

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

METAPLATFORMS, INC.,
Petitioner,

v.

THALES VISIONIX, INC.,
Patent Owner.

IPR2022-01294
Patent 8,224,024 B2

Before WILLIAM V. SAINDON, HYUN J. JUNG, and JASON W.
MELVIN, *Administrative Patent Judges*.

SAINDON, *Administrative Patent Judge*.

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

A. Background and Summary

Meta Platforms, Inc. (“Petitioner”) filed a Petition (Paper 2, “Pet.”) requesting *inter partes* review of claim 1 (“the challenged claim”) of U.S. Patent 8,224,024 B2 (Ex. 1001, “the ’024 patent”). Thales Visionix, Inc. (“Patent Owner”) filed a Preliminary Response (Paper 7, “Prelim. Resp.”).

We have authority to determine whether to institute an *inter partes* review under 35 U.S.C. § 314(b) and 37 C.F.R. § 42.4(a) (2020). The standard for instituting an *inter partes* review is set forth in 35 U.S.C. § 314(a), which provides that an *inter partes* review may not be instituted unless “there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.”

For the reasons provided below, we determine Petitioner has satisfied the threshold requirement set forth in 35 U.S.C. § 314(a). Because Petitioner has demonstrated a reasonable likelihood that at least one claim of the ’024 patent is unpatentable, we institute an *inter partes* review of all challenged claims based on all grounds raised in the Petition. 37 C.F.R. § 42.08(a).

Our findings of fact, conclusions of law, and reasoning discussed below are based on the evidentiary record developed thus far, and made for the sole purpose of determining whether the Petition meets the threshold for initiating review. This decision to institute trial is not a final decision as to the patentability of any challenged claim or the construction of any claim limitation. Any final decision will be based on the full record developed during trial.

B. Real Parties in Interest

Petitioner asserts that its real parties in interest are Meta Platforms, Inc. and Meta Platforms Technologies, LLC. Pet. 3.

Patent Owner asserts that its real parties in interest are Thales Visionix, Inc., Gentex Corporation, and Indigo Technologies, LLC. Prelim. Resp. 1.

C. Related Matters

The parties both assert that Patent Owner asserted infringement of the '024 patent in the Western District of Texas, *Gentex Corp. v. Meta Platforms, Inc.*, No. 6:21-cv-00755-ADA (Ex. 2001), which was transferred to the Northern District of California on July 5, 2022, No. 4:22-cv-03892-YGR (Ex. 1022).¹ Pet. 3; Prelim. Resp. 1.

D. Prior Art and Asserted Grounds

Petitioner's grounds rely on the following prior art references:

Name	Reference	Exhibit(s)
Satoh	U.S. Pub. 2004/0172838, pub. Sept. 9, 2004	1010
FlightTracker	Foxlin et al., <i>FlightTracker: A Novel Optical/Inertial Tracker for Cockpit Enhanced Vision</i> , Third IEEE and ACM International Symposium on Mixed and Augmented Reality (ISMAR 2004)	1005
Welch	Welch et al., <i>An Introduction to the Kalman Filter</i> , SIGGRAPH	1023

¹ The case was originally filed in the U.S. District Court for the Western District of Texas (No. 6:21-cv-00755-ADA) and was subsequently transferred to the U.S. District Court for the Northern District of California. Pet. 3. The parties incorrectly identify the case number in the Northern District of California as "5:22-cv-03892." Compare Pet. 3; Paper 3 (Patent Owner's Mandatory Notices), 1, with Ex. 2003 (Joint Order Regarding Claim Construction and Discovery).

Name	Reference	Exhibit(s)
	2001 Course 8	
Barfield	<i>Fundamentals of Wearable Computers and Augmented Reality</i> (Woodrow Barfield et al., eds, 2001)	1021

Our citations to these, and any other document of record, will be to the pagination stamped by Petitioner in the event both original and added pagination are provided (e.g., Exhibit 1023).

Petitioner asserts that claim 1 would have been unpatentable on the following grounds:

Claim(s) Challenged	35 U.S.C. § ²	Reference(s)/Basis
1	103	FlightTracker, Welch
1	103	FlightTracker, Welch, Satoh
1	103	Barfield, FlightTracker
1	103	Barfield, FlightTracker, Satoh

Petitioner also relies on the testimony of Dr. Ulrich Neumann, who has a Ph.D. in computer science and whose research focuses on neural networks for computer vision and graphics, 3D modeling, video visualization, tracking for augmented reality, and human facial modeling, rendering, and animation. Ex. 1003 ¶¶ 5–6.

E. Technical Background and Overview of the '024 Patent

The '024 patent is directed to the tracking of objects in 3-dimensional space. Ex. 1001, 1:12. For example, one may wish to track the position and

² The '024 patent was filed on Oct. 4, 2006. Ex. 1001, code (22). We apply the versions of 35 U.S.C. §§ 102 and 103 that were in force before they were amended by the Leahy-Smith America Invents Act, Pub. L. No. 112–29, 125 Stat. 284 (2011).

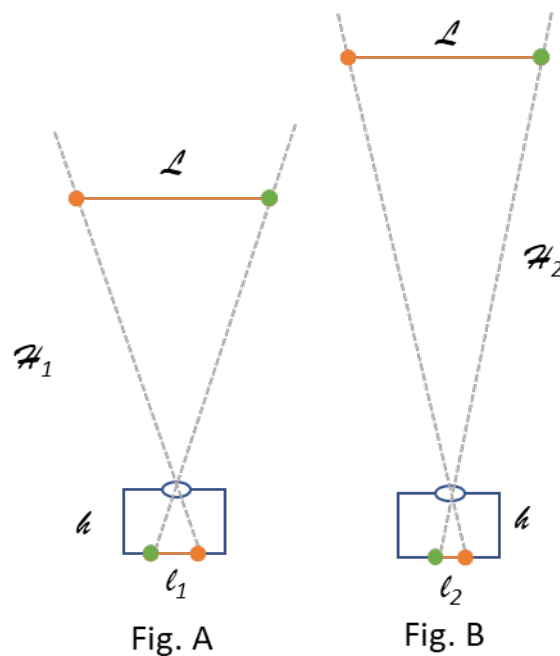
orientation of a pen-like object for use in a virtual reality program. The complete set of information, called “pose,” comprises x, y, and z *position* coordinates of the object along the x, y, and z axes, relative to some origin, as well as the object’s roll, pitch, and yaw *orientation* with respect to each of those axes. *Id.* at 1:16–24. These six pieces of information, three of position and three of orientation, are the six degrees of freedom used to track the complete pose of an object. *Id.* at 1:23–24.³

There are many different sensors useful in tracking objects. One common method uses cameras for optically tracking easily-visible targets, such as one or more light-emitting diodes or reflectors attached to the object. *Id.* at 1:25–28. Using two cameras, it is possible to triangulate the position of a target on the object, and thus the location of the object. *Id.* To triangulate the location *and orientation*, additional information is required, which in the context of our two-camera example could be provided by installing additional targets on the object arranged in a predefined pattern. *Id.* at 1:31–26. But other sensors may be used, such as a sensor on the object itself that can report its orientation, for example by noting the location of the downward pull of gravity or the northward pull of the Earth’s magnetic field, or even the position of targets that it is optically tracking. *See, e.g., id.* at 2:54–56; *see also, e.g.,* Ex. 1005, 5 (Figure 5, depicting a system where a camera is mounted on the device being tracked). Further, as noted in the prior art, different numbers of sensors (optical or otherwise) may be

³ Our description of an orthogonal Cartesian (x, y, and z) coordinate system is not meant to imply it is required. Any coordinate system (e.g., spherical, latitude/longitude, or north, south, east, west, etc.) may be used. *See, e.g.,* Ex. 1001, 1:20–21 (“any fixed axes can be used”).

combined with different numbers of trackers (0+) to determine position and orientation. *See, e.g.*, Ex. 1021, 61 *et seq.* (providing “a top-down classification of tracking technologies . . . organized in accordance with their physical principles of operation”). The ’024 patent, however, focuses on tracking using “a single camera image, of exactly two points on the object” along with “information about an orientation of the object.” Ex. 1001, 2:41–43. Accordingly, we will focus the following discussion of geometry using the single-camera scenario.

We start with a simple two-dimensional example. In the figures below, a one-foot ruler (orange) has targets attached on both ends (one orange, one green), and a camera (blue) is used to track the targets on that ruler:⁴



⁴ These are based on the drawings provided by Petitioner’s expert, Dr. Neumann, but modified by us to be partially schematic and in two dimensions for simplicity. *See, e.g.*, Ex. 1003 ¶¶ 33–37. The parties are encouraged to provide clarifications, corrections, or confirmations as to the accuracy of these figures.

Figure A on the left shows an example where the ruler is some distance H_1 directly in front of the camera. Figure B on the right shows an example where it is some further distance H_2 in front of the camera. As can be imagined, the closer the ruler gets to the camera, the wider apart the targets will appear on the camera image; compare l_1 and l_2 . This is illustrated by the proportional relationship between triangles that can be defined by the lengths of the ruler and its image in the camera and the distance between. We can use this relationship to determine how far away the ruler is. We know the height of the small triangle at the camera (focal length, marked h), and we know the length of base of the top triangle (one foot, marked L), and we can use the camera image to measure the length of the base of the small triangle at the camera (marked l), which leaves it easy for us to solve for H , the remaining unknown.⁵

A complication to this example arises when we can no longer be assured that the ruler is parallel to the camera sensor. One can imagine holding the ruler from Figure A above, and spinning it around its center like a top. This would cause the targets appearing on the camera image to appear to repeatedly come together and move away. In other words, we can no longer solve for distance using proportionality as done above because the

⁵ Specifically, using proportionality, $H/L = h/l$. Solved for the distance between camera and ruler in our example, $H = Lh/l$, or distance between camera and ruler equals the ruler length times the focal length divided by the distance between the targets on camera image. We assumed the ruler is parallel with the camera's image receptors and the center of the ruler is aligned with the center of the camera (i.e., that the triangles are isosceles triangles). A more general solution could use right-angle triangles instead. See, e.g., Ex. 1003 ¶¶ 33–37.

distance between the targets on the camera image can be the result of distance *or* orientation. For example, two targets very close together could indicate the ruler is parallel to the camera but very far away, or that it is very close but rotated nearly perpendicular to the camera, or anywhere in between. Figure C below illustrates this situation:

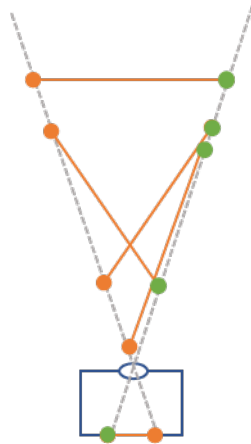


Fig. C

Figure C shows four rulers having the same length, but each is rotated in a different orientation. Even though the orientations are different, each ruler is seen by the camera as equivalent because each ruler's targets strike the camera at the same location. So long as the two targets remain on the dotted lines defining the edges of our triangles, they will always project onto the camera image in the same position.⁶

In order to resolve the ambiguity, the system needs to have information as to the orientation of the ruler. For example, an angle relative

⁶ The center of the ruler in our examples remain aligned with the center of the camera for simplicity. If the ruler were moved left or right, the targets as seen by the camera would shift right or left.

to some defined origin, such as north. Once we know the angle, then there is only one way to fit the ruler so that the targets are on the dotted lines.

This is similar to how the '024 patent works, but in 3-dimensional space. A camera image is used to obtain coordinate information of two target points on an object. Ex. 1001, 4:12–14. Information as to the pitch of the object are received from a sensor on the object itself. *Id.* at 4:14–15. This information, in combination with the known characteristics of the object and targets, is used to narrow down the potential orientations of the object, and to select one that fits the coordinate and pitch information. *Id.* at 15–24.

F. Challenged Claim

Claim 1, reproduced below, is the sole claim of the '024 patent.

1. A method comprising obtaining a camera image from a camera and processing said camera image in a data processor by computing the spatial location and azimuth of an object from the locations, in said camera image, of exactly two points on the object, and information about an orientation of the object, and generating one or more signals representative of the location and azimuth of the object, wherein computing the azimuth of the object comprises:

receiving coordinate information for images, on an imaging device of a camera, of two points on an object,

receiving pitch information from a sensor on the object, using the coordinate information and the pitch information to obtain candidate values for the azimuth of the object,

selecting one azimuth value based on an evaluation of the candidate azimuth values in equations relating the coordinate information and pitch information to distances of the points from the camera.

II. ANALYSIS

A. Discretionary Denial Under 35 U.S.C. § 314(a)

Patent Owner argues that we should deny institution under *Fintiv* on account of the parallel litigation between the parties. Prelim. Resp. 64–66 (citing *Apple, Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 at 6 (PTAB Mar. 20, 2020) (precedential)). *Fintiv* instructs us to consider whether to deny institution in certain circumstances when there is parallel district court litigation, upon consideration of six factors:

1. whether the court granted a stay or evidence exists that one may be granted if a proceeding is instituted;
2. proximity of the court’s trial date to the Board’s projected statutory deadline for a final written decision;
3. investment in the parallel proceeding by the court and the parties;
4. overlap between issues raised in the petition and in the parallel proceeding;
5. whether the petitioner and the defendant in the parallel proceeding are the same party; and
6. other circumstances that impact the Board’s exercise of discretion, including the merits.

Fintiv, Paper 11 at 6.

Our analysis of *Fintiv* is guided by the USPTO Director’s Memorandum issued on June 21, 2022, titled “Interim Procedure for Discretionary Denials in AIA Post Grant Proceedings with Parallel District Court Litigation” (“Director’s Memo”). We turn to the *Fintiv* factors.

1. Factor 1: Stay

Neither party has moved for a stay of the district court proceeding. This factor is neutral. *See Fintiv*, Paper 15 at 12 (“We decline to infer . . .

how the District Court would rule should a stay be requested by the parties in the parallel case here.”).

2. *Factor 2: Proximity to Trial Date*

The parallel litigation began in the U.S. District Court for the Western District of Texas, but was transferred to the U.S. District Court for the Northern District of California. Pet. 8–9; Prelim. Resp. 65. No trial date has been set. Pet. 9. Patent Owner argues that we should deny based on the median trial date of the Northern District of California, if we were to start counting time when the case was filed in the original venue. *See, e.g.*, Prelim. Resp. 65–66.

Fintiv factor 2 discusses consideration of a *trial date*. The Director’s Memo states that it may be useful to compare a trial date with evidence of a median time to trial. Director’s Memo 8. The purpose of doing so is in order to ascertain the likelihood of the scheduled trial date actually occurring on or around that date. *Id.* at 8 (“Stakeholders correctly noted that scheduled trial dates are unreliable and often change[,]” and a “scheduled trial date . . . is not by itself a good indicator of [when] the district court trial will occur.”). The Director’s Memo does not state that median time-to-trial statistics are themselves a trial date, or otherwise replace consideration of a trial date under *Fintiv* factor 2. And, in the circumstances here, where the case was transferred from the Western District of Texas, the usefulness of the median time to trial statistics is less clear. Ultimately, though, we will not speculate on when a trial may be scheduled. Accordingly, factor 2 favors not exercising our discretion to deny institution.

3. *Factor 3: Investment in Parallel Proceeding*

Patent Owner argues that “[t]he parties have fully briefed claim construction and exchanged infringement and invalidity contentions, and are almost eight months into general fact discovery.” Prelim. Resp. 65.

Petitioner argues that “the most burdensome parts of the case still remain,” for example fact discovery has several months yet, and expert discovery has yet to begin. Paper 8, 3 (Petitioner’s Reply to the Preliminary Response).

Petitioner also notes that there have not been any claim construction rulings.

Id. Patent Owner responds that “Petitioner has proposed that all document production be substantially completed by March 16, 2023.” Paper 9, 4 (Patent Owner’s Sur-reply to Petitioner’s Reply).

We determine that factor 3 does not favor discretionary denial.

Although there has been work completed, as Petitioner points out, “the most burdensome parts of the case still remain.” Paper 8, 3.

4. *Factor 4: Overlap with Parallel Proceeding*

The single claim of the ’024 patent is also at issue in the parallel proceeding, in which Petitioner is the defendant. Prelim. Resp. 66.

According to Patent Owner, the same prior art is also at issue. *Id.* Petitioner offers a *Sand Revolution* type of stipulation, indicating that it will not pursue the grounds raised in this proceeding in the parallel litigation. Paper 8, 3–4;

Sand Revolution II, LLC v. Cont’l Intermodal Grp. Trucking LLC, No.

IPR2019-01393, Paper 24 at 11–12 (PTAB June 16, 2020) (informative)

(finding that a stipulation not to pursue the same grounds in the parallel litigation “mitigates to some degree the concerns of duplicative efforts”).

Patent Owner argues that such a narrow stipulation does not mitigate the concerns of overlap. Paper 9, 4–5.

We are not aware of any precedent that states that *Sand Revolution*-type stipulations are no longer valid or not entitled to weight in the *Fintiv* analysis. We recognize that they are narrower in scope than *Sotera*-type stipulations, and perhaps may require a different result in a case with different facts. *See Sotera Wireless, Inc. v. Masimo Corp.*, IPR2020-01019, Paper 12 at 18–19 (PTAB Dec. 1, 2020) (precedential) (finding that a broad stipulation not to pursue any ground raised or that could have been reasonably raised in the parallel litigation weighs strongly toward institution). Here, Petitioner’s stipulation still eliminates the specific overlap with the parallel proceeding. As in *Sand Revolution*, we weigh this factor as marginally favoring institution. *Sand Revolution*, Paper 24 at 12.

5. *Factor 5: Whether Petitioner and Defendant are the Same Party*

“If a petitioner is unrelated to a defendant in an earlier court proceeding, the Board has weighed this fact against exercising discretion to deny institution” *Fintiv*, Paper 11 at 13. Petitioner is also a defendant in the related district court litigation. *See* Pet. 3; Prelim. Resp. 66. Thus, this factor weighs marginally in favor of exercising our discretion to deny institution. *Sotera*, Paper 12 at 19.

6. *Factor 6: Merits, and Other Considerations*

Patent Owner argues that Petitioner does not make out a compelling case on the merits. Prelim. Resp. 66. As specified in the Director’s Memo, “compelling, meritorious challenges will be allowed to proceed at the PTAB even where district court litigation is proceeding in parallel.” Director’s Memo 4. Accordingly, the Director’s Memo states that the *Fintiv* analysis will not lead to discretionary denial if it can be established that a case presents compelling merits. *Id.* at 4–5. But it does not stand for the

opposite. The Memo does not require a Petitioner to establish compelling merits to avoid discretionary denial.

Additionally, as the Director recently clarified, “[t]he Board should first assess *Fintiv* factors 1–5; if that analysis supports discretionary denial, the Board should engage the compelling merits question.” *CommScope Techs. LLC v. Dali Wireless, Inc.*, IPR2022-01242, Paper 23 at 6 (PTAB Feb. 27, 2023) (precedential). Here, we determine that, on balance, *Fintiv* factors 1–5 do not favor exercising our discretion to deny institution and, therefore, there is no need to determine whether the Petition establishes compelling merits.

7. Conclusion on *Fintiv* Factors

Upon consideration of the *Fintiv* factors, we determine that discretionary denial is not appropriate in this case.

B. Legal Standards Used in the Merits Analysis

“In an IPR, the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring *inter partes* review petitions to identify “with particularity . . . the evidence that supports the grounds for the challenge to each claim”)); *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (discussing the burden of proof in *inter partes* review).

A claim is unpatentable under 35 U.S.C. § 103 if “the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious . . . to a person having ordinary skill in the art to which said subject matter pertains.” *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 skill in the art; and (4) when in evidence, objective evidence of nonobviousness, i.e., secondary considerations. *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17–18 (1966).

C. Level of Ordinary Skill in the Art

Petitioner asserts that a person of ordinary skill in the art:

would have had a Bachelor's degree in Computer Science, or an equivalent field, and three to five years of experience working with computer-implemented tracking systems, virtual reality systems, and/or augmented reality systems. Additional education might compensate for less experience, and vice-versa.

Pet. 25 (citing Ex. 1003 ¶¶ 69–70).

Patent Owner states that it accepts Petitioner's proposed definition for purposes of its Preliminary Response. Prelim. Resp. 20. Patent Owner, however, "disagrees with Petitioner that such [person] should be limited to a maximum of five years' experience and reserves the right to offer an alternative definition based on expert evidence in the event IPR is instituted." *Id.*

Reviewing the references of record and the '024 patent, we find the level of skill in the art is high. For example, such a person is familiar with the different ways to mathematically formulate the equations and trigonometric relationships used in determining the position and orientation of objects using whatever knowledge is available regarding the degrees of freedom. *See, e.g.*, Ex. 1001, 4:51–7:23 (containing extensive mathematical discussion); Ex. 1003 ¶¶ 50–66 (Petitioner's expert walking through the

mathematics disclosed in the '024 patent); Ex. 1005, 2–4 (discussing equations relating to tracking); Ex. 1010 ¶¶ 47–135 (similar); Ex. 1023, 22–33, 72–77 (describing the Kalman filter and application to tracking). We adopt the undisputed definition proposed by Petitioner for purposes of this Decision.

D. Claim Construction

Petitioner asserts that no claims require construction. Pet. 25. Patent Owner asserts that the parties agreed in the district court litigation that the claim preamble is limiting. Prelim. Resp. 21. Patent Owner does not offer any other claim constructions.

We will consider any prior claim construction determination in a related district court proceeding. 37 C.F.R. § 42.100(b). However, the parties allegedly agreeing to a claim construction is not a “determination.” There are many reasons in litigation that parties may stipulate to, or agree on, the construction of claim terms not having to do with the merits of such construction. Similarly, there are different issues available in district court that are not available at the USPTO; those issues may require more or less precision than is necessary here or may motivate the parties to a different agreement. As to the alleged stipulation, the parties do not even stipulate as to a construction, they have merely agreed to address the preamble.

For purposes of this Decision, we do not consider the preamble limiting. In general, preambles are not limiting. *Allen Eng'g Corp. v. Bartell Indus., Inc.*, 299 F.3d 1336, 1346 (Fed. Cir. 2002). The parties have not explained why the preamble is limiting, nor is it plainly limiting. The body of the claim does not refer back to preamble, and it is not clear on this record that anything in the preamble is necessary to understand the claim.

Catalina Mktg. Int’l, Inc. v. Coolsavings.com, Inc., 289 F.3d 801, 808 (Fed. Cir. 2002) (holding the preamble may be construed as limiting “if it recites essential structure or steps, or if it is ‘necessary to give life, meaning, and vitality’ to the claim.”) (quoting *Pitney Bowes, Inc. v. Hewlett-Packard Co.*, 182 F.3d 1298, 1305 (Fed. Cir. 1999)). Indeed, the preamble appears to merely be a preview of the steps later recited in the body. The parties should brief this issue further if they believe an issue at trial turns on whether the preamble is limiting.

The parties have not offered competing claim constructions and it does not appear necessary to specifically construe any claim term to resolve any controversy. *Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019) (“The Board is required to construe ‘only those terms . . . that are in controversy, and only to the extent necessary to resolve the controversy.’”) (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)). Accordingly, we do not construe any claim terms.

E. Asserted Obviousness over FlightTracker and Welch

Claim 1 is directed to a method for computing the spatial location and azimuth (compass direction) of an object. The claim includes steps of receiving coordinate information regarding two points on an object from a camera and receiving pitch information from a sensor on the object. Then, the claim recites a step of using this information to obtain candidate values for the azimuth of the object, then a step of selecting one azimuth value. Petitioner asserts that FlightTracker and Welch render these steps obvious. Pet. 35–57.

In particular, Petitioner draws our attention to FlightTracker's combination of an inside-out and outside-in tracking system, such as shown in Figure 7, reproduced below:

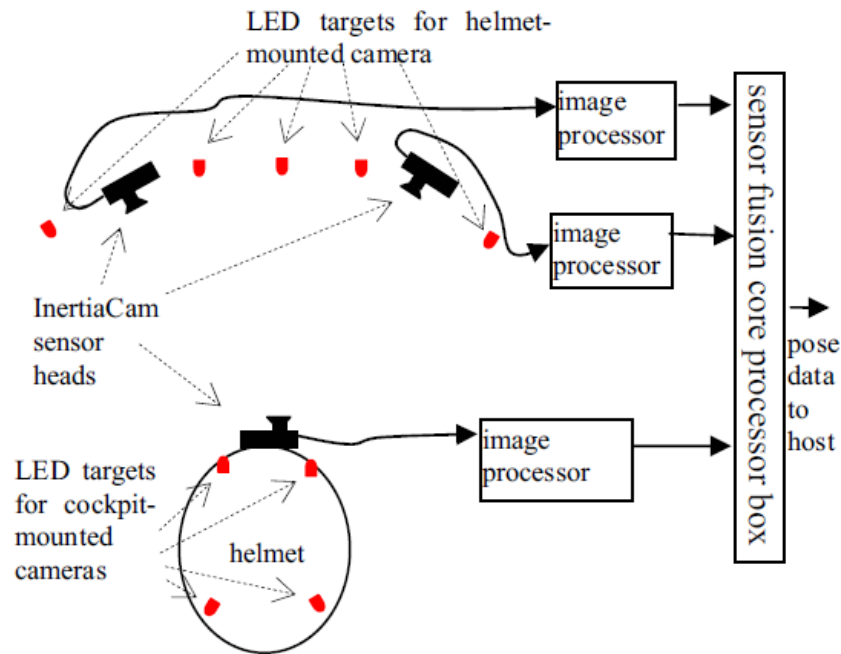


Figure 7: Schematic overview of tested system configuration

Figure 7 of FlightTracker shows an inside-out system, where the camera is on the user's head and looks at external sensors, as well as an outside-in system, where cameras look at sensors on the user's head. The figure depicts that both cameras can see a plurality of sensors. We now turn to Petitioner's showings for the specific limitations in the claim.

- 1. receiving coordinate information for images, on an imaging device of a camera, of two points on an object*

Petitioner asserts that the outside-in cameras in FlightTracker can determine the position of the user's head by seeing at least one, and preferably two, targets on the head. Pet. 45–46; *see also* Ex. 1005, 7 (depicting Figure 7, reproduced above). Petitioner notes that FlightTracker

explains that two cameras are highly redundant and that one outside-in camera would be sufficient to determine all degrees of freedom. *Id.* at 43–44; *see also* Ex. 1005, 6 (“[E]ven one outside-in camera would be sufficient[, with some caveats]. Thus two outside cameras is already highly redundant, allowing great robustness for occlusions.”).

Patent Owner argues that FlightTracker uses two cameras, not “a camera,” and that even considering FlightTracker’s teaching of using one camera, FlightTracker acknowledges that the full spatial location could not be known in that scenario. Prelim. Resp. 24–26 (referring to the caveat provided on page 6 of FlightTracker).⁷

Initially, we note that claim limitations introduced with the word *a* will be construed to mean *one or more* absent “clear intent to [] limit” the claim. *KCJ Corp. v. Kinetic Concepts, Inc.*, 223 F.3d 1351, 1356 (Fed. Cir. 2000) (“Unless the claim is specific as to the number of elements, the article ‘a’ receives a singular interpretation only in rare circumstances when the patentee evinces a clear intent to so limit the article.”). Patent Owner’s implicit position that the claim is limited to a single camera (and thus, single camera image), however, has some merit. For example, the ’024 patent summarizes its disclosure by stating it describes “the spatial location and azimuth of an object are computed from the locations, in a single camera image, of exactly two points on the object and information about an orientation of the object.” Ex. 1001, 2:40–43; *see also id.* at 4:51–55. But Patent Owner has not offered a claim construction in support of that position yet and it is unnecessary to so construe the claim at this time. We leave final

⁷ Patent Owner directs these arguments to similar language found in the preamble, but they are also applicable to this limitation.

resolution of that issue for trial after more facts have been gathered and the parties have briefed the issue. For purposes of this Decision, however, we will focus our analysis on the one-camera interpretation of the claim, as FlightTracker plainly shows two cameras in Figure 7.

Turning back to the claim's requirement of a camera receiving information about two points on an object, Petitioner asserts that FlightTracker teaches that "the outside-in cameras can see two targets on the helmet." Pet. 41 (quoting Ex. 1005, 6; Ex. 1003 ¶ 103). Petitioner also asserts that FlightTracker teaches that two cameras are optional; only one camera is necessary. Pet. 43–44 (citing Ex. 1005, 6; Ex. 1003 ¶ 106). Although Patent Owner notes the language in FlightTracker stating that one camera cannot resolve all degrees of freedom (Prelim. Resp. 24–26), we understand that language in FlightTracker is in reference to when only a single target point is used. Specifically, the paragraph in FlightTracker that Patent Owner references starts talking about "just one head-mounted target [being] visible" (Ex. 1005, 6), but FlightTracker's actual prototype shows more than one target (*id.* at 7, Fig. 7). As Petitioner's expert, Dr. Neumann explains, a person of ordinary skill in the art would understand that "a single camera observing two points would . . . fully constrain the solution." Ex. 1003 ¶ 106. This makes sense, because a camera seeing two points would allow the system to determine distance information along the camera's sight axis by using the observed distance between the points (in conjunction with their reported pitch orientation and with the actual distance between the points already being known).⁸ In other words, the evidence thus far

⁸ In this way, FlightTracker would operate similar to the examples we provided in Figures A, B, and C in the technology overview section above.

indicates that a person of ordinary skill in the art would understand that FlightTracker is talking about some combination of one or more cameras tracking one or more points, with robustness and/or accuracy affected by which number of each is chosen. Accordingly, we determine that Petitioner's position sufficiently shows on this preliminary record how FlightTracker discloses one camera and two targets.

2. receiving pitch information from a sensor on the object

Petitioner asserts that the helmet-mounted camera provides orientation tracking, and that pitch is one component of orientation. Pet. 47 (citing Ex. 1005, 6; Ex. 1003 ¶¶ 113–115). Patent Owner does not contest this limitation at this time. Petitioner's assertion that FlightTracker's inside-out camera provides pitch information appears reasonable on this record.

3. using the coordinate information and the pitch information to obtain candidate values for the azimuth of the object

Petitioner asserts that FlightTracker teaches “constrain[ing] the azimuth” and that this would have been understood by a person of ordinary skill in the art to be done by using known values to obtain candidate values. Pet. 48–49. In particular, relying on the testimony of its expert, Dr. Neumann, Petitioner asserts that if one knows the coordinates of the tracked object and its pitch, then there are only a few possible solutions for the azimuth, as shown in Figure 8 below:

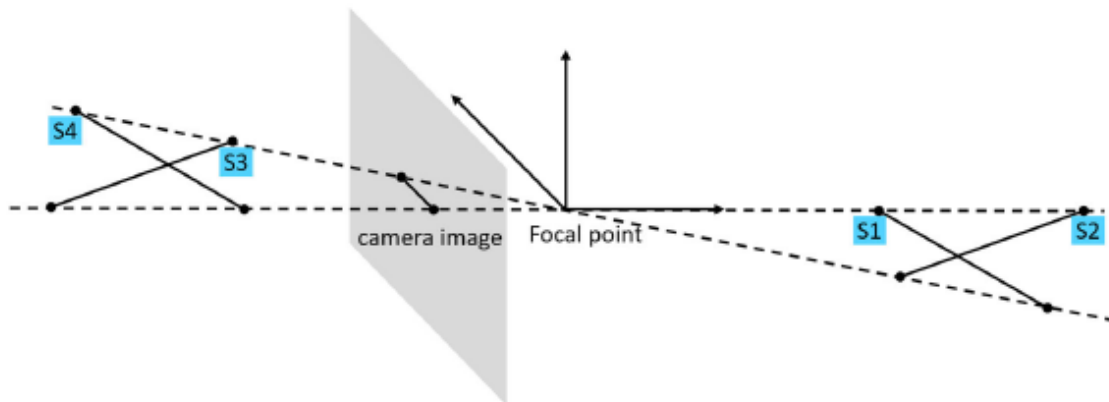


Figure 8.

Ex. 1003 ¶ 119, Fig. 8.

Figure 8 in Dr. Neumann’s testimony depicts how a given arrangement of two points on a camera image can be the result of four possible orientations of those two points. Knowing the pitch eliminates narrows down the possibilities (i.e., the number of candidate solutions). *Id.* ¶ 120.

Petitioner also asserts that Welch teaches that, depending on the number of knowns and unknowns, the number of combinations of position and orientation that could result in that camera image varies. Pet. 49–50 (citing Ex. 1023, 72). Petitioner asserts that Welch uses Kalman filters to fuse the inputs to obtain candidate measurements. *Id.*

Patent Owner first argues that FlightTracker describes the azimuth is *determined* rather than there being candidates *prior to determination*. Prelim. Resp. 29–30. We understand Petitioner’s position to be that FlightTracker must have candidate values prior to its final determination. Even assuming that Patent Owner is correct that FlightTracker’s sensors have enough information to determine azimuth, as Dr. Neumann explains,

any solution would have at least a twin solution behind the camera, such as shown in Figure 8 reproduced above. Ex. 1003 ¶ 125. In other words, it would appear that solutions at least come in pairs. Ex. 1003 ¶¶ 119–120; Ex. 1001, 6:53–57. On this record, such solution pairs would appear to be candidate values, and that would resolve this issue in favor of Petitioner.

Patent Owner next argues that FlightTracker employs multiple cameras, Prelim. Resp. 30–31, but as we discussed above, Petitioner also takes the position that FlightTracker teaches use of a single outside-in camera (Pet. 43–44).

Lastly, Patent Owner argues that Welch’s discussion of Kalman filters is not generating candidate values. Prelim. Resp. 32. We would need Patent Owner to offer a claim construction of “candidate” here to more definitively understand this argument because a facial construction of the word “candidate” would appear to be met by the two (or more) possible values in FlightTracker, for the reasons explained by Dr. Neumann (e.g., Ex. 1003 ¶¶ 117–120) and discussed above.

Specifically as to Patent Owner’s argument against the calculations done in the Kalman filters of Welch, Patent Owner’s argument may have some merit. On one hand, a Kalman filter calculates values, and one could construe those values to be *candidates* for the actual (but ultimately unknowable) value.⁹ That is, a Kalman filter is used because it is recognized

⁹ As background, a Kalman filter is a set of equations and a process for using them most commonly applied in filtering the noise from sensor measurements (such as in object tracking). *See* Ex. 1023, 21. Any sensor has some amount of error due to the nature of the sensor and the available precision, making all tracking an exercise in probability. *See id.* at 17. A Kalman filter lessens the overall error in measurements from many sensors

that sensor values are inherently inaccurate and thus calculations based on those inaccurate values are also inaccurate. The filter improves the accuracy of the calculated value, but ultimately it calculates an expected value, i.e., the best candidate for the real value. This interpretation may be plausible under some claim constructions. On the other hand, it is not clear to us that a Kalman filter calculates in parallel several discrete values potentially representing the same piece of information, and then choosing one of those discrete values to present as the calculated value. *See, e.g.*, Ex. 1023, 26 (showing a Kalman filter operates under a loop between a prediction and a correction of a desired value). Thus, under certain constructions it is not clear that the Kalman filter would teach candidate values. These issues are best left to trial, where further briefing and evidence would be useful.

Considering the entirety of Petitioner's position on this limitation, we determine that Petitioner's position is sufficient for purposes of institution because in order to ultimately eliminate values, one must initially have candidate values.

4. *selecting one azimuth value based on an evaluation of the candidate azimuth values in equations relating the coordinate information and pitch information to distances of the points from the camera*

Petitioner asserts that FlightTracker teaches the *selecting* limitation. Pet. 50–52. As we noted above and as explained by Dr. Neumann, the calculations involved provide at least two possible solutions and the pitch

by considering the errors of the individual sensors as well as any correlations between the sensors. *See id.* at 22–26. For example, if one ultimately wants to know a vehicle's position using GPS and an accelerometer, one could combine the fact that the accelerometer consistently reads at or near zero to help offset a noisy GPS signal indicating the object was moving around a little bit, in order to conclude the object was most likely stationary.

information is used as well as the fact that one set of solutions is behind the camera in order to limit the solution to a single value. Ex. 1003 ¶¶ 124–125. In effect, the “obtain[ing]” and “selecting” limitations go hand-in-hand—one must obtain candidates before selecting one, and one cannot select a candidate until they are obtained. Petitioner also points to the teachings of Welch regarding calculating a position; in particular, calculating positions when less than all inputs are available. Pet. 52–54.

Patent Owner’s arguments largely mirror those we discussed with respect to the prior limitation, and are not persuasive on this record for similar reasons. Prelim. Resp. 33–36.

5. *Objective Indicia of Non-Obviousness*

Patent Owner argues that its claims satisfy a long-felt need in the art. Prelim. Resp. 63–64. Specifically, Patent Owner asserts a need to be able to track objects using fewer tracking markers. *See id.* However, at this preliminary stage of the proceeding the record regarding the evidence of non-obviousness is undeveloped. We note that FlightTracker itself appears reasonably likely to meet the claim limitations, such that even assuming, *arguendo*, that there was a long-felt need, FlightTracker already satisfied the long-felt need. *Millennium Pharms., Inc. v. Sandoz Inc.*, 862 F.3d 1356, 1369 (Fed. Cir. 2017) (“The existence of a long felt *but unsolved need* that is met by the claimed invention is further objective evidence of non-obviousness.”) (emphasis added).

6. *Conclusion for the FlightTracker and Welch Ground*

Having considered the Petition and Preliminary Response, and the arguments and evidence cited therein, we conclude the Petitioner has

established a reasonable likelihood that claim 1 would have been obvious in view of FlightTracker and Welch.

F. Alternative Grounds

Petitioner alternatively asserts that the teachings of FlightTracker, Welch, and Satoh (Pet. 55–57), Barfield and FlightTracker (*id.* at 57–76), or Barfield, FlightTracker, and Satoh (*id.* at 76–77) would have rendered claim 1 obvious. Patent Owner disputes each of these grounds. Prelim. Resp. 36–38, 43–63. On this record and at this preliminary stage of the proceeding, however, those grounds are both highly related to, and do not appear more persuasive than, the ground discussed above. For example, although Satoh also discloses position and orientation tracking (Ex. 1010, code (57)), the claim limitations appear met by FlightTracker (i.e., without the need for Satoh), as we discussed above. With respect to Barfield, Patent Owner argues that Petitioner is picking and choosing varied independent teachings from Barfield. *See, e.g.*, Prelim. Resp. 44. FlightTracker discloses different configuration options, as we discussed above, but it is all the same system. Ex. 1005, 6 (noting options for one or two cameras). Patent Owner is correct to the extent that Barfield discloses a survey of different tracking systems. *See* Ex. 1021, 67 (noting five “main principles” of position and orientation tracking are surveyed and providing examples of systems utilizing each). But without further evidence to weigh against Petitioner’s position, there is little value in further analysis of that ground. For these reasons, and because Petitioner has already established a reasonable likelihood of success with respect to the first FlightTracker ground, we do not reach the remaining grounds.

III. CONCLUSION

As explained above, we find that Petitioner has established a reasonable likelihood of success in showing that claim 1 is unpatentable over FlightTracker and Welch. Accordingly, we institute *inter partes* review on all challenged claims on all asserted grounds. *See SAS Inst. v. Iancu*, 138 S.Ct. 1348, 1359–60 (2018).

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that an *inter partes* review of claim 1 of the '024 patent is instituted with respect to all grounds set forth in the Petition; and

FURTHER ORDERED that pursuant to 35 U.S.C. § 314(a), *inter partes* review of the '024 patent is hereby instituted commencing on the entry date of this Decision, and pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial.

FOR PETITIONER:

W. Todd Baker
Yimeng Dou
Ellisen Shelton Turner
KIRKLAND & ELLIS LLP
todd.baker@kirkland.com
yimeng.dou@kirkland.com
ellisen.turner@kirkland.com

FOR PATENT OWNER:

Meredith Martin Addy
Robert P. Hart
Gregory B. Gulliver
Brandon C. Helms
ADDYHART P.C.
meredith@addyhart.com
robert@addyhart.com
gbgulliver@addyhart.com
bhelms@addyhart.com

D. Shayon Ghosh
Arthur J. Argall III
WILLIAMS & CONNOLLY LLP
sghosh@wc.com
aargall@wc.com