

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

AXON ENTERPRISE, INC., DEDRONE HOLDINGS, INC., and
SKYDIO, INC.
Petitioner,

v.

AIRSPACE SYSTEMS, INC.,
Patent Owner.

IPR2025-00629
Patent 10,514,711 B2

Before MICHAEL R. ZECHER, BARRY L. GROSSMAN, and
SCOTT C. MOORE, *Administrative Patent Judges*.

MOORE, *Administrative Patent Judge*.

PRELIMINARY GUIDANCE
PATENT OWNER'S MOTION TO AMEND
37 C.F.R. § 42.121(e)

I. INTRODUCTION

On October 8, 2025, we instituted trial as to claims 1–20 of U.S. Patent No. 10,514,711 B2 (Ex. 1001, the “711 patent”). Paper 16. After institution, Patent Owner filed a Contingent-in-Part and Non-Contingent-in-Part Motion to Amend, with proposed substitute claims 21–37. Paper 21 (“Motion” or “Mot.”). The Motion is contingent as to claim 12, and non-contingent as to claims 1–4, 8–11, and 13–20. *Id.* at 1. The Motion also includes a request to cancel claims 5–7, which we decline to cancel until the filing of any revised motion. *Id.* Petitioner filed an Opposition. Paper 27 (“Opp.”).

In the Motion, Patent Owner requested that we provide preliminary guidance concerning the Motion in accordance with 37 C.F.R. § 42.121(a)(1)(ii). Mot. 1; *see* 37 C.F.R. § 42.121(e)(1); *see also Rules Governing Motion to Amend Practice and Procedures in Trial Proceedings under the America Invents Act before the Patent Trial and Appeal Board*, 89 Fed. Reg. 76,421 (Sept. 18, 2024) (“Final Rule”). We have considered Patent Owner’s Motion and Petitioner’s Opposition.

In this Preliminary Guidance, we provide information indicating our initial, preliminary, non-binding views on whether Patent Owner has shown a reasonable likelihood that it has satisfied the statutory and regulatory requirements associated with filing a motion to amend in an *inter partes* review and whether Petitioner establishes a reasonable likelihood that the substitute claims are unpatentable. 37 C.F.R. § 42.121(e)(1), (2); *see also* 35 U.S.C. § 316(d) (statutory requirements for a motion to amend); 37 C.F.R. § 42.121(a)(2), (a)(3), (b) (regulatory requirements and burdens for a motion to amend); *Lectrosonics, Inc. v. Zaxcom, Inc.*, IPR2018-01129, Paper 15 (PTAB Feb. 25, 2019) (precedential) (providing information and guidance regarding motions to amend). The reasonable likelihood standard this Preliminary Guidance applies is different than the preponderance of the evidence

standard applied when ultimately deciding the Motion. *Compare* 37 C.F.R. § 42.121(e)(1) *with* § 42.121(d). Finally, this Preliminary Guidance is not a “decision” for purposes of rehearing under 37 C.F.R. § 42.71(d). 37 C.F.R. § 42.121(e)(2).

For purposes of this Preliminary Guidance, we focus on the proposed substitute claims, and specifically on the amendments proposed in the Motion. *See* 37 C.F.R. § 42.121(e)(1); Final Rule, 89 Fed. Reg. at 76,425. We do not address the patentability of the originally challenged claims. *See id.* Moreover, in formulating our preliminary views on the Motion and Opposition, we have not considered the parties’ other substantive papers on the underlying merits of Petitioner’s challenges. We emphasize that the views expressed in this Preliminary Guidance are subject to change upon consideration of the complete record, including any revision to the Motion filed by Patent Owner. Thus, this Preliminary Guidance is not binding on the Board when rendering a final written decision or any other subsequent decision in this proceeding. 37 C.F.R. § 42.121(e)(2); *see Medytox, Inc. v. Galderma S.A.*, 71 F.4th 990, 1000 (Fed. Cir. 2023).

II. PRELIMINARY GUIDANCE

A. Statutory and Regulatory Requirements

Patent Owner bears the ultimate burden to show that its motion to amend complies with the requirements of 35 U.S.C. § 316(d)(1), (3) and 37 C.F.R. § 42.121(a)(2), (a)(3), (b)(1), and (b)(2). 37 C.F.R. § 42.121(d)(1). For the reasons discussed below, at this stage of the proceeding, and based on the current record, it appears that Patent Owner has shown a reasonable likelihood that it has satisfied the statutory and regulatory requirements associated with filing a motion to amend. *See* 37 C.F.R. § 42.121(e)(1).

1. Reasonable Number of Substitute Claims

A motion to amend must propose a reasonable number of substitute claims. 35 U.S.C. § 316(d)(1)(B); 37 C.F.R. § 42.121(a)(3). Patent Owner has shown it proposes a reasonable number of substitute claims by proposing a single substitute claim (i.e., claims 21–37) for each of the original claims (i.e., claims 1–4 and 8–20). *See* Mot. 2, Claims App.; *see also* 37 C.F.R. § 42.121(a)(3) (“The presumption is that only one substitute claim would be needed to replace each challenged claim, and it may be rebutted by a demonstration of need.”). Petitioner does not argue otherwise. *See* Opp.

2. Respond to Ground of Unpatentability

A motion to amend must respond to a ground of unpatentability involved in the proceeding. 37 C.F.R. § 42.121(a)(2)(i). Patent Owner has responded to the grounds of unpatentability involved in this proceeding by presenting arguments explaining why the newly added limitations in the proposed substitute claims overcome the prior art in those grounds. *See* Mot. 2, 24–25. Petitioner does not argue otherwise. *See* Opp.

3. Scope of Amended Claims

A motion to amend may not enlarge the scope of the claims of the patent. 35 U.S.C. § 316(d)(3); 37 C.F.R. § 42.121(a)(2)(ii). Patent Owner asserts that “no proposed substitute claim enlarges the scope of the challenged claims.” Mot. 2.

Petitioner contends the amendment of proposed substitute claim 33 to depend directly on proposed substitute claim 21, rather than intervening proposed substitute claim 32, “broadens [substitute claim] 33 as it no longer has [substitute claim] 32’s elements, regardless of other narrowing.” Opp. 1. We disagree with Petitioner’s contention.

The standard we apply is whether a substitute claim broadens the *claims of the patent*, not any particular claim. See *Lectrosonics*, IPR2018-01129, Paper 15, at 6–7 (“A substitute claim will meet the requirements of § 42.121(a)(2)(i) and (ii) if it narrows the scope of at least one claim of the patent . . .”). Substitute claim 33 includes the newly added limitations in proposed substitute claim 21 from which it depends. The removal of an intervening dependency does not change the fact that claim 33 is thus narrower than original claim 1.¹

Petitioner’s reliance on *Sisvel Int’l S.A. v. Sierra Wireless, Inc.*, 81 F.4th 1231 (Fed. Cir. 2023) is unavailing. See Opp. 1. In *Sisvel*, the court affirmed the Board’s denial of a motion to amend where the proposed substitute independent claim was broader in one respect than the corresponding original independent claim, even though it contained other narrowing limitations. See 81 F.4th at 1239–40. The court based its holding on the principle that “a claim ‘is broader in scope than the original claim[] if it contains within its scope any conceivable apparatus or process which would not have infringed the original patent.’” *Id.* at 1237 (alteration in original) (citing *Hockerson-Halberstadt, Inc. v. Converse Inc.*, 183 F.3d 1369, 1374 (Fed. Cir. 1999)). Here, there is no conceivable apparatus contained within the scope of proposed substitute claim 33 that would not have infringed original claim 1, because proposed substitute claim 33 is not broader in any respect than original claim 1.

¹ We note, however, that despite the change in dependency of proposed substitute claim 33, it retains a recitation of “*the direction adjustment factor*.” Mot., Claims App. (emphasis added). The only prior recitation of a direction adjustment factor is in proposed substitute claim 32 (original claim 15), from which claim 33 no longer depends. As addressed *infra*, § II.B.2, Patent Owner may consider addressing the antecedent basis issue presented by removing the intervening dependency.

For these reasons, neither proposed substitute claim 33, nor any of the other proposed substitute claims, enlarges the scope of the claims.

4. New Matter

A motion to amend may not introduce new subject matter. 35 U.S.C. § 316(d)(3); 37 C.F.R. § 42.121(a)(2)(ii). In particular, a motion to amend must show “support in the original disclosure of the patent for each proposed substitute claim.” 35 C.F.R. § 42.121(b)(1); *Lectrosonics*, IPR2018-01129, Paper 15, 7 (“[T]he Board requires that a motion to amend set forth written description support in the originally filed disclosure of the subject patent for each proposed substitute claim . . .”).

The test for satisfying the written description requirement “is whether the disclosure of the application relied upon reasonably conveys to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date.” *Ariad Pharms., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010) (en banc). Patent Owner’s Motion provides citations to U.S. Patent Application No. 16/142,452 (Ex. 2019, the “’452 application”), from which the ’711 patent issued, for each limitation in the proposed substitute claims. See Mot. 2–24.

Petitioner contends there is no support for the proposed substitute claim 36 features of, in Petitioner’s words, “a *first* neural network performing object detection and a *second* neural network incrementally predicting [three-dimensional (“3D”)] relative location.” Opp. 1. At this stage, we disagree with Petitioner. The ’452 application discloses that “[d]eep neural networks (DNN) may be executed to periodically detect objects and distinguish targets.” Ex. 2019 ¶ 109. Specifically, “[o]nce an object is detected in high-resolution mode (i.e. using DNN or manual input) a tracker algorithm takes control and maintains lock on the target.” *Id.* ¶ 110. Additionally, “[a] reduced resource background tracker may incrementally

predict the location of a target in the frame with low compute cost and average robustness.” *Id.*; *see also id.* ¶ 121 (“The high resolution tracker 1502 identifies the anomaly 1522 as a detected object 1524, which is then tracked by the low resolution tracker 1510.”), Fig. 15.

Petitioner’s argument that the background tracker in the ’452 application is not a neural network that performs incremental 3D relative location prediction (*see* Opp. 1) is not persuasive on the current record. The ’452 application, when read as a whole, indicates that the background tracker in the embodiment noted above may employ a neural network, given the disclosure that “[p]rocessing scheme examples for a group (ii) [(Medium cost, medium robustness algorithms)] & (iii) [(Low cost (high refresh rate), low robustness algorithms)] can include using SqueezeNet super fast rejection CNN [(Convolutional Neural Networks)] as the validation method on the estimated location produced by the algorithms.” *Id.* ¶ 151; *see also id.* ¶ 153 (“Other example algorithms may be substituted therefor without departing from the inventive scope . . .”). Moreover, on the current record, one of ordinary skill in the art would have understood the background tracker to predict relative location in 3D space because the ’452 application discloses using a 3D vector based on the determined relative location of a target. *See, e.g., id.* ¶ 91. That is, it appears the background tracker would need to provide 3D relative location information to support using a 3D vector to continue tracking a target.

Petitioner further contends there is no support for the proposed substitute claim 24 feature of “identifying a model type...*based on the classification.*” Opp. 2 (emphasis in original). On the current record, we disagree with Petitioner. The ’452 application discloses that “[t]he output of the image analysis (e.g., output from applying the machine learning model) may include . . . a classification of the detected target (e.g., type, model, class, manufacturer, size, etc. of the detected

target).” Ex. 2019 ¶ 94. It also discloses that, “[i]n some embodiments, the machine learning model has been trained using different examples of types of aerial vehicles (e.g., different models, types, manufacturers, sizes, etc.) to be able to classify and identify the specific type of the detected target aerial vehicle.” *Id.* ¶ 95. This disclosure is sufficient at this stage to show possession of the disputed feature in proposed substitute claim 24.

Petitioner also contends there is no support for the proposed substitute claim 25 feature of “determining a speed adjustment factor based on the determined distance of the target,” or, for a similar reason, the proposed substitute claim 31 feature of “scaling a speed adjustment factor to smooth and limit a rate of change of a speed of the reference aerial vehicle.” Opp. 2. Specifically, Petitioner argues that if either of the speed adjustment factors introduced in proposed substitute claims 25 or 31 is a second speed adjustment factor, in addition to the speed adjustment factor recited in proposed substitute claim 21, there is no support for this in the ’452 application. *See id.* On the current record, we are not persuaded that there is a lack of written description support for the disputed features in proposed substitute claims 25 and 31.

For purposes of this Preliminary Guidance, we interpret the recitation of “a speed adjustment factor” in each of proposed substitute claims 25 and 31 to further modify the “speed adjustment factor” recited in proposed substitute claim 21.² With this understanding, and regarding proposed substitute claim 25, the ’452 application discloses, with respect to “a vector identifying the relative location of the target,” that a distance value “is mapped to a desired speed of travel to reach

² To the extent the recitation of “a speed adjustment factor” in each of proposed substitute claims 25 and 31 is ambiguous as to whether more than one factor is required in each of these claims, we address this below with respect to indefiniteness. *See infra* § II.B.2.

the target (e.g., greater speed desired for further distance and slower speed desired for shorter distance to allow more time for direction correction) and the length of the vector is based on the determined distance and/or speed.” Ex. ¶ 97. Regarding proposed substitute claim 31, the ’452 application discloses that “scaling the vector includes modifying a speed and/or acceleration associated with the vector as well as smoothing and limiting the rate of change associated with the vector.” *Id.* ¶ 98.

Finally, Petitioner contends, regarding proposed substitute claim 32, that there is “no showing of ‘speed adjustment factor’ and ‘direction adjustment factor.’” Opp. 2. This argument, however, is conclusory because it does not provide a persuasive explanation of why the ’452 application fails to support the limitations recited in proposed substitute claim 32. On the current record, and to the extent Petitioner’s argument is that there is no support in the ’452 application for an embodiment with both “a speed adjustment factor” (proposed substitute claim 21) and “a direction adjustment factor” (proposed substitute claim 32), we disagree. *See, e.g.*, Ex. 2019 ¶¶ 97 (“In some embodiments, the vector is at least in part defined using a distance and/or speed value”), 99 (“Modifying the speed and/or acceleration associated with the vector includes adjusting a factor used to control the speed and/or acceleration . . .”), 100 (“In some embodiments, the scaling the vector includes modifying one or more directional component values of the vector.”).

B. Unpatentability Arguments by Petitioner

Petitioner bears the ultimate burden to show that any proposed substitute claims are unpatentable. 37 C.F.R. § 42.121(d)(2). For the reasons discussed

below, at this stage of the proceeding, and based on the current record,³ it appears that Petitioner has shown a reasonable likelihood that proposed substitute claims 21–37 are unpatentable. *See* 37 C.F.R. § 42.121(e)(1).

1. Lack of Enablement

Petitioner contends the following terms, recited in various proposed substitute claims, lack enablement: “speed adjustment factor”; “a first robustness and a first compute cost”; “a second robustness and a second compute cost”; “a first robustness and a first refresh rate”; and “a second robustness and a second refresh rate.” Opp. 2–5. The arguments presented, however, do not make a bona fide effort to weigh each of the factors set forth in *In re Wands*, 858 F.2d 731 (Fed. Cir. 1988), which are required to assess enablement. Although Petitioner asserts that one of ordinary skill in the art “would be left guessing how these terms are determined,” and that there are “no working examples of how the terms are determined” (Opp. 4–5), there is no persuasive explanation as to why undue experimentation would be required, in view of the understanding that “[a] patent need not disclose what is well known in the art.” *Wands*, 858 F.2d at 735, 737.

Other arguments presented by Petitioner appear to rely on alleged shortcomings regarding indefiniteness or lack of written description support to show a lack of enablement. *See, e.g.*, Opp. 3 (“The claims and specification use the terms without explaining their meaning. [Patent Owner] cites to various specification portions to show alleged support, but they do not provide clarity as to meaning.”) (citation omitted), 5 (“[T]he lack of support means the specification does not teach how a [person of ordinary skill in the art] would have made and

³ We express no view on the patentability of original claims 1–20 in this Preliminary Guidance. Instead, we focus on limitations added to those claims in Patent Owner’s Motion.

used the full scope of the claims without undue experimentation.”). But these are separate issues, and even if Petitioner’s arguments on these issues were to prevail, this would not necessarily prove a lack of enablement.

Accordingly, at this stage, there is not a reasonable likelihood of Petitioner showing the proposed substitute claims lack enablement.

2. Indefiniteness

In post-grant proceedings the Board applies the indefiniteness standard set forth in *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898 (2014). See Memorandum: Approach to Indefiniteness Under 35 U.S.C. § 112 in AIA Post-Grant Proceedings (Jan. 6, 2021) (*available at* <https://www.uspto.gov/sites/default/files/documents/IndefinitenessMemo.pdf>). Under *Nautilus*, a claim is indefinite if fails to “inform those skilled in the art about the scope of the invention with reasonable certainty.” 572 U.S. at 910.

Petitioner contends proposed substitute claim 21 is indefinite because “[i]t is unclear whether (1) ‘detecting...a target in the image’ is performed ‘to identify a bounding box . . .’ and ‘to identify a classification’ or (2) ‘applying...a machine learning model to the image’ is performed ‘to identify a bounding box . . .’ and ‘to identify a classification.’” Opp. 5.

Petitioner also contends proposed substitute claims 21, 36, and 37 are indefinite because the terms “speed adjustment factor,” “first robustness,” “second robustness,” “first compute cost,” “second compute cost,” “first refresh rate,” and “second refresh rate” are ambiguous. Opp. 5–6.

For proposed substitute claims 21, 26, and 37, Petitioner relies on mere assertions without providing persuasive explanations as to why any of the terms identified above render the proposed substitute claims indefinite. See Opp. 5–6.

Accordingly, at this stage, we disagree with Petitioner that proposed substitute claims 21, 36, and 37 are indefinite.

Petitioner contends that proposed substitute claim 24 is indefinite for reciting “the machine leaning model.” Opp. 6; Mot., Claims App. To the extent Petitioner’s argument is that the typographical error here amounts to indefiniteness, we disagree, but Patent Owner may consider correcting the error in a revised motion.

Petitioner further contends that proposed substitute claims 25 and 31 are indefinite because each claim is “[u]nclear whether ‘speed adjustment factor’ . . . is the same or different from ‘speed adjustment factor’ in [substitute claim 21].” Opp. 6. As noted *supra*, § II.A.4, for purposes of this Preliminary Guidance, we interpret the “speed adjustment factor” limitations in proposed substitute claims 25 and 31 as further modifying the “speed adjustment factor” introduced in proposed substitute claim 21. At this stage, we are not persuaded, based on a reasonable likelihood, that Petitioner has shown proposed substitute claims 25 and 31 are indefinite. With the knowledge that consideration of the complete record might lead to a different conclusion, Patent Owner may consider clarifying the language in proposed claims 25 and 31 in a revised motion.

Finally, Petitioner asserts that proposed substitute claim 33 is indefinite for reciting “the direction adjustment factor,” which lacks antecedent basis. Opp. 6. We agree that proposed substitute claim 33 appears to be indefinite for this reason, because there is no longer an intervening dependent claim providing antecedent basis for this limitation. See Mot., Claims App.; see also *supra* n.1.

For these reasons, and on the current record, there is a reasonable likelihood that proposed substitute claim 33 is indefinite, but there is not a reasonable

likelihood of Petitioner showing the remaining proposed substitute claims (i.e., claims 21–32 and 34–37) are indefinite.

3. Obviousness

i. Ground 23—Obviousness over Beard, Laufer, Pierce, Khan, and Kumar

Petitioner contends proposed substitute claims 21–27, 29, 31–33, and 35 would have been obvious over the combination of Beard (Ex. 1009), Laufer (Ex. 1010), Pierce (Ex. 1005), Khan (Ex. 1021), and Kumar (Ex. 1007). Below, we focus on the limitations added in the Motion.

Proposed substitute claim 21 recites the following newly added limitations (underlined):

receiving at a processor at the reference aerial vehicle an image captured by an image sensor of the reference aerial vehicle;

detecting at the reference aerial vehicle a target in the image including by applying at the reference aerial vehicle a machine learning model to the image, to identify a bounding box outlining a portion of the image that includes detected features of the target, and to identify a classification of the detected target;

determining at the reference aerial vehicle a three-dimensional relative location of the target with respect to the reference aerial vehicle based on the image including by determining a distance to the target based at least in part on a size of the bounding box of the target detected within the image and on a physical size corresponding to the classification of the target detected within the image; and

performing at the reference aerial vehicle the flight control operation

Mot., Claims App.

For the newly added limitations in proposed substitute claim 21 in which functionality occurs “at the reference vehicle,” Petitioner asserts that Beard teaches an image processor aboard an unmanned aerial vehicle (“UAV”) that receives and

analyzes images. *See* Opp. 8–9 (citing Ex. 1009, 3:57–4:21, 7:13–53, Fig. 5), 11, 13.

For the newly added limitations of “identify[ing] a bounding box outlining a portion of the image that includes detected features of the target, and [] identify[ing] a classification of the detected target,” Petitioner relies on Pierce, Khan, and Kumar. *See* Opp. 9–11. Specifically, Petitioner asserts that Pierce teaches a drone with an “on-board object tracking module” that uses neural networks to “analyze the images ‘to identify and track the moving target’ and estimate its position and velocity.” *Id.* at 9 (quoting Ex. 1005 ¶ 45) (citing Ex. 1005 ¶¶ 27, 42, 44–46, Figs. 1, 6). Petitioner further asserts that Khan teaches determining features in images “located within a bounding box surrounding” a vehicle, and using a machine learning model “to determine a[] classification of vehicle type” based on the features. *Id.* (citing Ex. 1021 ¶ 3, 37–39, 44–63; Ex. 1030 ¶ 185). Petitioner also asserts that Kumar teaches “‘bounding boxes’ around objects of interest in an image are output by a neural network.” *Id.* at 9–10 (citing Ex. 1007 ¶¶ 2, 19; Ex. 1008 ¶¶ 1, 29; Ex. 1030 ¶ 186).

Finally, for the newly added limitations of “determining a distance to the target based at least in part on a size of the bounding box of the target detected within the image and on a physical size corresponding to the classification of the target detected within the image,” Petitioner relies on Beard, Kumar, and Khan. *See* Opp. 11–13. Specifically, relying on the testimony of its declarant, Dr. William Signhose, Petitioner asserts that Beard teaches the UAV image processor determines a distance to a target “based on pixel size of the target 118 . . . relative to that of the frame and specifically the area (i.e., the size) of bounding box 16 around a target.” *Id.* at 11–12 (quoting Ex. 1030 ¶ 191). Petitioner further asserts that “Kumar determines the relative position of a target to the camera

capturing the images based on the ‘known physical [bounding] box size of the object of interest’s type of object’ and the ‘physical length of the diagonal across the [bounding] box for an average instance of the object.’” *Id.* (citing Ex. 1007, ¶¶ 19–25, 37, Fig. 3A; Ex. 1008 ¶¶ 18–23, 32, claims 4, 5, 14, 15, 24, 25, Fig. 3A; Ex. 1003 ¶¶ 157–158). Petitioner also asserts that “Khan teaches classification of a target into a type.” *Id.* (citing Ex. 1021 ¶¶ 3, 37–39, 44–63, Figs. 7, 8).

Proposed substitute claim 24 recites the following newly added limitations (underlined):

wherein detecting the target in the image including by applying at the reference aerial vehicle the machine learning model to the image includes identifying a model type of the target based on the classification of the detected target.

Mot., Claims App.

Petitioner contends Kahn teaches the newly added limitations in proposed substitute claim 24 shown above, namely, that “Kahn teaches object classification into a model type.” Opp. 13 (citing Ex. 1021 ¶¶ 3, 37–39, 44–63, Figs. 7, 8).

Petitioner contends one of ordinary skill in the art would have combined Beard, Laufer, Khan, and Kumar for the various reasons previously presented in the Petition, and additionally would have combined Pierce with these references because this “would have been applying a known technique (drone having on-board object identification and tracking capabilities that use neural networks) to improve similar devices (drones that identify, track objects) in the same way, with the predictable result of Beard’s UAV performing on-board object identification and tracking using neural networks.” Opp. 8 (citing Ex. 1005 ¶¶ 27, 42, 44–46, Figs. 1, 6; Ex. 1030 ¶ 180).

For the reasons explained in the Opposition and highlighted above, at this stage, and based on the current record, we determine that Petitioner has shown a reasonable likelihood that proposed substitute claims 21–27, 29, 31–33, and 35 would have been obvious based on Beard, Laufer, Pierce, Khan, and Kumar.

- ii. Grounds 24–26—Obviousness over (24) Beard, Laufer, Malecki, Pierce, Khan, and Kumar; (25) Beard, Laufer, Sahasrabudhe, Pierce, Khan, and Kumar; and (26) Beard, Laufer, Hogasten, Pierce, Khan, and Kumar

Petitioner contends proposed substitute claims 28, 30, and 34 would have been obvious over the combinations proposed in Grounds 24–26, respectively. *See* Opp. 13–14. No additional new limitations are recited in proposed substitute claims 28, 30, or 34. Accordingly, for the reasons discussed above, at this stage, Petitioner has shown a reasonable likelihood that proposed substitute claims 28, 30, and 34 would have been obvious.

- iii. Ground 27—Obviousness over Beard, Laufer, Pierce, and Ning

Petitioner contends proposed substitute claim 36 would have been obvious over the combination of Beard, Laufer, Pierce, and Ning (Ex. 1034). Below, we focus on the limitations added in the Motion.

Proposed substitute claim 36 recites the following newly added limitations:

wherein the detecting of the target in the image is performed using a first neural network at a first robustness and a first compute cost, and the determining of the three-dimensional relative location of the target in the image comprises incrementally predicting the location of the target in the image using a second neural network at a second robustness and a second compute cost, the first robustness and the first compute cost being greater, respectively, than the second robustness and the second compute cost.

Mot., Claims App.

For the newly added limitations in proposed substitute claim 36 shown above, Petitioner relies on Beard and Ning. *See* Opp. 15–17. In particular, Petitioner asserts that “Ning discloses a [You Only Look Once (“YOLO”)] neural network” that performs “object location estimates based only on a current full image.” *Id.* at 15 (citing Ex. 1034, Abstract, 1:51–2:3, 2:35–57, 3:3–6, 4:38–54, 5:46–54, 6:15–43, 9:30–37, 9:61–10:32, 10:55–11:13, 12:55–13:2, Figs. 2, 8; Ex. 1036, 779–780, Figs. 1, 2; Ex. 1030 ¶ 210). Petitioner further asserts that “Ning teaches the LSTM [(long short-term memory)] neural network ‘refin[ing]’ its predicting and tracking of an object’s location, as well as repeating its predicting and tracking of object location, . . . thus teaching the object’s location is predicted *incrementally* as claimed.” *Id.* at 16–17 (citing Ex. 1034, 6:33–53, 6:59–8:33, Figs. 1, 4; Ex. 1030 ¶ 211). Petitioner clarifies that, in the proposed combination, Ning’s “YOLO neural network has ‘high robustness,’ ‘high cost’” and the “LSTM neural network has ‘medium robustness,’ ‘medium cost’ or ‘low robustness,’ ‘low cost.’” *Id.* at 17 (citing Ex. 1030 ¶ 212).

Petitioner contends one of ordinary skill in the art would have combined Beard, Laufer, and Pierce with “Ning’s teachings of performing object detection using a ‘You Only Look Once’ (YOLO) and object tracking using an LSTM neural network” because “Ning’s YOLO and LSTM neural networks provide ‘real time’ object detection and tracking that is ‘efficient yet accurate,’ [thereby] enhancing Beard’s object detection and tracking.” Opp. 14 (citing Ex. 1034, Abstract, 1:51–2:19, 2:35–3:17, 4:38–5:9, 5:46–54, 6:15–8:33, 8:41–9:4, 9:18–10:32, 10:55–11:13, 12:55–13:2, Figs. 2, 4–6, 8; Ex. 1030 ¶ 203). Moreover, Petitioner asserts that “using [Ning’s] YOLO was a known favorable solution application to object recognition and

tracking algorithms used by drones.” *Id.* (citing Ex. 1036, 779, 785–786; Ex. 1030 ¶ 203).

For the reasons explained in the Opposition and highlighted above, at this stage, and based on the current record, we determine that Petitioner has shown a reasonable likelihood that proposed substitute claim 36 would have been obvious based on Beard, Laufer, Pierce, and Ning.

iv. Ground 28—Obviousness over Beard, Laufer, Pierce, Park, and Redmon

Petitioner contends proposed substitute claim 37 would have been obvious over the combination of Beard, Laufer, Pierce, Park (Ex. 1035), and Redmon (Ex. 1036). Below, we focus on the limitations added in the Motion.

Proposed substitute claim 37 recites the following newly added limitations:

wherein the detecting of the target comprises: determining a confidence level for the detection of the target, and

using a first neural network having a first robustness and a first refresh rate, or a second neural network having a second robustness and a second refresh rate, the first robustness being greater than the second robustness and the first refresh rate being smaller than the second refresh rate, and

wherein the first neural network is used when the confidence level is below a given threshold and the second neural network is used when the confidence level is above the given threshold.

Mot., Claims App.

For the newly added limitations in proposed substitute claim 37 shown above, Petitioner relies on (1) “Park’s teachings of using a ‘little’ and big’ system architecture that determines whether to use a low energy or high energy object detection model based on detection accuracy of the low energy model using a score margin,” and (2) “Redmon’s teachings of using a base YOLO neural network as a high energy detection model and fast YOLO

neural network as a low energy detection model.” Opp. 17–18 (citing Ex. 1035, 134–131; Ex. 1036, Abstract, 779–783, 786; Ex. 1030 ¶¶ 213–214).

Petitioner contends one of ordinary skill in the art would have combined Beard, Laufer, and Pierce with Park and Redmon because “their teachings provide energy efficiency and accuracy, as well as fast object detection.” Opp. 18 (citing Ex. 1035, Abstract, 124–126; Ex. 1036, 785–786; Ex. 1030 ¶ 214). Appellant also asserts that there would have been a reasonable expectation of success in making this proposed combination because “the implementation details of Park and Redmon were well known in the art.” *Id.*

For the reasons explained in the Opposition and highlighted above, at this stage, and based on the current record, we determine that Petitioner has shown a reasonable likelihood that proposed substitute claim 37 would have been obvious based on Beard, Laufer, Pierce, Park, and Redmon.

v. Ground 29—Obviousness over Pierce, Kumar, Khan, and Beard

Petitioner contends proposed substitute claims 21, 23–26, and 32 would have been obvious over the combination of Pierce, Kumar, Khan, and Beard, for reasons overlapping with those presented for Ground 23. *See* Opp. 20–23. The main difference in this ground and Ground 23 applies to proposed substitute claim 21. Notably, Petitioner relies on a modification of Pierce’s on-board object tracking module, in view of Khan and Kumar, rather than Beard’s image processor. *See id.* For similar reasons as for Ground 23, at this stage, it appears Petitioner has shown a reasonable likelihood that proposed substitute claims 21, 23–26, and 32 would have been obvious over Pierce, Kumar, Khan, and Beard.

- vi. Grounds 30 and 31—Obviousness over (30) Pierce, Kumar, Khan, Beard, and Laufer; and (31) Pierce, Kumar, Khan, Beard, and Hogasten

Petitioner contends proposed substitute claims 22, 29, and 35 would have been obvious over the combination proposed in Ground 30, and proposed substitute claim 34 would have been obvious over the combination proposed in Ground 31. *See* Opp. 23. No additional new limitations are recited in proposed substitute claims 22, 29, 34, or 35. Accordingly, for the reasons discussed above, at this stage, Petitioner has shown a reasonable likelihood that proposed substitute claims 22, 29, 34, and 35 would have been obvious.

- vii. Ground 32—Obviousness over Pierce, Kumar, Ning, and Beard

Petitioner contends proposed substitute claim 36 would have been obvious over the combination of Pierce, Kumar, Ning, and Beard, for reasons overlapping with those presented for Ground 27. *See* Opp. 23–24. The main difference in this ground and Ground 27 is Petitioner’s primary reliance on Pierce, rather than Beard. *See id.* For similar reasons as for Ground 27, at this stage, it appears Petitioner has shown a reasonable likelihood that proposed substitute claim 36 would have been obvious over Pierce, Kumar, Ning, and Beard.

- viii. Ground 33—Obviousness over Pierce, Kumar, Park, Redmon, and Beard

Petitioner contends proposed substitute claim 37 would have been obvious over the combination of Pierce, Kumar, Park, Redmon, and Beard, for reasons overlapping with those presented for Ground 28. *See* Opp. 24–25. The main difference in this ground and Ground 28 is Petitioner’s primary reliance on Pierce, rather than Beard. *See id.* For similar reasons as for Ground 28, at this stage, it

appears Petitioner has shown a reasonable likelihood that proposed substitute claim 37 would have been obvious over Pierce, Kumar, Park, Redmon, and Beard.

- ix. Grounds 34–38—Obviousness over (34) Pierce, Khan, Kumar, Beard, and Sahasrabudhe; (35) Pierce, Khan, Kumar, Beard, Sahasrabudhe, and Laufer; (36) Pierce, Khan, Kumar, Beard, Sahasrabudhe, and Hogasten; (37) Pierce, Kumar, Sahasrabudhe, and Ning; and (38) Pierce, Kumar, Sahasrabudhe, Park, and Redmon

Petitioner contends proposed substitute claims 21–26, 29, and 31–37 would have obvious over the various respective combinations presented in Grounds 34–38. *See* Opp. 25. For these grounds, Petitioner relies on the same contentions provided for the numbered grounds discussed above. *See id.* For similar reasons already discussed, at this stage, it appears Petitioner has shown a reasonable likelihood that proposed substitute claims 21–26, 29, and 31–37 would have been obvious as specified in Grounds 34–38.

III.CONCLUSION

This concludes our Preliminary Guidance. Patent Owner has the option to reply to this Preliminary Guidance *or* to file a revised MTA by DUE DATE 3. 37 C.F.R. § 42.121(e)(3), (f); Paper 17, 10–11, 13. Patent Owner’s reply or revised MTA may only respond to this Preliminary Guidance or Petitioner’s Opposition and may be accompanied by new evidence (including declarations). 37 C.F.R. § 42.121(e)(3). Petitioner has the option to file a sur-reply responsive to this Preliminary Guidance, Patent Owner’s reply, or Patent Owner’s revised MTA but may not present new evidence in any case. 37 C.F.R. § 42.121(e)(3). Petitioner may also file a reply to the preliminary guidance in the case Patent Owner does not file a reply or revised MTA. 37 C.F.R. § 42.121(e)(4).

In addition, Patent Owner is reminded that amendments of the challenged claims may also be pursued in a separate reissue or reexamination proceeding before, during, or after an *inter partes* review proceeding, including subsequent to the issuance of the Final Written Decision. We draw Patent Owner's attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. See 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. See 37 C.F.R. § 42.8(a)(3), (b)(2).

IPR2025-00629

Patent 10,514,711 B2

FOR PETITIONER:

Chad Walters

Harrison Rich

Joseph Grado

Ellyar Barazesh

BAKER BOTTS L.L.P.

chad.walters@bakerbotts.com

harrison.rich@bakerbotts.com

andrew.grado@bakerbotts.com

ellyar.barazesh@bakerbotts.com

Nicholas Matich

Christopher Leone

McKOOL SMITH, P.C.

nmatich@mckoolsmith.com

cleone@mckoolsmith.com

FOR PATENT OWNER:

Suhrid Wadekar

Matthew Vella

James Hall

PRINCE LOBEL TYE LLP

swadekar@princelobel.com

mvella@vellapatentservices.com

jhall@princelobel.com