52; Ex. 1002 ¶¶ 332–334). Patent Owner does not dispute Petitioner’s contentions regarding these limitations. *See generally* PO Resp. Nonetheless, the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware*, 800 F.3d at 1378.

Based on our review of the entirety of the record before us, we agree with Petitioner and find that Winter discloses the graphical user interface and software that allows a user to enter a video/virtual tripwire on a video image as required by claims 1, 25, and 28.

g. graphical user interface adapted to enable a user to draw a video tripwire on at least one of a video image of said video output or a snapshot taken from said video output (claims 1, 7, 28) / wherein the computer system includes software permitting a user to enter at least one virtual tripwire (claim 25) / initializing the system including entering at least one virtual tripwire (claim 26)

Petitioner contends Winter discloses “a screen display of the type that may be presented to the user in connection with setting parameters for execution of a ‘perimeter violation’ image analysis tool.” Pet. 65–66 (citing Ex. 1004, 62:37–39); *see* Ex. 1004, Fig. 155; Ex. 1002 ¶¶ 335–336.

Petitioner contends Winter’s video tripwire is drawn onto the display in a two-step process. First, “a drawing element (such as a box or line) which is indicative of a perimeter of an area in the scene represented by the video signal” is displayed over the video image. *Id.* (citing Ex. 1004, 62:40–46). Second, “the user is permitted to drag and/or stretch the perimeter element 1966” and can then save the perimeter element. *Id.* (citing Ex. 1004, 62:48–57). Petitioner further asserts that Winter includes the step of entering parameters such as entering multiple parallel trip wires or enter of the directionality tripwire rules. Pet. 75 (citing Ex. 1001, 9:3–8).

Other than arguing Winter does not disclose a video tripwire, Patent Owner does not dispute Petitioner’s contentions regarding these limitations. *See generally* PO Resp. We disagree with Patent Owner’s argument regarding “video tripwire” because this argument relies upon its proposed

construction of “video tripwire”, a construction that we do not adopt as discussed above in Section II.C.1.

Based on our review of the entirety of the record before us, we agree with Petitioner and find that Winter discloses the graphical user interface and software that allows a user to enter a video/virtual tripwire on a video image as required by claims 1, 7, 12, 25, and 26.

h. the video tripwire comprising at least one of a curved video tripwire, a multi-segment video tripwire, and a multiple parallel video tripwire (claim 25) / said at least one virtual tripwire comprising at least one of a curved tripwire, a multi segment tripwire, and a multiple parallel tripwire (claim 26)

Petitioner contends Winter’s perimeter element (1966) having parallel top and bottom pairs, discloses a video tripwire comprising a multiple parallel video tripwire as recited by claim 25 and similarly by claim 26. Pet. 73 (citing Ex. 1004, Fig. 155; Ex. 1002 ¶¶ 376–77). Patent Owner does not dispute Petitioner’s contentions addressing these limitations. *See generally* PO Resp. Nonetheless, the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware*, 800 F.3d at 1378.

Based on our review of the entirety of the record before us, we agree with Petitioner and find that Winter discloses the limitations requiring a video or virtual tripwire comprising a multiple parallel video tripwire as required by claim 25 and 26.

i. analyzing the data obtained from the sensing device to determine if the at least one virtual tripwire has been crossed; and triggering a response to a virtual tripwire crossing (claim 26).

Petitioner contends Winter’s “perimeter tool” tracks objects and tests their location to determine if the video tripwire overlap. Pet. 76 (citing

Ex. 1002 ¶¶ 396–367; Ex. 1004, 62:58–59, 68:11–17, Ex. 1001, 10:32–36, 10:56–67). Winter triggers an alarm (response) to the video crossing including flashing lights or sirens. *Id.* (citing Ex. 1004, 16:58–61, 64:27–61, 92:13, Fig. 155; Ex. 1002 ¶ 398–399).

Patent Owner responds that because Winter is “an area-based system,” Winter determines whether an object is within an area, not whether a virtual tripwire, or any boundary, has been crossed. PO Resp. 51 (citing Ex. 2014 ¶ 61). Patent Owner asserts that detecting whether an object is “within” the area of interest is not the same thing as detecting a crossing. *Id.* (citing Ex. 2014 ¶ 61).

We disagree with Patent Owner’s argument. As stated above in Section II.C.1., we do not construe a video tripwire as excluding area-based systems that determine if an object is within an area. Additionally, we disagree with Patent Owner that detecting whether an object is within the area of interest is not the same thing as detecting a crossing. The ’083 patent expressly states that “an object is determined to *cross* a tripwire if the bottom portion of the object *overlaps* a tripwire line.” Ex. 1001, 9:19–21 (emphasis added); *see also id.* at Fig. 11 (step 742), 10:35–36 (“stating an object is determined to *cross* a tripwire if the bottom portion of the object *overlaps* a tripwire line”) (emphasis added).

Based on our review of the entirety of the record before us, we agree with Petitioner and find that Winter discloses the limitations regarding analyzing data, determining of a tripwire has been crossed, and triggering a response as required by claim 26.

j. Summary

For the foregoing reasons, and based upon a review of the full record, we find Petitioner has shown by a preponderance of the evidence that Winter discloses each and every limitation of independent claims 7, 12, 26 and 28 but has not shown by a preponderance of the evidence that Winter discloses each and every limitation of independent claim 1 and 25. Accordingly, we find Petitioner has shown by a preponderance of the evidence that independent claims 7, 12, and 28 are anticipated by Winter but has not shown by a preponderance of the evidence that claims 1 and 25 are anticipated by Winter.

2. Dependent claims 2–6, 8–11, 13–24, 27, and 29

Petitioner asserts that dependent claims 2–6, 8–11, 13–24, and 29 are anticipated by Olson and that dependent claims 2–6, 27, and 29 are unpatentable over Winter and Olson. Other than the arguments related to the patentability of the independent base claim, Patent Owner only presents arguments directed to the patentability of claims 11 and 19. *See generally* PO Resp. 52–66. Nonetheless, the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware*, 800 F.3d at 1378. For the following reasons, we determine Petitioner has not demonstrated by a preponderance of the evidence that Winter anticipates claims 2–6 and of the '083 patent, but has demonstrated by a preponderance of the evidence that Winter anticipates claims 8–11, 13–24, 27, and 29 of the '083 patent and that claims 2–6 and 29 are unpatentable over Winter and Olson.

Claims 2–6

Claims 2–6 each depend directly or indirectly from claim 1 and thus incorporate all limitations of claim 1. As described above in Section II.H.1.,

we find Petitioner has not established by a preponderance of the evidence that claim 1 is anticipated by Winter. All of the Petition's deficiencies in the context of claim 1 carry through to dependent claims 2–6. Accordingly, we determine that Petitioner has not shown by a preponderance of the evidence that claims 2–6 are anticipated over Winter.

Claims 11, 19

Claim 11, which depends from claim 7, further requires that the “graphical user interface is further adapted to enable a user to enter at least one video event rule.” Claim 19, which depends from claim 12, further requires the entering “of at least one video event rule.”

Petitioner asserts Winter discloses the entry of various event rules and “alarm enunciating devices, such as flashing lights, sirens or the like,” that may be triggered in response to the detection of an event. Pet. 82–84; Ex. 1004, 16:58–61; *see* Ex. 1002 ¶¶ 444–446. For example, Petitioner states that in “carrying out the perimeter detection violation algorithm of Figure 155, the controller DSP may “issue an event report to the motherboard, which may, in turn, declare an alarm condition.” Pet. 83 (quoting Ex. 1004, 64:27–61; citing Ex. 1004, 92:1–3). Petitioner further asserts that, in Winter, “alarm events” may be employed after it has been determined that an object has crossed the perimeter. *Id.* (citing Ex. 1004, 68:23–44, Fig. 96).

Patent Owner responds that Winter does not teach the claimed “video event rules.” PO Resp. 66–67. Patent Owner asserts that the Petition fails to identify where Autoscope discloses a “user interface that allows a user to enter video event rules” as required by claim 11 or the actual entering of a video event rule as required by claim 19. *Id.*

Upon consideration of the arguments and evidence of record, we disagree with Patent Owner and find Winter's disclosures relating to the perimeter detection violation algorithm depicted in Figure 155, including the issuance of "an event report" to the motherboard, which may, in turn, declare an alarm condition, disclose the video event rule limitations of dependent claims 11 and 19.

The '083 patent states that a video event rule "may comprise a prescribed action (such as a 'human' crossing a 'virtual tripwire' in a prescribed direction) and a prescribed response (such as logging the alert with text and video to a database and sending an e-mail to a particular email address)." Ex. 1001, 10:5–10. "Video event rules may encompass more complex activities involving other virtual video features, such as areas of interest, along with other classes of activities, such as loitering, leaving a bag behind, or stealing an item, and other types of response, such as activating a Digital Video Recorder (DVR) or sounding an audible alarm." *Id.* at 10:10–15.

Figure 155 of Winter depicts a screen display present to the user for setting parameters for execution of a "perimeter violation" image analysis tool. Ex. 1004, 62:37–39. The user may draw a box or a line on the image to indicate the "perimeter of an area." *Id.* at 62:39–46. Winter's "image analysis algorithm" is used to detect entry of objects into this area. *Id.* We find that Winter's "alarmed mode" in which recording occurs "only in the event an alarm condition is detected" discloses the video event rule of claims 11 and 19. *Id.* at 91:67–92:2. The detection of objects entering into the perimeter of the area constitutes a "prescribed action" and the recording of video in response to an object having entered that area constitutes

“prescribed responses.” *See* Ex. 1004, 92:1–3 (each camera can be set to “alarmed” mode, which involves “recording only in the event an alarm condition is detected”).

We also find that Winter discloses how user can enter the video event rule in a user interface. Figure 158 of Winter shows the different operating modes for the camera, which the user can manipulate by using the cursor to set the scheduled period of time for a selected operating mode. Ex. 1004, 91:56–62. The “alarmed mode” records video “only in the event an alarm condition is detected.” *Id.*; *see also id.* at 68:23–44 (discussing how a “preselected analysis algorithm” is applied to a video signal stream if certain alarm events occur). Additionally, Figure 172 of Winter depicts a GUI showing a menu that is present to the user “to permit selection of an analysis algorithm to be applied to live incoming video streams, including allowing the user to set an alarm for a particular user-selected camera tool, such as the “perimeter tool”, and time. *Id.* at 95:21–29, *see also id.* at 95:50–96:4 (stating that alarm conditions are based on “user-settable parameters”).

Based on our review of the entirety of the record before us, we agree with Petitioner and find that Winter discloses limitations required by dependent claims 11 and 19.

Claims 8–10, 13–18, 20–24, 27, 29

Petitioner provides detailed evidence and argument that Winter discloses each limitation of claims 8–10, 13–18, 20–24, 27, and 29. *See* 54–66, 79–89 Patent Owner presents no arguments separately directed to the patentability of claims these dependent claims. We have reviewed the record and the parties’ arguments and determine that Petitioner sufficiently

identifies disclosure in Winter corresponding to the additional limitations of claims 8–10, 13–18, 20–24, 27, and 29. *Id.*

Therefore, for all of the foregoing reasons, based on the record developed during trial, we find (1) Petitioner has demonstrated by a preponderance of the evidence that claims 1–6 and 25–29 are unpatentable under 35 U.S.C. § 103(a) as obvious over Winter and Olson, (2) Petitioner has demonstrated by a preponderance of the evidence that claims 7–24, 28, and 29 are unpatentable under 35 U.S.C. § 102(b) as anticipated by Winter, and (3) Petitioner has *not* demonstrated by a preponderance of the evidence that claims 1–6 and 25 are unpatentable over § 102(b) over Winter.

I. Asserted Obviousness of Claims 1–6, 25, and 28–29 over Winter, Olson, and Togashi

Petitioner argues that claims 1–6, 25, and 28–29 would have been obvious over the combination of Winter, Olson, and Togashi. Pet. 54–81. Petitioner contends that to the extent Winter does not teach the gathering and processing data based on video output received from a sensing device limitations recited in independent claims 1, 25, 26, and 28, Togashi makes up for any deficiencies. Specifically, Petitioner contends that Togashi teaches an algorithm for detecting when an object overlaps a line (tripwire) by comparing the pixel luminance of the line between a background image at time $t=t_0$ and a new image at time $t=t_1$, generating a difference value for each pixel, binarizing each pixel into “0” or “1” based on a predetermined threshold value, and determining that an object overlaps the line if the number of pixels on the line having the value “1” is greater than a threshold number. *Id.* at 62–64 (citing Ex. 1007, 4, Figs. 3(a), 3(b), 3(c), 3(d)). Petitioner further contends that it would have been obvious to combine the

teachings of Togashi with Winter and Olson to achieve the benefits of using Togashi's efficient algorithm (e.g., decreased computation time and data storage requirements) in Winter's similar system. *Id.* at 62–63 (citing, *inter alia*, Ex. 1007, 2–3; Figs. 6–8; Ex. 1002 ¶¶ 128, 331).

Patent Owner argues that the challenged claims are patentable because Winter, Olson, and Togashi are each area-based systems and, therefore, do not teach or suggest the video tripwire requirements of the challenged claims. We disagree. As discussed above in Section II.C.1., we do not construe video tripwire or virtual tripwire as recited in the claims to exclude area-based systems.

We have reviewed the parties' evidence and arguments and determine that Petitioner has persuasively shown that Togashi also teaches the gathering and processing data based on video output received from a sensing device limitations of independent claims 1, 25, 26, 28, and has provided articulated reasoning with rational underpinning for combining the teachings of Togashi with the combined teachings of Winter and Olson. Therefore, based on the record developed during trial, we conclude Petitioner has demonstrated by a preponderance of the evidence that claims 1–6, 25, and 28–29 are unpatentable under 35 U.S.C. § 103(a) as obvious over Winter, Olson, and Togashi.

J. Motion to Amend

Having concluded that claims 1–29 are unpatentable, we address Patent Owner's Contingent Motion to Amend.

In an *inter partes* review, amended claims are not added to a patent as of right, but rather must be proposed as a part of a motion to amend. 35 U.S.C. § 316(d). The Board must assess the patentability of the proposed

substitute claims without placing the burden of persuasion on the patent owner. *Aqua Prods., Inc. v. Matal*, 872 F.3d 1290, 1328 (Fed. Cir. 2017). Patent Owner’s proposed substitute claims, however, must still meet the statutory requirements of 35 U.S.C. § 316(d) and the procedural requirements of 37 C.F.R. § 42.121. See “Guidance on Motions to Amend in view of *Aqua Products*” (Nov. 21, 2017).¹³ Accordingly, Patent Owner must demonstrate (1) the amendment responds to a ground of unpatentability involved in the trial; (2) the amendment does not seek to enlarge the scope of the claims of the patent or introduce new subject matter; (3) the amendment proposes a reasonable number of substitute claims; and (4) the original disclosure sets forth written description support for each proposed claim. See 37 C.F.R. § 42.121.

In order to show an amendment does not introduce new matter, a motion to amend must set forth written description “support in the original disclosure of the patent for each claim that is added or amended.” 37 C.F.R. § 42.121(b)(1); *see also* Guidance 2 (stating that “a motion to amend must set forth written description support . . . in relation to each substitute claim”). The test for compliance with the written description requirement of 35 U.S.C. § 112 is whether the disclosure of the application as originally filed reasonably conveys to those skilled in the art that, as of the filing date, the inventor had possession of the invention that is now claimed. *Ariad Pharms., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010) (en banc).

¹³ The guidance memorandum is publicly available at https://www.uspto.gov/sites/default/files/documents/guidance_on_motions_to_amend_11_2017.pdf.

“Possession” is shown by descriptive means such as words, structures, figures, diagrams, and formulas that set forth fully the claimed invention. *Lockwood v. Am. Airlines, Inc.*, 107 F.3d 1565, 1572 (Fed. Cir. 1997). “It is not sufficient for purposes of the written description requirement . . . that the disclosure, when combined with the knowledge in the art, would lead one to speculate as to modifications that the inventor might have envisioned, but failed to disclose.” *Id.* “One shows that one is ‘in possession’ of the invention by describing the invention, with all its claimed limitations, not that which makes it obvious.” *Id.* “[T]he hallmark of written description is disclosure [T]he test requires an objective inquiry into the four corners of the specification from the perspective of a person of ordinary skill in the art.” *Ariad*, 598 F.3d at 1351. Also, the claimed invention does not have to be described *ipsis verbis* in the specification to satisfy the written description requirement. *Union Oil Co. of Cal. v. Atl. Richfield Co.*, 208 F.3d 989, 1000 (Fed. Cir. 2000).

Patent Owner seeks entry of proposed claims 30–58 as substitutes for claims 1–29. *See generally* Mot. to Amend; Reply to Opp. to Mot. to Amend. Petitioner opposes. *See generally* Opp. to Mot. to Amend. For the reasons that follow, we deny Patent Owner’s Contingent Motion to Amend as to the entry of proposed substitute claims.

1. Analysis

Our analysis focuses on language added to proposed substitute independent claim 30, which is similar to original claim 1 but includes the following additional limitation:

wherein the video tripwire comprises at least one line segment on the at least one of the video image and the snapshot,

and the video tripwire is configured to allow *detection of a crossing of a tracked object from one side of the line segment to the opposite side of the line segment*.

Mot. to Amend, 22 (emphasis added). Comparable language is added to proposed substitute independent claims 36, 41, 54, 55, and 57, which are similar to original claims 7, 12, 25, 26, and 28 respectively. *See id.* at 24, 26–28.¹⁴ Thus, all of the proposed substitute independent claims contain language directed to a video tripwire that can detect the crossing of a tracked object from one side a line segment to the opposite side of a line segment.

Patent Owner contends that this added claim language differentiates the proposed substitute claims over the asserted art because none of the asserted references require determining if a tracked object is on one side of the tripwire and then the other side of the tripwire. Reply 2; *see also* Motion to Amend 15 (stating the asserted art does not “disclose a video tripwire system that determines tripwire crossings by *tracking objects moving from one side of a line segment to another*”) (emphasis added); *see also* Reply to Opp. to Mot. to Amend, 9–10 (stating Dr. Papanikolopoulos testified that [the asserted art does] not teach “determining whether a tripwire is tripped by monitoring whether an object *moves* from one side of a tripwire to the other. . . . Accordingly, proposed substitute claims 30–58 address the

¹⁴ Proposed substitute claim 55 is similar to original claim 26 but adds language reciting “detect a crossing of a tracked object from one side of the of the curved line segment to the opposite side of the curved line segment, the multi-line segments to the opposite side of said multi-line segments, and the multiple parallel line segments to the opposite side of said multiple parallel line segments” and does not recite “determine if the at least one virtual tripwire has been crossed” as recited in original claim 26. *Id.* at 27.

grounds at issue in this trial and are patentable) (emphasis added)). **__verify quote**

During oral argument, counsel for Patent Owner clarified that, unlike the asserted art, the proposed substitute claims require *analysis of at least two frames*, such that in the first frame the object is seen on one side of the line and then in the second frame, the object is seen on the second side of the line. See Tr. 59:16–21 ([Q. D]o the amended claims require an analysis of at least two frames? So in the first frame you see the object on one side of the line and then you see the object in a second frame on the other side? [A] You would have to analyze at least two frames.”). Counsel further explained that “none of the prior art discloses a tripwire where you monitor an object, it overlaps a tripwire and then moves to another location and monitors it throughout. None of the prior art does that.” *Id.* at 47:22–48:4; *see also id.* at 28:13–29:6 (describing the Motion to Amend as covering security systems that don’t require an object to “overlap” the tripwire but rather determine the location of a tracked object in relation to the tripwire).

In its Motion to Amend, Patent Owner cites to three separate sections of U.S. Patent Application 10/704,645 (Ex. 2013, “the ’645 application”), which issued as the ’083 patent and to its parent application, U.S. Patent Application No. 09/972,039 (Ex. 2011, “the ’039 application”), to show written description support for the detection of a tracked object from one side of a tripwire line segment to another. Mot. to Amend, 6, 7, 11–13. The three cited portions of the specifications, with corresponding cites to the ’083 patent, are reproduced below:

- (1) The objective of foreground detection and tracking 7222 is to combine the FG pixels into FG objects and to track them

over a number of frames, to guarantee spatio-temporal consistency.

Ex. 2011, 121:11-12, Ex. 2013, 141:15-16; Ex. 1001, 8:18-21.

(2) These objects are tracked using correlation methods over several frames to obtain reliable size information. Exemplary tracking techniques are discussed in, for example, commonly assigned co-pending U.S. patent application Ser. No. 09/694,712, entitled, "Interactive Video Manipulation," filed Oct. 24, 2000, and incorporated herein by reference in its entirety. See, also, e.g., Wren, C. R. et al., "Pfunder: Real Time Tracking of the Human Body," IEEE Trans. on Pattern Matching and Machine Intelligence, Vol. 19, pp. 780-784, 1997; Grimson, W. E. L. et al., "Using Adaptive Tracking to Classify and Monitor Activities in a Site," CVPR, pp. 22-29, June 1998; and Olson, T. J. and Brill, F. Z., "Moving Object Detection and Event Recognition Algorithm for Smart Cameras, IUW, pp. 159-175, May 1997. Each of these references is to be considered as being incorporated by reference herein in its entirety.

Ex. 2011, 121:16-122:4; Ex. 2013, 141:20-142:8; Ex. 1001, 8:28-42.

(3) Returning now to FIG. 5, the step of calibration 72 is followed by a step of initializing the system 73. This step permits a user to enter various parameters relating to how the system will gather, respond to, and report data. First, a user may superimpose one or more lines of interest on the image; these lines will serve as one or more tripwires. The lines may be of any orientation and may be placed almost anywhere in the image; the exception is that the lines may not occur too close to image boundaries because the object (e.g., person) crossing the line must be at least partially visible on both sides of the line for detection to occur. In an illustrative embodiment, it is assumed that the tripwire is on the ground in the image; that is, detection occurs when the bottom portion of an object (e.g., a person's legs) crosses the line. In a more general embodiment, the user may set a height above the ground for each line.

Ex. 2011, 123:1-10, Ex. 2013, 143:4-1; Ex. 1001, 9:3-17.

Petitioner responds that the limitations requiring detection of a crossing of a tracked object from one side to the opposite side of the line segment to the opposite side of the line segment add new matter in violation of 37 C.F.R. § 316(d) and 37 C.F.R. § 42.121. Opp. to Mot. to Amend. 2–3. Specifically, Petitioner asserts that there is no support in the specifications for a system that determines that an object is located on one side of the line segment in a first frame of a video, and then must determine that the same object is located on the other side of the line segment in a second, later frame of the video. *Id.* at 4.

Having reviewed the three cited portions of the '645 application and the '039 application, we agree with Petitioner and determine that Patent Owner has not identified sufficient written description support for the amended claim language reciting a video tripwire that allows detection of a crossing of a tracked object from one side of the line segment to the opposite side of the line segment.

The original claims covered the embodiment shown in Figure 11 of the '083 patent that determined if a tripwire was crossed by determining if the object overlapped the tripwire. *See* Ex. 1001, Fig. 11. Patent Owner attempts to narrow the claim language to exclude this embodiment and claim a narrower species that does not require an overlap of the tripwire, but rather determines if the tripwire has been crossed by first requiring detection of an object on one side of the tripwire and then detecting the object on the opposite side of the tripwire. We find that this narrower species of claim is not adequately supported by the cited specifications. *See Knowles Elecs. LLC v. Cirrus Logic, Inc.*, 883 F.3d 1358, 1366 (Fed. Cir. 2018) (stating a patent's general disclosure of a broad genus does not necessarily support a

claim directed to a particular species within that genus, even if the claimed species is consistent with that genus). Patent Owner has not persuasively shown, by descriptive means such as words, structures, figures, diagrams, and formulas, that it was in possession of a system that detects crossing of a tripwire in two step process that first detects an object in relation to a line segment of a tripwire and then in a second step determines if the object has moved to the opposite side of the line segment. “It is not sufficient for purposes of the written description requirement . . . that the disclosure, when combined with the knowledge in the art, would lead one to speculate as to modifications that the inventor might have envisioned, but failed to disclose.” *Lockwood*, 107 F.3d 1572. “One shows that one is ‘in possession’ of the invention by describing the invention, with all its claimed limitations, not that which makes it obvious.” *Id.*

Patent Owner states that Petitioner admits the '083 patent (1) tracks objects and (2) discloses determining if an object is on one side of a line and the opposite side and, therefore, Patent Owner has shown it was in possession of the substance of the claim which “determines if a tracked object is on one side of the a line and then the other.” Reply to Opp. to Mot. to Amend. 2–3 (citing Opp. to Mot. to Amend, 5; Ex. 1001, 8:18–21, 8:26–42, 9:3–17). We disagree. Patent Owner has not shown, and it does not appear Petitioner has admitted, that the specifications show tracking of the object as it relates to determining if the object is one side of a trip wire and then the other side. Rather, the specifications’ discussion of “tracking” relates to tracking an object to for the purpose of object segmentation, and not for determining if the object has crossed from one side of the line to another.

Patent Owner asserts the Specification's disclosure that the tripwire not be placed too close to the image boundary (Ex. 1001, 9:6–17) “only makes sense if the system has to sense an object on one side of the tripwire, and *later*, on the other side of the tripwire to detect a crossing.” Reply to Opp. to Mot. to Amend, 3. We do not find Patent Owner's argument persuasive. Rather, we agree with the testimony of Dr. Papanikolopoulos that a POSITA would have understood that a tripwire should not be near the boundary of an image for other reasons, including radial distortion, and image intensity variations. Ex. 1036 ¶¶ 26–28.

For the foregoing reasons, we find Patent Owner has not shown written description support for the proposed added claim language that requires detection of a tracked object from one side of a tripwire line segment to another. As such, we determine that proposed substitute claims 30–58 improperly introduces new matter under 35 U.S.C. § 316(d)(3) and 37 C.F.R. § 42.121(a)(2)(ii). Accordingly, Patent Owner's Contingent Motion to Amend is denied.

K. Patent Owner's Motion to Exclude

Patent Owner filed a Motion to Exclude (Paper 24, “PO Mot. Exc.”), Petitioner filed an Opposition (Paper 26, “Pet. Opp. Mot. Exc.”), and Patent Owner filed a Reply (Paper 28, “PO Reply Mot. Exc.”). For the reasons that follow, we deny the motion in-part and dismiss the motion in-part as moot.

Patent Owner moves to exclude Exhibits 1030, 1033, and 1034, which were utilized during Dr. Bovik's deposition, as irrelevant and prejudicial because, *inter alia*, these exhibits were not cited by Petitioner in any of their filings or declarations and were not properly authenticated. PO Mot. Exc. 2–3 (citing Federal Rules of Evidence 402, 901). Patent Owner also moves to

exclude paragraphs 72, 95–101, 113–120, and 132 and “any reference to 1-dimensional lines” from Dr. Papanikolopoulos’s Declaration in support of Petitioners’ Opposition to Patent Owner’s Motion to Amend (Ex. 1036) as irrelevant because the cited paragraphs “do not respond to Patent Owner’s Motion to Amend” and should be considered an improper attempt to supplement the record with new testimony without authorization required under 37 CFR § 42.123(b). PO Mot. Exc. 3–7. Patent Owner also contends the Brill reference (Ex. 1037) should be excluded as irrelevant and highly prejudicial because the submission “is tantamount to identifying a new ground of unpatentability.” *Id.* at 9.

Because we have not relied on Exhibits 1030, 1033, 1034, 1037, or the specified paragraphs of Exhibit 1036, we dismiss the motion as moot as it relates to these exhibits.

Patent Owner also objects to Petitioner’s citations to Dr. Papanikolopoulos’s Declaration in support of Petitioners’ Opposition to Patent Owner’s Motion to Amend (Ex. 1036) as an improper attempt to incorporate declaration arguments into the opposition brief to avoid page limits. PO Mot. Exc. 7–8. We disagree with this argument. Contrary to Patent Owner’s characterization, the opposition brief provides a sufficient discussion of the cited portions of Dr. Papanikolopoulos’s supplemental declaration and explains the significance of the testimony. In light of this, we conclude that Petitioner has not improperly incorporated by reference declaration testimony to avoid page limitations. Accordingly, we deny Patent Owner’s motion to exclude Exhibit 1036 for improper incorporation by reference.

III. CONCLUSION

Based on the evidence and arguments, we find Petitioner has demonstrated by a preponderance of the evidence that:

Claims 1–29 are unpatentable under 35 U.S.C. § 102(b) as anticipated by Autoscope;

Claims 1–6, 25, 28, and 29 are unpatentable under 35 U.S.C. § 103(a) over Autoscope and Togashi;

Claims 7–24, 28, and 29 are unpatentable under 35 U.S.C. § 102(b) as anticipated by Winter;

Claims 1–6 and 25–29 are unpatentable under 35 U.S.C. § 103(a) over Winter and Olson; and

Claims 1–6, 25, 28, and 29 are unpatentable under 35 U.S.C. § 103(a) over Winter, Olson, and Togashi.

Based on the evidence and arguments, we find Petitioner has *not* demonstrated by a preponderance of the evidence that claims 1–6 and 25 are unpatentable under 35 U.S.C. § 102(b) as anticipated by Winter.

We deny-in-part and dismiss-in-part Patent Owner’s Motion to Exclude.

In addition, we find that proposed substitute claims 30–58 introduces new matter. Accordingly, Patent Owner’s Motion to Amend is denied pursuant to 35 U.S.C. § 316(d)(3) and 37 C.F.R. § 42.121(a)(2)(ii).

IV. ORDER

Accordingly, it is:

ORDERED that claims 1–29 of U.S. Patent No. 6,970,083 are held to be unpatentable;

FURTHER ORDERED that Patent Owner’s Motion to Exclude is *denied-in-part* and *dismissed-in-part*;

FURTHER ORDERED that Patent Owner's Contingent Motion to Amend is *denied*; and

FURTHER ORDERED that, because this Decision is final, a party to the proceeding seeking judicial review of the Decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

IPR2017-01833
Patent 6,970,083 B2

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