

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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SAMSARA INC.,  
Petitioner,

v.

MOTIVE TECHNOLOGIES, INC.,  
Patent Owner.

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IPR2025-00574  
Patent 11,875,580 B2

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Before JUSTIN T. ARBES, BETH Z. SHAW, and DANIEL J. GALLIGAN,  
*Administrative Patent Judges.*

SHAW, *Administrative Patent Judge.*

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

## I. INTRODUCTION

Samsara Inc. (“Petitioner”) filed a Petition pursuant to 35 U.S.C. § 311 requesting institution of *inter partes* review of claims 1–7 of U.S. Patent No. 11,875,580 B2 (Ex. 1001; “the ’580 patent”). Paper 2 (“Pet.”). Motive Technologies, Inc. (“Patent Owner”) timely filed a Patent Owner Preliminary Response. Paper 9 (“Prelim. Resp.”). We authorized Petitioner to file a Preliminary Reply to address Patent Owner’s arguments about incorporation by reference. Paper 10 (“Prelim. Reply”). We authorized Patent Owner to file a Preliminary Sur-reply. Paper 11 (“Prelim. Sur-reply”).

To institute an *inter partes* review, we must determine “that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” 35 U.S.C. § 314(a).

For the reasons that follow, we grant institution of *inter partes* review.

### A. *Related Matters*

According to the parties, the challenged patent has been asserted in *Motive Technolgies, Inc. v. Samsara, Inc.*, No. 3:24-cv-00902 (N.D. Cal. Feb. 15, 2024). Pet. 78; Paper 7, 2 (Mandatory Notices).

### B. *The ’580 Patent*

The ’580 patent, titled “Camera Initialization for Lane Detection and Distance Estimation Using Single-View Geometry,” is directed to detecting lanes and objects in image frames. Ex. 1001, Abstr. The ’580 patent describes embodiments for “using a monocular camera (e.g., an image sensor) that may be retrofitted and adjustable within the vehicle such as, the vehicle’s dashboard.” *Id.* at 1:21–23.

### C. *Illustrative Claim*

Independent claim 1 and dependent claims 2–7 are the challenged

claims. Claim 1, reproduced below with Petitioner's identifiers for the claim limitations in bold (*see* Pet. 24–33), illustrates the claimed subject matter:

**[1Pre]** A method comprising:

**[1A]** receiving, over a network from a camera device, a video comprising a set of image frames;

**[1B]** identifying one or more lines in the video using a predictive model, the one or more lines including a horizon line;

**[1C]** computing at least one camera parameter based on the one or more lines;

**[1D]** overlaying the one or more lines on the video to generate an overlaid video;

**[1E]** transmitting the overlaid video to an annotator device for manual review;

**[1F]** receiving a confirmation from the annotator device, the confirmation indicating that the one or more lines are accurate;

**[1G]** transmitting data representing the at least one camera parameter to the camera device.

Ex. 1001, 20:2–18.

*D. Asserted Grounds of Unpatentability*

Petitioner asserts claims 1–7 are unpatentable on the following

Grounds:

Ground	Claims Challenged	35 U.S.C. §	Reference(s)/ Basis
1	1–4	103 <sup>1</sup>	Choe <sup>2</sup>
2	1–5	103	Choe, Khan, <sup>3</sup> Ali <sup>4</sup>
3	1–4	103	Choe, Workman <sup>5</sup>
4	5–7	103	Choe, Westmacot <sup>6</sup>
5	1–7	103	Choe, Westmacot, Khan, Ali
6	1–7	103	Choe, Westmacot, Workman

Pet. 10. Petitioner filed a declaration of Trevor J. Darrell, Ph.D. in support of the Petition. Ex. 1003.

## II. 35 U.S.C. § 314(a)

On May 22, 2025, this case was referred to the panel to consider the merits and non-discretionary considerations. Paper 8.

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<sup>1</sup> The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) (“AIA”) includes revisions to 35 U.S.C. §§ 102, 103 that became effective before the filing date of the application that led to issuance of the challenged patent. Hence, this *inter partes* review is governed by the AIA provisions of 35 U.S.C. §§ 102, 103.

<sup>2</sup> US 2020/0410704 A1, filed June 28, 2019, published December 31, 2020 (Ex. 1005, “Choe”).

<sup>3</sup> Khan *et al.*, “Lane Detection Using Lane Boundary Marker Network with Road Geometry Constraints” (2020) (Ex. 1007, “Khan”).

<sup>4</sup> Ali *et al.*, “Real-Time Vehicle Distance Estimation using Single View Geometry” (2020) (Ex. 1008, “Ali”).

<sup>5</sup> Workman *et al.*, “Horizon Lines in the Wild” (2016) (Ex. 1011, “Workman”).

<sup>6</sup> WO 2019/175286 A1, published Sept. 19, 2019 (Ex. 1010, “Westmacot”).

### III. MERITS

#### A. *Level of Ordinary Skill in the Art*

Petitioner states that a person of ordinary skill in the art (“POSITA”) “would have had a Bachelor’s in Computer Science with a focus on computer/machine vision, and at least two years of experience with each of: (1) machine learning (including neural network) methods as applied to machine/computer vision and (2) classical machine/computer vision algorithms (e.g., edge detection, line identification, computation of camera parameters from horizon line, etc.)” and that additional education “could serve as a substitute for the experience requirement.” Pet. 7–8 (citing Ex. 1003 ¶ 77). Patent Owner disagrees with Petitioner’s definition and asserts that a POSITA “would have a bachelor’s degree in engineering or computer science with one- or two-years training and/or experience in design of software for camera/sensor systems in the automotive industry.” Prelim. Resp. 12 (citing Ex. 2003 (Declaration of Scott Andrews) ¶ 35).

We determine that no express finding is necessary, on the present record, and that the level of ordinary skill in the art is reflected by the prior art of record. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001); *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995); *In re Oelrich*, 579 F.2d 86, 91 (CCPA 1978). The difference in how each party characterizes a POSITA’s work experience does not change our analysis or conclusions based on the present record. Should the parties continue to disagree regarding the level of ordinary skill in the art during trial, we encourage the parties to explain how an automotive-focused definition, or

the lack thereof, would affect any obviousness analysis in our final written decision.

*B. Asserted Obviousness of Claims 1–4 over Choe (Ground 1) and Choe and Workman (Ground 3)*

Petitioner argues that independent claim 1 and dependent claims 2–4 of the '574 patent are rendered obvious by Choe alone (Ground 1), and Choe and Workman (Ground 3), under 35 U.S.C. § 103. Pet. 24–35, 47–51 (citing Exs. 1005, 1011).

*1. Choe (Ex. 1005)*

Choe discloses “calibrating a sensor system of an autonomous driving vehicle.” Ex. 1005 ¶ 1; Pet. 10. Choe describes “still cameras and/or video cameras.” Ex. 1005 ¶ 22.

After receiving an image, Choe determines horizon line and lane lines. *Id.* ¶¶ 15, 16. “[A] horizon line is determined based on the camera’s hardware settings.” *Id.* ¶ 15. Additionally, “[o]ne or more lane lines are determined based on the first image via a perception process performed on the first image.” *Id.* ¶¶ 15, 56, 59, FIG. 7.

Choe describes superimposing lines for the horizon line and lane lines on the image. *Id.* ¶¶ 16, 50. After determining the horizon line within a video frame, the horizon line is superimposed on the frame. *Id.* ¶ 50. Then, “a second image is rendered” that “includes the lane lines superimposed thereon.” *Id.*

We reproduce below Petitioner’s annotated version of a portion of Choe Figure 6A:



EX1006, FIG. 6A (excerpt, annotated); EX1005, FIG. 6A.

Pet. 29. In Figure 6A, “horizon line 610 is determined and placed on a location within image 601.” Ex. 1005 ¶ 55; *see also id.* ¶¶ 15, 16, 46, 56, 57. In the annotated version above, Petitioner includes a red circle around label 610 with a caption reading “horizon line 610” to identify the horizon line.

## 2. *Workman (Ex. 1011)*

Workman describes that “[s]ingle image horizon line estimation is one of the most fundamental geometric problems in computer vision.” Ex. 1011, 1. Workman proposes to use a convolutional neural network (“CNN”) to directly estimate a horizon line. *Id.*

We reproduce Workman Figure 5:



Figure 5 shows a “ground truth horizontal line (green dash) and the predicted horizontal line (magenta).” Ex. 1011, 9.

### 3. *Choe and Workman (Ground 3)*

Petitioner asserts that the combination of Choe and Workman (Ground 3) teaches all the elements of claim 1. Pet. 24–35, 47–51 (citing Ex. 1005, 1011). Petitioner relies on Dr. Darrell’s Declaration testimony to support its arguments that the combination of Choe and Workman renders obvious independent claim 1. *See* Ex. 1003.

Patent Owner argues that Choe does not teach or suggest the use of “predictive models” in “identifying one or more lines in the video . . . , the one or more lines including a horizon line,” as required by claim 1. Prelim. Resp. 1. Patent Owner also argues that “Workman does not mention any automotive systems or initialization of dash-cam or automotive sensor systems as a relevant field or application of its experimental approach.” *Id.* at 21 (citing Ex. 2003 ¶ 71).

For the reasons explained below, we determine that Petitioner has demonstrated a reasonable likelihood of prevailing on its asserted challenge to claim 1 based on the combination of Choe and Workman.

- a. ***Limitation [1B]: “identifying one or more lines in the video using a predictive model, the one or more lines including a horizon line”***

As a preliminary matter, neither party has proposed any explicit claim construction of “predictive model.” To the extent the meaning of this term impacts the patentability analysis during trial, the parties should address the term’s construction.

Petitioner asserts that Choe discloses limitation [1B] because Choe’s method “identif[ies] one or more lines . . . including a horizon line.” Pet. 27 (citing Ex. 1003 ¶ 91.) Choe explains: “[I]n response to a first image captured by a camera of an [autonomous driving vehicle (ADV)], *a horizon line is determined* based on the camera’s hardware settings.” Ex. 1005 ¶ 15 (emphasis added), *quoted in* Pet. 27; *see* Pet. 27 (citing Ex. 1005 ¶¶ 15, 45, 48, 55, 59, Fig. 7). Additionally, “[o]ne or more lane lines are determined based on the first image via a perception process performed on the first image.” Ex. 1005 ¶ 15 (emphasis added), *quoted in* Pet. 27.

The initial horizon and lane lines are identified in Choe, according to Petitioner, “using a predictive model.” Pet. 27 (citing Ex. 1003 ¶¶ 93–96.) Petitioner asserts that Choe states that it uses a “machine learning engine 122 [that] generates or trains a set of rules algorithms, *and/or predictive models 124* for a variety of purposes.” *Id.* (quoting Ex. 1005 ¶ 30). Petitioner asserts that one of these purposes is camera calibration: “Algorithms 124 may further include sensor calibration algorithms . . . .” *Id.* (quoting Ex. 1005 ¶ 30; citing Ex. 1005, Fig. 1). These sensor calibration algorithms/models, according to Petitioner, predict the initial horizon line before manual calibration. *Id.* (citing Ex. 1005 ¶¶ 15, 59; Ex. 1003 ¶¶ 93–94). Petitioner asserts that “[a]fter the initial horizon line is predicted with a

predictive model 124, the result is then identified again and used by additional predictive models.” *Id.* at 27–28 (citing Ex. 1005 ¶ 45 (“The result of the perception processing can be utilized by other modules such as prediction module 303 . . . .”)); Ex. 1003 ¶ 94.

Workman also discloses predictive models to identify the horizon line, according to Petitioner. Pet. 47 (citing Ex. 1003 ¶ 146). Petitioner argues that a person of skill in the art “would have known *how* and *why* to use Workman’s predictive models to identify the horizon lines in Choe with an expectation of success because the combination achieved state-of-the-art results.” *Id.* at 47–48 (citing Ex. 1011, 1, 2, 8–10; Ex. 1003 ¶ 147). A person of skill in the art, according to Petitioner, “would have known *how* and *why* to use Workman’s predictive models to identify the horizon lines in Choe with an expectation of success also because it identifies the horizon line faster than other models.” *Id.* at 48 (citing Ex. 1011, 1, 2, 10; Ex. 1003 ¶¶ 148–150).

Petitioner asserts that “[u]sing Workman’s model to identify the horizon line would also have been a combination of known elements (CNNs and annotation for camera calibration) according to known methods to yield predictable results and used known techniques (CNNs) to improve similar devices in the same way.” Pet. 48–49 (citing Ex. 1003 ¶ 150). Because these models were well known, Petitioner asserts, a person of skill in the art would have had a reasonable expectation of success in combining the teachings of Choe and Workman to achieve the method of claim 1. *Id.* at 49 (citing Ex. 1003 ¶ 150).

Patent Owner argues that the “predictive models 124” of Choe are based on “driving statistics 123” and are used for sensor calibration “to

determine a set of calibration parameters.” Prelim. Resp. 15 (citing Ex. 2003 ¶ 46). Patent Owner argues that nothing “in Choe teaches or suggests ‘identifying one or more lines in the video *using a predictive model*, the one or more lines including a horizon line.’” *Id.* at 15–16 (emphasis in original) (citing Ex. 2003 ¶ 46).

Patent Owner also argues that “Workman does not mention any automotive systems or initialization of dash-cam or automotive sensor systems as a relevant field or application of its experimental approach.” Prelim. Resp. 21 (citing Ex. 2003 ¶ 71), 28, 31. Patent Owner argues that there is no reason but hindsight to combine Choe and Workman. *Id.* at 28. In particular, Patent Owner argues that “[s]imply disclosing the use of driving-statistics-based predictive models used to calibrate sensors with calibration parameters [in Choe] does not motivate a POSITA to look for image-trained predictive models to identify horizon lines [in Workman].” *Id.* at 29 (citing Ex. 2003 ¶ 74). “There is simply nothing in Choe to motivate a POSITA to look for other references discussing the use of image-trained predictive models, much less for the different purpose of identifying a horizon line,” according to Patent Owner. *Id.* (quoting Ex. 2003 ¶ 74).

Apart from identifying one or more lines in a video, claim 1 does not limit a “predictive model” in any way. With this understanding of the claim, we preliminarily agree with Petitioner that Workman teaches limitation [1B] because at least pages 1–2 and Figure 5 of Workman describe estimating a horizon line using a convolutional neural network. Ex. 1011, 1–2, Fig. 5.

For purposes of institution, we find sufficient Dr. Darrell’s testimony that a person of ordinary skill in the art would have been motivated to combine Choe and Workman because Workman discloses predictive models

to identify the horizon line (Ex. 1003 ¶ 146), and additionally, because using Workman’s model to identify the horizon line would have been combining known elements (CNNs and annotation for camera calibration) according to known methods to yield predictable results and used known techniques (CNNs) to improve similar devices in the same way. Pet. 48 (citing Ex. 1003 ¶ 150). We find sufficient for institution Dr. Darrell’s testimony that because these models were well known, a person of skill in the art would have had a reasonable expectation of success in combining the teachings of Choe and Workman to achieve the method of claim 1. *Id.* at 49 (citing Ex. 1003 ¶ 150). We have reviewed Mr. Andrews’s testimony to the contrary (Ex. 2003 ¶¶ 71–80) but, at this stage, do not find it persuasive. For example, to the extent Patent Owner and Mr. Andrews assert that Choe does not identify any “shortcomings” that would motivate a POSITA to look for a better approach like that of Workman (*see* Prelim. Resp. 29; Ex. 2003 ¶ 74), we note that it is “not necessary to show that a combination is ‘the *best* option, only that it be a *suitable* option,’” and “if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill,” *Intel Corp. v. Qualcomm Inc.*, 21 F.4th 784, 800 (Fed. Cir. 2021) (citations omitted).

Thus, at this stage and on this record, we preliminarily agree that the combination of Choe and Workman teaches the subject matter of limitation [1B] sufficiently to meet Petitioner’s burden on institution.

b. *Remaining Limitations of Claim 1*

Apart from the arguments discussed above, Patent Owner does not present arguments specifically directed to the other limitations of claim 1

with respect to Choe and Workman. *See* Prelim. Resp. 21–25, 28–33. We determine that Petitioner’s arguments made in connection with those limitations are sufficient at this stage and on this record.

c. *Determination for Claim 1*

For the reasons discussed above, we find that the Petition establishes a reasonable likelihood that Petitioner would prevail with respect to claim 1 based on the combination of Choe and Workman.

4. *Remaining Claims*

Apart from the arguments discussed above, Patent Owner does not present arguments specifically directed to the other challenged claims 2–4. *See* Prelim. Resp. 28–34. On this record, we disagree with Patent Owner’s arguments with respect to claim 1 and are persuaded that Petitioner has shown a reasonable likelihood of prevailing on its assertion that claim 1 is unpatentable over Choe and Workman. Accordingly, we need not determine at this time whether Petitioner also has shown a reasonable likelihood of prevailing as to any of the other challenged claims or as to the asserted ground based on Choe alone. *See* 37 C.F.R. § 42.108(a).

C. *Asserted Obviousness of Various Combinations of Claims 1–7 Based on Grounds 2, 5, and 6*

At this point in the proceeding, Patent Owner does not make separate arguments for Grounds 5 and 6. *See* Prelim. Resp. 12–35.

1. *Khan (Ex. 1007)*

Khan discloses “a lane boundary marker network to detect keypoints along . . . lane boundaries.” Ex. 1007, 1823. Figure 1 of Khan is reproduced below:

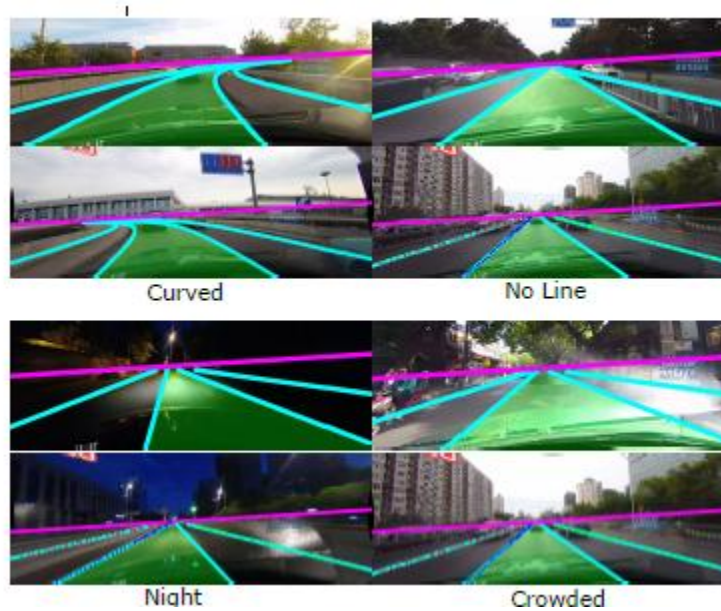


Figure 1 of Khan shows “[c]yan lines are the detected lane boundaries, green region represents the ego lane and magenta line displays the estimated horizon.” Ex. 1007, 1823. Khan uses a known predictive model called “Mask-RCNN” to identify the lane lines. *Id.* at 1825. Khan describes that the horizon is detected based on the lane lines and states that the horizon prediction algorithm is disclosed in *Ali*. *Id.* at 1827 (citing Ex. 1008).

## 2. *Ali (Ex. 1008)*

*Ali* explains that “[d]istance estimation is required for advanced driver assistance systems” and that it “uses geometric features of . . . road lane markings for distance estimation.” Ex. 1008, 1100. *Ali* cites to *Khan* to describe how it estimates lane lines. *Id.* at 1102. *Ali* describes how it uses the lane lines to estimate a horizon line. *Id.* at 1102, Fig. 2.

3. *Claims 1–5: Ground 2 (Choe, Khan, Ali)*

Petitioner asserts that Khan and Ali disclose predictive models for horizon and lane detection. Pet. 36. Petitioner relies on the combination of Choe, Khan, and Ali as allegedly teaching the “using a predictive model” limitation of claim 1 and the additional limitation of dependent claim 5. *Id.* at 41–46. Patent Owner argues “Khan does not mention or suggest using Mask-RCNN to identify a **horizon** line in video.” Prelim. Resp. 25 (citing Ex. 2003 ¶ 64). Patent Owner agrees that the “Petition is correct in that Khan cites Ali (Ex. 1008) with respect to the determination of the horizon line.” Prelim. Resp. 26 (citing Pet. 41). But, Patent Owner argues, “Ali does not describe the use of a predictive model to identify the horizon line. Instead, Ali describes a geometric approach expressly distinguished in the ’580 [p]atent.” *Id.* (citing Ex. 2003 ¶¶ 67–69).

Apart from identifying one or more lines in the video, claim 1 does not limit a “predictive model” in any way. With this understanding of the claim, we preliminarily agree with Petitioner that the combination of Choe, Khan, and Ali teach “identifying one or more lines in the video using a predictive model, the one or more lines including a horizon line,” because Ali describes a specific horizon estimation algorithm, and Khan states “we use [Ali’s] horizon estimation algorithm to find the best fitting horizon  $l_h$ .” Ex. 1007, 1827.

At this preliminary stage, we find sufficient Dr. Darrell’s testimony that a person of ordinary skill in the art would have been motivated to combine Khan, Ali, and Choe to arrive at the method of claim 1 because a person of ordinary skill in the art would have understood that Khan’s predictive models would have been compatible with Choe, and because

predictive models such as the ones in Khan were well known, a person of ordinary skill in the art would have had a reasonable expectation of success when combining Khan's predictive models with Choe's system. Ex. 1003 ¶ 124. Additionally, we find persuasive, on this preliminary record, Dr. Darrell's testimony that a person of ordinary skill in the art would have also been motivated to use Ali's horizon estimation algorithm with Choe and Khan at least because Khan states that it uses Ali's horizon estimation algorithm to find the best horizon line. *Id.* ¶ 125.

Apart from the arguments discussed above, Patent Owner does not present arguments specifically directed to the other limitations of claims 1–5. *See* Prelim. Resp. 25–28.

#### IV. CONCLUSION

For the foregoing reasons, we determine Petitioner has established a reasonable likelihood of prevailing in its challenge to the patentability of at least one claim in the '580 patent, and we institute *inter partes* review of all challenged claims on all grounds.

At this stage of the proceeding, the Board has not made a final determination as to the patentability of any challenged claims or any underlying factual or legal issues. A final determination will be made based on the record as developed during the *inter partes* review.

#### V. ORDER

In consideration of the foregoing, it is hereby

ORDERED that, pursuant to 35 U.S.C. § 314(a), an *inter partes* review of claims 1–7 of the '580 patent is instituted with respect to all

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grounds set forth in the Petition; and

FURTHER ORDERED that, pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4(b), *inter partes* review of the '580 patent shall commence on the entry date of this Order, 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.

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