

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSARA, INC.

Petitioner

v.

MOTIVE TECHNOLOGIES, INC.,

Patent Owner.

Case IPR2025-00574

U.S. Patent No. 11,875,580

PATENT OWNER'S RESPONSE

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Ex. No.	Description
2001	U.S. Patent No. 11,798,187, “Lane detection and distance estimation using single-view geometry” (Oct. 24, 2023)
2002	Provisional Application No. 62/975,360, filed on Feb. 12, 2020
2003	Declaration of Scott Andrews (Revised)
2004	Declaration of Hector Ribera

Motive Technologies, Inc. (“Patent Owner”) respectfully submits this Patent Owner Response to Samsara, Inc.’s (“Petitioner”) IPR Petition for cancellation of claims 1-7 (“Challenged Claims”) of U. S. Patent No. 11,875,580 (“the ’580 Patent”). In this Response, Patent Owner addresses the preliminary findings from the Board’s Decision Granting Institution of *Inter Partes* Review 35 U.S.C. § 314. Paper No. 12 (“I.D.”).

I. INTRODUCTION

Grounds 1-6 rely on an incorrect interpretation of the Choe et al. (Ex_1005) base reference for obviousness combinations. Petitioner alleges that Choe teaches the use of “predictive models” to “predict the initial horizon line.” *See, e.g.*, Pet. at 27. It does not. The only discussion related to predictive models in Choe relates the use of “driving statistics” to generate algorithms used “to determine a set of calibration parameters,” not to identify lines in a video. *See* Ex_1005, ¶¶ [0030] and [0044]. Because Petitioner relies on this incorrect interpretation of Choe in all the asserted grounds, and Choe alone or in the improper combinations proposed in the Petition does not teach or suggest all the limitations of any of the Challenged Claims, Petitioner fails to meet its burden of proving unpatentability of any Challenged Claim. *See* 35 U.S.C. § 316(e).

II. BACKGROUND

A. The '580 Patent

The inventors of the '580 Patent found a problem with prior art automotive systems for detecting objects on the road, which required use of “[m]ultiple cameras or sensors [that] may be installed in a vehicle to detect objects.”

Ex_1001, 1:10-11. The problem was that “use of multiple cameras” or proximity sensors “such as Radar and Lidar” was too expensive. *Id.* at 1:11-14. Instead, monocular cameras could provide a more cost-effective approach, but their use “require[d] the location of the camera to be predefined or preset.” *Id.* at 14-16.

To address these deficiencies, the '580 Patent describes various examples 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. To increase ease of use and avoid the need to have a predefined or preset camera location, the invention provides for “initializing such a camera onboard a vehicle.” *Id.* at 1:28-29. “Upon driving, the camera initializes itself to determine its height with respect to the ground as well as a road plane normal. Thus, the camera may be installed in various positions and later re-initialized or recalibrated as needed.” *Id.* at 1:24-27.

The Challenged Claims are directed to a method that may, for example, be used to provide “a network-based initialization system.” *See, e.g., id.* at 1:36-52.

For example, the specification describes:

[A] server-side system receives a video comprising a set of image frames and identifies one or more lines in the video using a predictive model (e.g., a convolutional neural network). In one embodiment, the lines can include a horizon line. After identifying the horizon line, the system computes some camera parameters (e.g., height, viewing angle, road plane normal, etc.) based on the horizon line. The system then overlays the computed horizon line on the video and transmits it to an annotator device for manual review. In response, the annotator device can transmit a confirmation indicating the horizon line was accurate. In some embodiments, the annotator device can reject the horizon line and manually add the horizon line. Once the horizon line is confirmed, the system returns the camera parameters to the calling party (e.g., a camera onboard a vehicle).

Id. The inventors realized that a network-based camera initialization service could be implemented to provide a robust approach to initializing dash-cams in a reliable way using “a remote computing device executing the camera initialization service 232,” for example, “an application running on a remote server.” *See, e.g., id.* at 5:13-20.

The specification explains that the disclosed “[s]ystems can use the illustrated neural network in some embodiments **instead of a geometric process** to

determine lane and horizon lines.” *Id.* at 7:14-16.¹ As explained in more detail below, these embodiments use “predictive models” without a geometric process, as distinct from some prior art systems that rely on geometry. “Specifically, given an input image 302 (e.g., a video frame), a backbone network 304 can convolve the input image 302 to generate a set of intermediate features (not illustrated).” *Id.* at 7:16-19. The specification provides a lane-horizon marking head 306 that can comprise “a CNN configured to process images and output a sequence of points representing the horizon and/or lane lines.” *Id.* at 7:24-27. It also provides many examples of CNN technologies that may be used with the invention, such as, “a fully convolutional network (FCN) that includes a plurality of convolutional blocks where each block can include one or more convolution, batch normalization, activation and up-sampling layers ... FCN can also be a network comprising, or based on, Unet, DeepLab, PSPNet, SCNN or EnetSAD architectures ... [and] can include a neck module that further processes backbone features to detect markers on fine-grain scale.” *Id.* at 7:27-36. Notably, “the neural network is trained to predict lane **and horizon** key points 308.” *Id.* at 8:7-8. The neural network training is based on the processing of images with ground truth image labels to “compute a prediction loss.” *See, e.g., id.* at 9:60-10:58; *see also*, FIG. 4A-4B.

¹ All emphasis added unless otherwise noted.

Using “predictive models” in “identifying one or more lines in the video ... including a horizon line” is a key aspect of the Challenged Claims. The specification explains that “the model of FIG. 3A can provide advantages over the offline process of FIG. 2.” *Id.* at 8:37-39. “For example, the use of the neural network can relax constraints that the vehicle needs to be driving on a highway having three or more lane lines. Indeed, just two lane-lines with a known lane-width would be sufficient for camera initialization. That is, since the model is **capable of predicting the horizon line directly**, previous requirements of having three lane lines in frame (e.g., to **geometrically** calculate a horizon line) can be relaxed.” *Id.* at 8:39-46.

B. Prosecution History

Given the novelty of the invention, the Examiner’s prior art search did not turn up any references applicable to claims 4 and 6-7; the sole Office Action issued by the Examiner noted that claims 4 and 6-7, among others, “would be allowable if rewritten in independent form.” *See* Ex_1002, p.0136. Claims 1-3 and 5 (among others) were rejected as obvious over KWANT1 (U.S. Pub. No. 2019/0034740) and KWANT2 (U.S. Pub. No. 2019/0102674 A1). *Id.* at 0131; *see also* Ex_1057 and Ex_1058.

With respect to [1B], the Examiner cited KWANT1’s paragraph 46: “the output of a lane feature detection process include lane models representing the

detected lanes or features, and associated prediction confidence values indicating a probability that the processed features of the input image are predictive of the detected lane features.” *Id.*, 0131. Specifically, as to the “horizon line,” the Examiner quoted the Abstract: “determining a horizontal line in the image at which a maximum number of the one or more extended road lanes crosses over a minimum horizontal extent of the horizontal line.” *Id.*

The Response did not amend claims. *Id.* at 0138-0149. Instead, with respect to claim 1, the applicants traversed the rejection and explained why KWANT1 failed to teach or suggest the “predicting a horizon line” step required by claim 1. *Id.* at 0145. Specifically, the applicants explained:

KWANT1 does not disclose using a predictive model to detect a horizon line. Instead, KWANT1 describes predicting lane lines. KWANT1 then describes extending these lane lines and, using a geometric approach, identifying the horizon line. KWANT1 only describes using predictive modeling to predict lane lines. Thus, KWANT1 does not describe predicting a horizon line as claimed.

Id. at 0145-0146. In response the Examiner allowed the claims noting that the arguments “have been fully considered and are persuasive.” *Id.* at 0169.

The ’580 Patent incorporates by reference the ’187 patent, which itself incorporates the same subject matter of Khan (Ex_1007) and Ali (Ex_1008), which are relied upon in Grounds 2 and 5. *See* Ex_2002, pp.0008 and 0018. The ’580

Patent refers to the Khan/Ali disclosure as providing additional details for some aspects of embodiments of the invention. Ex_1001, 5:38-47, 14:34-36, 15:20-27 and 49-52, and 16:1-11. However, Khan and Ali do not disclose the claimed network-based approach or the use of a “predictive model” for “identifying ... a horizon line” in a network-received video.

C. Relevant Person of Ordinary Skill in The Art

Patent Owner disagrees with Petitioner’s proposed education and training of the relevant Person of Ordinary Skill in the Art (“POSITA”). The factors that may be considered to determine the level of ordinary skill in the art include the “type of problems encountered in the art; prior art solutions to those problems; rapidity with which innovations are made; sophistication of the technology; and educational level of active workers in the field.” *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995) (citation omitted). The level of ordinary skill may also be reflected by the prior art of record. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001).

The ’580 Patent “relate[s] to **automotive systems** and to machine learning systems for analyzing sensor data in such systems.” Ex_1001, 1:7-10. Petitioner’s proposed POSITA appears to be an expert in computer/machine vision but lacks any training or experience in “automotive systems,” precisely what the ’580 Patent relates to. *See* Ex_2003, ¶37. The type of problem being addressed by the ’580

Patent deals with the initialization of cameras in automotive systems. *See* Ex_2003, ¶34. This is different than the type of problems encountered in computer vision generally. *Id.*, ¶37. The typical educational level of active workers in the automotive systems design field was a bachelor's degree in engineering, typically Electrical or Computer Science. *Id.*, ¶35. A typical designer the type of system described in the '580 Patent would have at least two years working experience in the automotive field, perhaps less with a more advanced degree. *Id.*

Moreover, the cited references are also related to the automotive field. *Id.*, ¶34; *see also, e.g.*, Ex_1005, ¶[0001] (“disclosure relate generally to operating autonomous vehicles”); Ex_1007, p.1823 (“[l]ane detection is of critical importance to both self-driving cars as well as advanced driver assistance systems”); Ex_1008 (“[d]istance estimation is required for advanced driver assistance systems (ADAS) as well as self-driving cars”); Ex_1010, 1:13-14 (“[a] rapidly emerging technology is autonomous vehicles (Avs) that can navigate by themselves ...”). Thus, some experience or training with automotive systems is needed for the appropriate level of ordinary skill in the relevant art. *See Okajima*, 261 F.3d at 1355. Accordingly, Petitioner's proposed POSITA is improper. A POSITA for the '580 Patent as of 2021 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. *See* Ex_2003, ¶35.

This distinction is important because the Board relied on the knowledge of a POSITA, as defined by Petitioner, to find motivation to combine references that are not related to the automotive field. For example, in the I.D., the Board found “sufficient Dr. Darrell’s testimony that a person of ordinary skill in the art would have been motivated to combine Choe and Workman” I.D., pp.11-12. While an “expert in computer/machine vision,” as Petitioner’s proposed POSITA appears to be, may have a higher level of skill regarding the use of CNNs as disclosed by Workman, Petitioner provides no evidence to support that a POSITA working in the automotive field would have recognized the use of Workman’s CNNs as a “suitable option” to identify horizon lines in dashcam automotive systems. Petitioner does not identify any examples, predating the ’580 patent, combining CNNs for horizon line identification and annotations for camera calibration in automotive systems.

Further, under the proper POSITA, Dr. Darrell’s testimony regarding what a POSITA would have found obvious should be closely scrutinized as he himself may be an expert in “computer vision and artificial intelligence,” but, unlike Mr. Andrews, Dr. Darrell reports no experience in the automotive industry or the design of automotive sensor systems or any other factual basis to be

knowledgeable about such ordinary knowledge or level of skill. *See* Ex_1003 at 14-19.

III. THE CHALLENGED CLAIMS ARE NOT UNPATENTABLE

None of the grounds show that all the limitations of independent claim 1, or of any of the dependent claims 2-7, are unpatentable “only on the basis of prior art consisting of patents or printed publications.” *See* 35 U.S.C. § 311(b). At the very least, none of the alleged prior art combinations show the method of claim 1, including limitations [1A], [1B], [1C], [1D], and [1E], to be obvious. Further, Petitioner’s reliance on its expert, Dr. Darrell, to supply limitations missing in the cited prior art should be disregarded as failing to meet the statutory requirements for an IPR. *See Qualcomm Inc., v. Apple Inc.*, 24 F.4th 1367, 1373-77 (Fed. Cir. 2022).

A. Ground 1 – Choe Does Not Teach or Suggest Claims 1-4.

Choe does not render claims 1-4 obvious because it fails to disclose at least limitations [1A], [1B], [1C], [1D], and [1E] or the additional limitations of claims 2-4.

1. Choe Does Not Teach or Suggest Limitation [1B]

In Grounds 2 and 3, Petitioner tacitly acknowledges that Choe fails to describe the use of “predictive models” to identify a horizon line. *See* Pet. at 41. This is correct. *See* Ex_2003, ¶54.

Choe discloses a manual camera calibration system that uses camera hardware to determine the horizon line. Ex_2003, ¶41. As the specification describes, “a calibration system with a visualizer is utilized to calibrate sensors (e.g., cameras, LIDAR, RADAR) of an autonomous driving vehicle (ADV).” Ex_1005 at [0014]. “The visualizer includes a user interface to visually display a two-dimensional (2D) image captured by a camera and a three-dimensional (3D) image to allow a user visually calibrate the camera, a LIDAR device, and/or a RADAR device.” *Id.* “A user can calibrate any of the sensors such as a pitch angle, a yaw angle, and/or a roll angle using an input device such as a keyboard or joystick to provide incremental calibration feedback, while displaying the calibration result on a display device concurrently.” *Id.*

In the calibration system of Choe “in response to a first image captured by a camera of an ADV, **a horizon line is determined based on the camera's hardware settings.**” *Id.* at [0015]. “The horizon line represents a vanishing point from a view point of the ADV **based on an initial or default pitch angle of the camera.**” *Id.* “One or more lane lines are determined based on the first image via

a perception process performed on the first image.” *Id.* “In response to a first input signal (e.g., an up or down arrow key) received from an input device (e.g., keyboard, joystick, voice interactive command), a position of the horizon line is updated based on the first input signal and a position of at least one of the lane lines is updated based on the updated horizon line.” *Id.*

“Choe consistently describes throughout the specification that the horizon line is determined based on the hardware parameters of the camera.” Ex_2003, ¶43; *see also, e.g.*, Ex_1005 at [0046] (“2D rendering module 401 is configured to render a 2D view including superimposing a horizon line onto the image according to the camera setting (e.g., hardware preset pitch angle).”); at [0048] (“perception module 302 determines a horizon line based on the camera’s hardware settings.”); at [0055] (“horizon line 610 is determined and placed on a location within image 601 based on the hardware setting of the targeted camera.”); at [0059] (“processing logic determines a horizon line ... based on a pitch angle of a camera that captured a first image”). Even the claims of Choe limit its invention to “determining a horizon line representing a vanishing point from a view point of the ADV **based on a pitch angle of a camera** that captured a first image representing a two-dimensional (2D) view from the viewpoint of the ADV.” *Id.* at claim 1. Despite this clear description of a hardware-parameter-based horizon line determination, Petitioner alleges that in Choe, “[t]he initial horizon and lane lines are identified

‘using a predictive model.’” Pet. at 27. “This is incorrect.” Ex_2003, ¶47. Every embodiment in Choe describes “that the horizon line is determined based on the hardware parameters of the camera.” *Id.*; *see also*, e.g., Ex_1005, ¶¶[0046], [0048], [0055], [0059].

Petitioner points to Choe’s paragraph [0030] stating that “predictive models 124” may be used for “sensor calibration algorithms.” Pet. at 27 (citing Ex_1005 at [0030]). But Petitioner misinterprets this paragraph to conclude that “the initial horizon line is predicted with a predictive model 124.” *Id.* at 27-28; Ex_2003, ¶48. What paragraph [0030] in Choe states is that “[b]ased on **driving statistics** 123, machine learning engine 122 generates or trains **a set of rules, algorithms, and/or predictive models 124** for a variety of purposes.” Ex_1005 at [0030]. Thus, any “predictive models” in Choe are based on the use of a machine learning module to process driving statistics, such as vehicle speeds, accelerations, etc., not based training a predictive model with images to identify lines in the images. *See* Ex_2003, ¶48. Paragraph [0030] states that “[a]**lgorithms 124** may further include **sensor calibration** algorithms, which will be described **further below**.” Ex_1005 at [0030]. Notably, this statement in Choe refers to “algorithms” not to “rules” or “predictive models.” *See* Ex_2003, ¶¶87-91. Further, the word “sensor” in sensor calibration algorithms, also refers to LIDAR devices, RADAR devices, or other sensors; it is not specific to “camera” calibration. *See* Ex_1003, ¶93; *see also*

Ex_2003, ¶49. Even if this disclosure related expressly to camera calibration, “calibration is a broad term and does not necessarily include identifying a horizon line.” *See* Ex_2003, ¶49. Thus, paragraph [0030] in Choe does not teach or suggest the use of predictive models for any specific purpose, much less for the identification of a horizon line as Petitioner argues.

Further, paragraph [0030] states that the use of these **algorithms** for sensor calibration “will be described further below.” Ex_1005 at [0030]. Yet, neither Petitioner nor Dr. Darrell discuss what is further described about the use of these algorithms for sensor calibration. Choe describes that a “sensor calibration module or system 308 is configured to calibrate, using sensor calibration algorithms 313, a sensor based on an image or point cloud captured by the sensor **to determine a set of calibration parameters.**” Ex_1005 at [0044]. Thus, even if Choe disclosed calibration “algorithms/models” as Petitioner alleges (it does not) any such “algorithms/models” would be based on machine learning processing of **driving statistics** (e.g., driving commands, speeds, accelerations, decelerations, etc.), and, if predictive models were used for sensor calibration, something Choe does not actually describe, they would be used “to determine a set of calibration parameters,” not horizon or lane lines. *See id.* at [0030] and [0044]; *see also*, Ex_2003, ¶50.

Thus, unlike the predictive models of the '580 Patent, Choe's predictive models are based on machine learning processes that use driving statistics. *See* Ex_2003, ¶¶51-53. While the predictive models of the '580 Patent are trained from ground truth images to directly identify horizon lines in images, the alleged sensor calibration predictive models in Choe are trained with driving statistics and at best, would determine calibration parameters, not lines in images. *Id.* "Choe does not teach or suggest the use of a predictive model trained with images for any purpose, much less for determining a horizon line in video images." *Id.*, ¶53. "The only teaching regarding predictive models in Choe is that they are 'based on driving statistics' and 'generated or trained' by 'machine learning engine 122.' Nothing in Choe teaches or suggests any predictive model trained to identify lines in video." *Id.* Instead, to determine the horizon line, Choe teaches the use of hardware parameters of the camera, not the use of predictive models at all. *Id.*, ¶54.

In sum, Choe does not teach or suggest using predictive models to "identify[] one or more lines in the video using a predictive model, the one or more lines including a horizon line." Thus, Choe cannot render claim 1 or any of the dependent claims, 2-7, obvious.

2. Choe Does Not Teach or Suggest Limitation [1A]

Element [1A] requires “receiving, over a network from a camera device, a video comprising a set of image frames.” Petitioner fails to show this disclosure in Choe. Instead, Petitioner relies on Choe’s disclosure of the use of video cameras to collect images and the subsequent analysis of single frames to meet this limitation. Pet. at 25. But a single frame, even if it was extracted from a video, is not “a video comprising a set of image frames” as claimed. Realizing of this deficiency in Choe, Petitioner argues that “combining Choe’s video frames to form a video would have been obvious to a POSA.” *Id.* at 26.

That is, lacking a disclosure in Choe, Petitioner relies on the testimony of Dr. Darrell and an alleged admission by Applicant to supply the missing limitation. *Id.* However, expert testimony and alleged admissions are not “patents or printed publications” and thus fail to meet the requirement of 35 U.S.C. § 311(b). *See, e.g., Qualcomm*, 24 F.4th at 1373-77 (vacating and remanding to determine whether applicant admitted prior art improperly formed the “basis” of petitioner’s patentability challenge); *Qualcomm Inc. v. Apple Inc.*, 134 F.4th 1355, 1364-65 (Fed. Cir. 2025) (holding that “because the basis can only include prior art consisting of patents or printed publications, and because AAPA is not a prior art patent or printed publication (per *Qualcomm I*), it follows that the plain meaning of § 311(b) does not permit the basis to include AAPA.”). Accordingly, these

alternative evidentiary references cannot be relied upon in an IPR to supply limitations absent in the prior art. Here, Choe does not disclose “receiving, over a network from a camera device, a video comprising a set of image frames” but instead it shows operation on single frames. *See* Ex_2003, ¶86. Thus, limitation [1A] is not disclosed in Choe. Accordingly, claims 1-4 are not obvious over Choe for this reason too.

3. Choe Does Not Teach or Suggest Limitation [1C].

With respect to limitation [1C], Petitioner relies on Choe’s description of the “calibration factors or parameters for calibrating the camera’s pitch, yaw, and roll.” Pet. at 28. Petitioner cites: “[a] first calibration factor or first correction value is determined for calibrating a pitch angle of the camera based on a difference between the initial horizon line and the updated horizon line.” EX1005, ¶[0015]. Petitioner argues that while “Choe computes these camera parameters *after* the manual calibration” the computation is nonetheless “based on the one or more lane lines” and in any case “neither the claims themselves, nor the specification require a specific order for this element.” Pet. at 28. (emphasis in original).

Order of the steps aside, limitation [1C] requires that the camera parameter be computed based on “**the**” one or more lines, which refers to the “one or more lines” of element [1B]. As discussed above, element [1B] requires the one or more

lines to at least include “a horizon line” and that these lines be identified in the video using a predictive model. Choe does not disclose this. Further, as Petitioner acknowledges, because the “calibration factors or parameters” of Choe are determined *after* the manual corrections are entered by a user, they are not based on **the** lines identified by the predictive model but rather on the “difference” generated by the manually entered lines.

In addition, Choe does not describe computing the camera parameters themselves, pitch, yaw or roll, based on the manually entered lines, but instead it teaches the determination of a “correction value” that can subsequently be used **for calibrating** a pitch angle of the camera. Ex_1005, [0015]. Nowhere does Choe describe computing the actual camera parameters, pitch, yaw, or roll, based on a predictive-model-identified horizon line. Thus, Choe does not disclose element [1C]. Accordingly, claims 1-4 are not obvious over Choe for this reason too.

4. Generating and Transmitting an Overlaid Video of [1D] and [1E] Are Not Disclosed in Choe

Limitation [1D] requires “overlaying the one or more lines on the video to generate an overlaid video” and [1E] requires “transmitting the overlaid video.” Petitioner fails to show these steps in Choe. Instead, for element [1D], Petitioner simply identifies “**the first image** with the horizon line superimposed thereon,” *i.e.*, a single frame. Pet. at 29. But the claim requires generating an “overlaid

video,” which must include “**a set** of image frames,” not just a single frame. *See* claim 1. Acknowledging this deficiency, Petitioner argues that “a POSA would have found it obvious that a collection of video frames having the horizon line superimposed thereon is an overlaid ‘video.’” Pet. at 29. But as noted above, this type of argument fails to show the required disclosure in the “printed patent or publication,” and therefore is insufficient for an IPR Petition. *See, e.g., Qualcomm*, 24 F.4th at 1373-77.

With reference to element [1E], Petitioner relies on Choe’s paragraphs [0045] to [0054] as showing the claimed transmission of the overlaid video, stating that “[i]n Choe, the captured video with the initial overlaid horizon and lane lines is first transmitted to the sensor calibration module 308 ... [and] then transmitted (shown below with the red arrow) to the annotator device ...”. Pet. at 31. But Choe does not actually mention any transmission of a video, much less an overlaid video.

Instead, Choe’s system works a single frame at a time: “in response to **a first image** captured by a camera ...”. Ex_1005 at [0048]; *see also id.* at [0050] (referring to “**the first image** with the horizon line superimposed thereon is rendered by 2D module 401 and displayed within a first display area of display device 405 ...”); Ex_2003, ¶86. The identified elements of FIG. 4, 404, 405, 411, 412, and/or 413, all operate on a single frame not a “video” as Petitioner alleges.

Similarly, Figure 6A, reproduced in the Petition (p. 30), clearly shows operation of a single frame from the camera along with corresponding “3D information” from other sensors (LIDAR/RADAR); a video is not used for the manual calibration process. *See* Ex_2003, ¶86. Thus, nowhere does Choe disclose the generation and transmission of an “overlaid video” as required by elements [1D] and [1E]. For this additional reason claims 1-4 are not obvious over Choe.

5. Choe Does Not Teach or Suggest the Limitations of Claims 2-4

Petitioner also fails to show that the additional limitations of claims 2-4 in Choe.

a) Claim 2

With respect to claim 2, Petitioner argues that “the lines 621, 622, 623 superimposed on the video” allegedly shown in FIG. 6A somehow meet the limitation of claim 2. Pet. at 33. But claim 2 requires “identifying one or more lines in the video using a predictive model, ... wherein the one or more lines includes at least one lane line of a roadway.” Ex_1001 at claim 2.

Petitioner fails to explain how Choe uses a predictive model to identify at least one lane line of a roadway. Choe describes that the “lane lines are determined based on the first image via a perception process performed on the first image.” Ex_1005 at [0015], [0059]. Once again, given that this limitation is

absent in the cited art, Petitioner improperly relies on Dr. Darrell’s testimony to supply it. Dr. Darrell states that “industry’s wide use of predictive algorithms to identify horizon and lane lines ... a POSA would have understood that Choe’s predictive models 124 would have predicted these lines.” *See* Pet. at 27-28; Ex_1003 at 94. Thus, Dr. Darrell tacitly admits that Choe does not actually disclose using a predictive model to identify the lane lines in video as the claim requires but instead doing so would be obvious based on some generalized industry-wide knowledge. However, this type of expert testimony, relying on “industry wide” general knowledge to supply a claim limitation fails to meet the requirement of 35 U.S.C. § 311(b). *See, e.g., Qualcomm*, 24 F.4th at 1373-77; *see also Qualcomm*, 134 F.4th at 1364-65. Thus, Choe does not actually disclose the limitations of claim 2 and thus cannot render it obvious.

b) Claim 3

Petitioner fails to address the required “predicting the at least one camera parameter using **the** predictive model” of claim 1, the same “predictive model” used to identify the horizon line. *See* Ex_1001 at claim 3. Petitioner generically points to “machine learning engine 122 [that] generates or trains a set of rules algorithms, and/or predictive models 124 for a variety of purposes.” But Petitioner does not identify how “machine learning engine” uses a predictive model for any

purpose, much less using the same predictive model to identify a horizon line and to also predict camera parameters.

In fact, for claim 3, Petitioner identifies paragraphs in Choe that describe the manual adjustment of lines by a user, not any use of a predictive model, as the basis for computing “calibration parameters.” Ex_2003, ¶¶92-93. Further, calibration parameters of Choe are not camera parameters. *Id.* For example, “in response to a third signal received from the input device (e.g., shift-left or shift-right arrow key), the lane lines are modified and a third **calibration factor** for calibrating a **roll angle of the camera** is determined.” Ex_1005 at [0017]; *see also* Pet. at 35. That, is, the manually entered lines are used to determine a calibration **factor** than is subsequently used to calibrate, not predict, a **roll angle** of the camera. None of the cited paragraphs disclose “predicting the at least one camera parameter using **the** predictive model” as claimed.

Further, in addressing claim 4, Petitioner admits that, even under its flawed theory, Choe fails to disclose the use of “**the** predictive model” of claim 1 to predict the at least one camera parameter of claim 3: “As explained for [1B], Choe discloses a predictive model for identifying a horizon line in a video frame (**a first predictive model**). And as explained for claim 3, Choe discloses a predictive model for predicting a camera parameter (**a second predictive model**).” Pet. at 35. Thus, by Petitioner’s own admission, Choe does not disclose **the** predictive

model of [1B] being used to predict the camera parameter of claim 3, “a second predictive model” allegedly does it. Accordingly, claim 3 is also patentable over Choe.

c) Claim 4

Choe does not show that “computing the at least one camera parameter comprises predicting the at least one camera parameter using a second predictive model” either. Unlike claim 3, requiring the use of “the predictive model” of claim 1, claim 4 requires the use “a second predictive model.” Ex_1001, claim 4. But for claim 4, Petitioner simply refers to its flawed arguments regarding claim 3 and fails to show any additional evidence of a “second predictive model” that predicts camera parameters in Choe. Pet. at 35. As shown above regarding claim 3, Choe does not describe any predictive model being used to predict any camera parameters; the cited sections of the Choe specification all show the use of manual user input to adjust the lane lines and determine calibration factors, not camera parameters. Ex_2003, ¶¶92-93. Thus, claim 4 is also patentable over Choe.

B. Ground 2 – The Choe/Khan/Ali Combination Fails to Render the Challenged Claims Obvious.

Ground 2 relies on the combination of Choe with Khan and Ali. As disclosed in the ’580 Patent, while Khan and Ali provide “additional detail” regarding some aspects of the described embodiments, Khan and Ali do not

provide the elements missing in Choe, including the predictive model of limitation [1B]. *See* Ex_2003, ¶¶55, 63.

1. Claim 1: Khan and Ali Disclose the Use of a Geometric Algorithm, not a Predictive Model, to Determine the Horizon

Petitioner alleges that “[i]n Khan, the predictive model used to identify lane and horizon lines is called a ‘Mask-RCNN.’” Pet. at 41 (citing Ex_1007, p.1825). This is incorrect. *See* Ex_2003, ¶64. Khan states that “[a]s generally is the case with deep learning methods for **lane detection** that output lane boundary maps which are sampled to produce boundary markers, we instead take motivation from keypoint detection in Mask-RCNN [12] and predict these lane markers directly instead of sampling them from segmentation maps.” Ex_1007, p.1825. Khan does not mention using “Mask-RCNN” to identify a **horizon** line. *See* Ex_2003, ¶64.

Petitioner also states that “Khan uses RANSAC (a predictive model) to predict the horizon line.” Pet. at 41 (citing Ex_1007, pp.1826-27). This too is incorrect. Ex_2003, ¶65. RANSAC is not a model at all; “provides a process for fitting a model to experimental data.” *Id.* What Khan states regarding RANSAC is that the “estimation of IPM assumes a planar road scene having no elevation and more than one lanes (3 or more lane boundaries), such as a typical highway scenario.” Ex_1007, p.1826. It then explains that their process starts “by fitting lines to the detected markers” but “[a] best fit line must have a minimum number

of inlier markers.” *Id.* Khan then defines inlier markers as “those having horizontal distance of under 8 pixels to the best 1st degree line fit through RANSAC [8].” *Id.* Thus, the RANSAC fitting process is mentioned in the context of determining what an “inlier marker” is. *See* Ex_2003, ¶65. “Khan does not describe using RANSAC to predict the **horizon** line.” *Id.*

Khan cites Ali (Ex_1008) with respect to the determination of the horizon line: “described more fully in Ali.” *See* Pet. at 41. But, like Khan, Ali does not describe the use of a predictive model to identify the horizon line. Ali provides a section describing its “Horizon estimation” approach. *Id.* at 1103 (Section 3.2.2). It explains that “[t]he horizon must be known to estimate the required camera rotation for an IPM.” *Id.* For the Ali system, “[a] horizon is a vanishing line of a plane which, in our case, is the road.” *Id.* Specifically, Ali explains:

In order to find vanishing line, we need two vanishing points. The first one can be simply calculated through the cross product of the vectors of any two lane lines expressed in homogeneous coordinates (*See* Figure 5 (a)). We call it the forward vanishing point (V). Finding a second vanishing point, however, is a bit involved. ... For this, we will need three co-linear points existing on the road plane having known real world length ratios. Since we already have detected lane lines in the image which lie on the road plane, we can find three co-linear points by drawing any line l' which intersects all three lane lines at points a' , b' and c' respectively.

Id. at 1103-1104. The process of getting the vanishing points is illustrated in Figure 5, which is reproduced below:

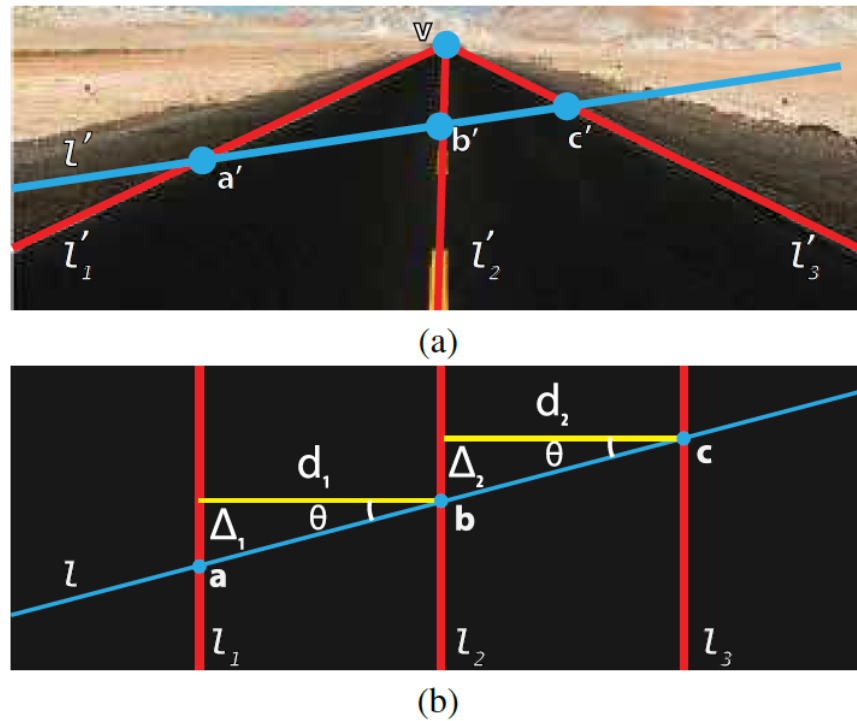


Figure 5. (a) Perspective view of road plane. Lane lines (l'_1 , l'_2 , and l'_3) are shown in red and an arbitrary line l' (blue) cuts all lane lines at points a' , b' , and c' . Forward vanishing point (V) is obtained by the cross product of any two lane lines (b) Real world top-down view of the road plane. d_1 and d_2 are the distances between lane lines l_1 , l_2 and l_2 , l_3 respectively. Since all lane lines are parallel Δ_1 and Δ_2 are similar triangles which implies

$$\frac{ab}{bc} = \frac{d_1}{d_2}$$

Id. at 1104. Because the three vanishing points “lie on three (parallel) lane lines (l_1 , l_2 and l_3), it can be established **through trigonometry** that the ratio of the line segments ab/bc is equal to d_1/d_2 where d_1 and d_2 are the distances between lines l_1 , l_2 and l_3 respectively.” *Id.*

Thus, both Khan and Ali “assume[] a planar road scene having no elevation and more than one lanes (**3 or more lane boundaries**), such as a typical highway scenario.” *See* Ex_2003, ¶¶67-68; *see also* Ex_1007, p.1826 and Ex_1008, pp.1103-1104. “The ’580 Patent specification expressly noted that the use of predictive models for identifying the horizon line improved over these types of geometric approaches.” Ex_2003, ¶69. As the ’580 Patent explains:

the use of the neural network can relax constraints that the vehicle needs to be driving on a highway having three or more lane lines. Indeed, just two lane-lines with a known lane-width would be sufficient for camera initialization. That is, since the model is capable of predicting the horizon line directly, **previous requirements of having three lane lines** in frame (e.g., to **geometrically** calculate a horizon line) can be relaxed.

Ex_1001 at 8:39-46. As described above, Ali teaches precisely this prior art geometric approach for estimating the horizon that the ’580 Patent recognized and improved upon. *See* Ex_2003, ¶69; *see also* Ex_1008, p.1104 and Fig. 5. The use of predictive models in the invention of the ’580 Patent allows it to “relax constraints” required by this previous geometric approach. *Id.*

In the I.D., the Board, noted that “[a]part from identifying one or more lines in the video, claim 1 does not limit a ‘predictive model’ in any way.” I.D., p.15. The Board concluded that “[w]ith 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 *lh*.’” *Id.* However, to reach this conclusion, the Board’s “understanding of the claim” is solely based on its assessment that “claim 1 does not limit a ‘predictive model’ in any way.” But this interpretation expressly contradicts the disclosure in the specification and the prosecution history, which distinguish the inventive “predictive model” from the geometric approach of Khan and Ali.

In the I.D., the Board requested that the parties address the meaning of term “predictive model” to the extent it impacts the patentability analysis. I.D., p.9. Patent Owner asserts that the Board’s interpretation of the term in reaching its preliminary conclusion regarding Khan and Ali impacts the patentability analysis because it is overly broad. Claims are to be interpreted “from the perspective of a person of ordinary skill in the art at the time of the invention, who is ‘deemed to read the claim term **not only in the context of the particular claim** in which the

disputed term appears, but in the context of the entire patent, **including the specification.**” *HD Silicon Solutions LLC v. Microchip Technology Inc.*, 127 F.4th 919, 921 (2025), (citing *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313 (Fed. Cir. 2005) (*en banc*)). In *HD Silicon*, the Federal Circuit found the Board’s construction of “‘comprising tungsten’ to mean any form of tungsten, including both elemental tungsten and tungsten compounds” to be erroneous considering the disclosure of the specification. *Id.* at 921. The specification “exclusively refers to tungsten as a singular component, i.e., as an element.” *Id.* at 921. The Court further noted that the Board’s construction conflicted “with the specification, claims, and prosecution history.” *Id.* at 923. Thus, the Board’s broader interpretation of the term as used in the claim was improper because it was contrary to what the specification and prosecution history described.

Here, the ’580 patent specification distinguishes prior approaches “to **geometrically** calculate a horizon line,” like Ali’s approach, from what it refers to as the “predictive model” of the invention, which allows it to “relax constraints” required by the prior geometric approach. Ex_1001, 8:39-46. In addition, during prosecution, the inventors distinguished the claimed predictive model from KWANT1, explaining that “KWANT1 does not disclose using a predictive model to detect a horizon line. Instead, KWANT1 describes predicting lane lines. KWANT1 then describes extending these lane lines and, **using a geometric approach,**

identifying the horizon line. KWANT1 only describes using predictive modeling to predict lane lines.” *See* Ex_1002 at 0145-0146. The Ali/Kahn combination does not disclose anything more than KWANT1, using predictive models to predict lane lines, and their “horizon line estimation algorithm” cannot be a “predictive model” because it is a geometric approach like the one disclosed in KWANT1 and distinguished by the inventors.

Therefore, interpreting “predictive model” to include Ali’s “horizon estimation algorithm” that uses the distinguished geometric approach is an erroneous interpretation of the term, which conflicts with the specification and the prosecution history. *See* 127 F.4th at 923. Thus, when claim 1 is read in light of the specification and the prosecution history, the claimed “predictive model” must be interpreted as being different from the geometric algorithm of Khan/Ali.

Accordingly, the Khan/Ali geometric horizon estimation disclosure does not teach or suggest “identifying one or more lines in the video using a predictive model, the one or more lines including a horizon line” required by claim 1.

Ex_2003, ¶70. Their combination with Choe, even if it were appropriate and not based on impermissible hindsight (as further explained below), still fails to render the Challenged Claims obvious.

Patent Owner additionally notes that in the I.D., the Board appears to rely on a theory that, while failing to show limitation [1B] in the Ground 3 combination, is

not advanced in the Petition. The Board agreed that the combination of Choe, Khan, and Ali teach limitation [1B] because “Ali describes a specific horizon estimation algorithm, and Khan states, ‘we use [Ali’s] horizon estimation algorithm to find the best fitting horizon *lh*.’” I.D., p.15. But what Petitioner argues is that “[i]n Khan, the predictive model used to identify lane and horizon lines is called a ‘Mask-RCNN.’ ... Khan in view of Ali uses this predictive model to identify lane lines and horizon lines. ... After lane lines are fit to the detected markers, Khan uses RANSAC (a predictive model) to predict the horizon line.” Pet. at 41. As shown above, Khan and Ali do not in fact teach using Mask-RCNN or RANSAC, the alleged “predictive models” in the Petition, to identify a horizon line. Accordingly, the argument presented in the Petition itself failed to “specify where each element of the claim is found in the prior art patents or printed publications relied upon” and should therefore be denied. *See* 37 C.F.R. § 42.104(b)(4).

Because for Ground 2 Petitioner relies exclusively on Choe with respect to the other limitations of claim 1, given that, as shown above with reference to Ground 1, Choe fails to disclose limitations [1A], [1C], [1D], and [1E] the Choe/Khan/Ali combination similarly fails to disclose those limitations. Thus, even if the combination disclosed limitation [1B], which it does not, it still fails to render claim 1 obvious for those additional reasons.

2. No Motivation to Combine Choe with Khan and Ali

In the I.D., the Board credited 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." I.D., pp.15-16. However, Dr. Darrell's conclusory statements are insufficient to show the "why" an automotive sensor system designer of ordinary skill starting with Choe would have found it obvious to use Khan and Ali to arrive at the claimed invention. "The consequent legal question, then, is whether [an automotive sensor system] designer of ordinary skill starting with [Choe] would have found it obvious to use [Khan/Ali's algorithms to identify a horizon line]." *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 424 (2007).

First, as *KSR* notes, the relevant POSITA for evaluating a motivation to combine is a "designer" in the relevant field, thus a "an automotive-focused definition" of a POSITA is critical. *See* I.D. at 5-6. As further described above, Dr. Darrell relies on the incorrect POSITA and he does not provide any factual basis to opine on the level of ordinary skill of an automotive-focused sensor system

designer or what such a designer would have found obvious. *See* Ex_1003 at 14-19.

Second, Choe consistently describes that “a horizon line is determined based on the camera’s hardware settings.” Ex_1005 at [0015]; Ex_2003 ¶47. Choe references “predictive models” along with “sets of rules” and “algorithms.” Ex_1005, [0030]. But, unlike the rules and algorithms, “Choe does not actually describe how ‘predictive models’ are used for any purpose.” Ex_2003, ¶90. “The only teaching regarding predictive models in Choe is that they are ‘based on driving statistics’ and ‘generated or trained’ by ‘machine learning engine 122.’” *Id.* at ¶53. Simply disclosing driving-statistics-based predictive models does not motivate a POSITA to look for any kind of predictive models to identify horizon lines. *See id.* at ¶74. Even assuming arguendo, that Choe teaches the use of “algorithms/models” for sensor calibration, which it does not, sensor calibration algorithms in Choe are only used “to determine a set of calibration parameters”; not identifying lines in video as Petitioner alleges. *See* Ex_1005, [0029], [0030], and [0044]; *see also* Ex_2003, ¶¶48-50. “Choe does not identify any shortcomings with its camera-hardware based approach to determining the horizon line or the need for using predictive models for this purpose. Nor does Choe identify or suggest any problem or other need to improve its sensor calibration approach in any way.” 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.” *Id.*

As further elaborated below with reference to Ground 3, neither Petitioner nor Dr. Darrell’s testimony identify any “known problem” or shortcoming in Choe for which the Khan/Ali methodologies provide a suitable solution. *See PAR Pharm., Inc. v. TWI Pharms., Inc.*, 773 F.3d 1186, 1197-98 (Fed. Cir. 2014); *see also Intel Corp. v. Qualcomm Inc.*, 21 F.4th 784, 800 (Fed. Cir. 2021). Petitioner here fails to identify any “known problem” or shortcoming in the prior art to motivate a POSITA to replace the camera-hardware based approach to determining the horizon line in Choe with the Khan/Ali geometric approach.

Instead, Petitioner and Dr. Darrell rely on the generic statement in Choe that “[i]t will be evident that various modifications may be made thereto without departing from the broader spirit and scope of the disclosure....”. EX1005, ¶[0066].” Pet. 40; Ex_1003, ¶130. While “various modifications” may be made to Choe, this statement does not provide a reason why those modifications would correspond specifically to changing the camera-hardware based approach of Choe for determining a horizon line to the approach of Khan and Ali. This statement in the Choe specification and Dr. Darrell’s related testimony “is generic and bears no relation to any specific combination of prior art elements. It also fails to explain **why** a person of ordinary skill in the art would have combined elements from

specific references in the way the claimed invention does.” *See ActiveVideo Networks, Inc. v. Verizon Commc’ns, Inc.*, 694 F.3d 1312, 1328 (Fed. Cir. 2012) (citing *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007)). “This is not sufficient and is fraught with hindsight bias.” *Id.* at 1327. Simply “being known” and “being compatible” does not suffice as a motivation to combine; “[u]nder the correct analysis, any need or problem known in the field and addressed by the patent can provide a reason for combining the elements **in the manner claimed.**” *KSR Int’l*, 550 U.S. at 420. However, aside from hindsight, Petitioner does not provide any such known need or problem motivating the combination of Choe with Khan and Ali.

3. Claims 2, 3, and 5 Are Not Obvious Over the Choe/Khan/Ali Combination

To the extent Petitioner relies on its analysis of Choe for Ground 1 with respect to Ground 2 (*see* Pet. at 41), given that, as shown above with reference to Ground 1, Choe fails to disclose claims 2-4, the Choe/Khan/Ali combination similarly fails to disclose those claims. In addition, to the extent Petitioner relies on Khan or Ali for the additional limitations of claims 2, 3, and 5, as shown below, the Choe/Khan/Ali combination fails to render those claims obvious for the following additional reasons.

a) Claim 2

With respect to Claim 2, the combined references do not disclose that the predictive model of claim 1 is used to “predict at least one lane of a roadway” in addition to the horizon line. As shown above, the combined references do not show a predictive model used to identify the horizon line. Further, Ali’s “specific horizon estimation algorithm” and Khan’s use of “[Ali’s] horizon estimation algorithm to find the best fitting horizon *lh*” that the I.D. relied upon, is not shown or even alleged in the Petition to also predict at least one lane of a roadway. “Khan does not rely on Ali’s horizon line estimation approach for identifying lane lines of a roadway in the video.” Ex_2003, ¶95. Further, Petitioner’s argument that “the entire end2end detection algorithm ... is ‘the predictive model’” is a baseless generalization.

Petitioner argues that pretty much any computation or algorithm discussed in Khan is the claimed “predictive model”: Mask-RCNN, RANSAC, and even the entire “end2end” pipeline. As discussed above, the specification and prosecution history show that such an overly broad interpretation is inappropriate. *See HD Silicon Solutions*, 127 F.4th at 921. For example, the inventors distinguished the claimed predictive model from KWANT1, which “describes using predictive modeling to predict lane lines” but “using a geometric approach, identifying the horizon line.” *See* Ex_1002, 0145-0146. Khan similarly uses predictive models

for lane detection but uses Ali's geometric approach for estimating the horizon line. Despite Petitioner's conclusory assertion, "[a] POSITA would not consider the 'end2end detection algorithm' of Figure 3 in Khan (Ex. 1007), to be a predictive model." Ex_2003, ¶95. Accordingly, Petitioner fails to show the additional limitations of claim 2 in the Khan/Ali/Choe combination.

b) Claim 3

Petitioner fails to show "predicting the at least one camera parameter using **the** predictive model" in the Khan/Ali/Choe combination. Instead, Petitioner alleges that "[i]n Khan and Ali, camera parameters are predicted during its Inverse Perspective Mapping (IPM) computation step." Pet. at 42. But IPM is not mentioned as part of the "predictive model" identified for limitation [1B]: Mask-RCNN or RANSAC. *See* Pet. at 41. The IMP computation does not involve Ali's horizon estimation algorithm. As discussed above, Petitioner's arbitrary box-drawing arguments to show the claimed predictive model in Khan are inconsistent with the proper interpretation of the term. None of Petitioner's vague theories show how the same predictive model used to identify the horizon line as required in [1B] is also used to predict a camera parameter. Thus, claim 3 is patentable over the Khan/Ali/Choe combination.

c) Claim 5

Petitioner also fails to account for the dependency of claim 5 on claim 1: “**the** at least one camera parameter” that “comprises a camera height and road plane normal” must also be “comput[ed] ... based on the one or more lines” [1C] and “data representing the at least one camera parameter” must be transmitted to the camera device” [1G]. *See* Ex_1001, claims 1 and 5. With respect to limitation [1C], Petitioner points to “camera’s pitch, yaw, and roll” as the at least one camera parameter. Pet. at 28. With respect to limitation [1G], Petitioner alleges that “after the manual calibration, the data representing at least one camera parameter (e.g., calibration factors or parameters for calibrating the pitch, yaw, and roll of camera 211) is transmitted to the camera 211.” Pet. at 33. Petitioner relies on these arguments with respect to Ground 2. Pet. at 41.

For Claim 5, Petitioner points to Khan’s and Ali’s discussion of the use of “camera height” and “plane normal.” *See* Pet. at 44-45. However, Petitioner fails to identify where in Choe, Khan, or Ali “data representing” the “camera height” or “plane normal” is transmitted to the camera device as claims 1 and 5 require. In fact, Khan’s “approach is aimed at a forward looking dashcam installed inside the driver’s cabin” and makes no mention of any transmission of camera parameters. Petitioner does not explain why or how when the dashcam-based approach of Khan is combined with Choe, data representing the camera height and plane normal of

Khan would be transmitted along “the pitch, yaw, and roll” to camera 211 in Choe. Choe does not teach computing camera height and plane normal and since Khan teaches that these values are computed in the dashcam itself, there is no need to transmit them to the camera device as the claims require. Accordingly, claim 5 is patentable over the combination.

C. Ground 3 – The Choe/Workman Combination Fails to Render the Challenged Claims Obvious.

1. No Reason to Combine Choe with Workman but for Impermissible Hindsight

As described above, Choe uses a camera-hardware-based approach to determine horizon lines. *See* Ex_2003, ¶43. Workman (Ex_1011) is a generic computer vision reference that has no relation to the type of automotive system of Choe. Ex_2003, ¶¶71-73. To show motivation to combine these references, “[t]he consequent legal question, then, is whether [an automotive sensor system] designer of ordinary skill starting with [Choe] would have found it obvious to use [Workman’s image-trained predictive models to identify a horizon line].” *See KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 424 (2007). Here again, the proper definition of the relevant automotive-focused POSITA is critical. *See* Ex_2003, ¶35. A designer of ordinary skill in the automotive systems field with would not

have found it obvious to use Workman’s CNN approach to replace Choe’s camera-hardware based horizon line determination. *See* Ex_2003, ¶72.

Petitioner asserts that “if PO alleges that Choe does not explicitly disclose which predictive models it uses or whether it uses predictive models to identify the horizon line, a POSA would have searched for references that use predictive models and how such models were used.” Pet. at 47. Choe’s problem is not that it fails to explicitly disclose which predictive models it uses—Choe consistently describes that “a horizon line is determined based on the camera’s hardware settings.” Ex_1005 at [0015]; Ex_2003 ¶47. Choe references “predictive models” along with “sets of rules” and “algorithms.” Ex_1005, [0030]. But, unlike the rules and algorithms, “Choe does not actually describe how ‘predictive models’ are used for any purpose.” Ex_2003, ¶90. “The only teaching regarding predictive models in Choe is that they are ‘based on driving statistics’ and ‘generated or trained’ by ‘machine learning engine 122.’” *Id.* at ¶53. Simply disclosing driving-statistics-based predictive models does not motivate a POSITA to look for any kind of predictive models specifically to identify horizon lines. *See id.* at ¶74. Even assuming arguendo, that Choe teaches the use of “algorithms/models” for sensor calibration, which it does not, sensor calibration algorithms in Choe are only used “to determine a set of calibration parameters”; not identifying lines in video as Petitioner alleges. *See* Ex_1005, [0029], [0030], and [0044]; *see also* Ex_2003,

¶¶48-50. “Choe does not identify any shortcomings with its camera-hardware based approach to determining the horizon line or the need for using predictive models for this purpose. Nor does Choe identify or suggest any problem or other need to improve its sensor calibration approach in any way.” 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.” *Id.*

In the I.D., the Board noted that the fact 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)” does not impact the motivation to combine analysis because “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.” I.D., p.12 (citing *Intel Corp. v. Qualcomm Inc.*, 21 F.4th 784, 800 (Fed. Cir. 2021)).

Patent Owner respectfully disagrees. *Intel* involved an identified shortcoming or known problem as the motivating reason to combine the references in the prior art. What the Court in *Intel* was discussing as what may be the “best

option” or a “suitable option” refers to a solution to a known problem or shortcoming identified in the prior art, something Petitioner failed to do here. 21 F.4th at 800 (citing *PAR Pharm., Inc. v. TWI Pharms., Inc.*, 773 F.3d 1186, 1197-98 (Fed. Cir. 2014)).

For example, in the *PAR* case cited by *Intel*, “the district court concluded that the **known high viscosity and high interpatient variability of Megace OS** would have motivated ‘a person skilled in the art to create a method of treatment using nanoparticles.’” 773 F.3d at 1192. The patentee argued that there was no motivation to combine because “there were better methods available to address” the viscosity problem than the combined NanoCrystal technology. *Id.* But the Court concluded that “[t]here is no question, based on the disclosures in the prior art, that the NanoCrystal technology presented a **suitable option** for reducing interpatient variability and viscosity in megestrol formulations.” *Id.* at 1199. And thus, the known viscosity problem motivated the combination with the NanoCrystal technology despite better method being available. *Id.*

Intel similarly identified a shortcoming in the prior art as the motivation “to combine Der with Burgener”; “**the ‘feedthrough problem ... [an] expected negative consequence of disabling Der’s variable gain mixer.’**” *Intel*, 21 F.4th at 799. The Court found that if a “less effective” option to solve the identified problem is recognized to be a “suitable option,” while not necessarily “the best

option,” motivation to combine the less effective solution with the reference identifying the problem may still exist. *Id.* at 800. Even the motivation to combine in *KSR* was based on the identification of a “known problem,” the “wire chafing” problem. *KSR Int’l Co.*, 550 U.S. at 425 (finding that from the known wire chafing problems of Rixon, “the designer would know to place the sensor on a nonmoving part of the pedal structure. ... follow[ing] Smith in mounting the sensor on a pivot, thereby designing an adjustable electronic pedal covered by claim 4.”)

In contrast, as pointed out by Mr. Andrews and the PPOR, Petitioner here fails to identify any such “known problem” or shortcoming in the prior art to motivate the Choe-Workman combination. As described above, Choe’s predictive models are based on driving statistics, like speeds, accelerations, etc., and the alleged “algorithm/models” are to be used for sensor calibration “to determine a set of calibration parameters,” not for identifying lines. Mr. Andrews testified that “[t]here 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.” Ex_2003, ¶74. Thus, the fact that “Choe does not identify any shortcomings with its camera-hardware based approach to determining the horizon line” or “any problem or other need to improve its sensor calibration in any way” combined with Petitioner’s failure to identify any other reference that shows Choe’s system to suffer from any known

problem for which Workman provides a “suitable” solution, fails to show any motivation to combine the references. *See id.*

Instead, Petitioner relies on the very disclosure of the ’580 patent, albeit using the Khan and Ali versions, “to show that predictive models were already used to identify these lines.” Ex_1003, ¶145. Thus, “[i]t appears that [the expert] relied on the . . . patent itself as [his] roadmap for putting . . . pieces of a ‘jigsaw puzzle’ together.” *See* IPR2023-00656, Paper No. 33 (FWD), p.50, (October 2, 2024) (citing *InTouch Techs., Inc. v. VGO Commc’ns, Inc.*, 751 F.3d 1327, 1351 (Fed. Cir. 2014)). But Khan and Ali do not identify any “known problem” with the camera-hardware based approach to determine the horizon line used in Choe. Instead, Khan and Ali describe a geometric approach to identify the horizon line that is expressly distinguished in the ’580 patent specification. *See* Ex_2003, ¶¶69-70. Thus, Khan and Ali cannot provide a reason to use Workman’s CNN in Choe to identify the horizon line. Dr. Darrell’s opinion, in addition to being factually wrong, “failed to provide the glue to combine these references.” *InTouch Techs.*, 751 F.3d at 1348.

The Board relied on Dr. Darrell’s testimony in the I.D. to find motivation to combine Choe with Workman. I.D., pp.11-12. The Board found “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.* (citations omitted). But Dr. Darrell’s testimony is flawed because it is rooted in the wrong ordinary skill in the art, being viewed from the perspective of a computer vision expert, not an automotive system designer. Petitioner does not identify any instance where image-trained predictive models like Workman’s have been used to improve any automotive system or any other “similar device.” And, in any case, elements of a claim “being known” “is not sufficient [to motivate the combination] and is fraught with hindsight bias.” *See ActiveVideo Networks, Inc. v. Verizon Commc’ns, Inc.*, 694 F.3d 1312, 1327 (Fed. Cir. 2012). It remains “important to identify **a reason** that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does.” *See KSR*, 550 U.S. at 418.

A designer in the automotive systems art, as opposed POSITA proposed by Petitioner, would not recognize that Workman’s CNN approach would improve the camera-hardware approach of Choe to determine a horizon line. *See Ex_2003*, ¶75. Instead, the alleged improvements or benefits of Workman discussed in the Petition are unrelated to the system described in Choe or to any automotive sensor system whatsoever.

a. Alleged “state-of-the-art” results

Workman’s paper does not relate to any sort of automotive system. *See* Ex_2003, ¶76. The performance improvement referenced by Petitioner (Pet. at 47) is for Workman’s “state-of-the-art results on **the challenging HLW dataset** and two existing **benchmark datasets**.” Ex_1011, p.1; *see also* Ex_2003, ¶76. This provides no indication of whether a POSITA would know “*how* and *why* to use Workman’s predictive models to identify the horizon lines in Choe” because Choe does not use any sort of predictive model to identify horizon lines; it uses hardware settings. *See* Ex_2003, ¶¶76-77. Moreover, “[t]he alleged ‘algorithms/models 124’ of Choe ... are not used for identifying lines but to generate ‘calibration parameters,’ ... based on the machine learning processing of ‘driving statistics’ and have no relation or ability to work with the HLW dataset of ‘real-world images with labeled horizon lines’ or any other dataset of images.” *Id.*, ¶76.

There is no evidence that Choe’s hardware-based horizon line approach is not already “state-of-the-art” without the need for the combination with Workman. *Id.*, ¶77. Nothing in Choe identifies any problem for which achieving “state-of-the-art results on the challenging HLW dataset” provides a “suitable option” as a solution. *See Intel*, 21 F.4th at 800. A POSITA would not know how or why the Workman “state of the art” performance with the HLW dataset is relevant to the completely different Choe system. *Id.*

b. Alleged faster identification than other methods

Similarly, the “orders of magnitude faster” performance referenced by Petitioner (Pet. at 48) is irrelevant. Ex_2003, ¶78. Petitioner does not identify any known problem of Choe for which the “orders of magnitude faster” operation of Workman provides a “suitable” solution. *See Intel*, 21 F.4th at 800. The Workman paper does not mention or compare its performance with Choe or any similar camera calibration system. Ex_1011, p.1; *see also* Ex_2003, ¶78. Workman reports a faster, “milliseconds per image” performance when compared with “the approach of Lezama et al. [19]” requiring from “approximately 30 seconds” up to “1 minute per image” on the test image datasets. Ex_1011, p.3. But this comparison does not provide any indication of how Workman’s CNN approach performs compared to the camera-hardware-based approach of Choe. *See* Ex_2003, ¶78. Choe’s camera hardware settings approach may be faster than Workman’s CNN at determining the horizon line. *Id.* at ¶79. Further, “[g]iven this user-based refinement of the horizon line position, the difference between 30 seconds or milliseconds per image may not be that relevant to the Choe system.” *Id.* In any case, nothing in Workman indicates that a POSITA would know “*how* and *why*” to use Workman’s approach to identify the horizon lines in Choe’s system since Choe’s camera-hardware-based approach is completely different and could be faster and perform better. *See id.*

Workman is about single-picture horizon estimation in a dataset of photographs; “it says nothing about video pipelines, networking, overlay generation, annotator confirmation, or sending parameters back to the camera.” Ex_2003, ¶96. Thus, Dr. Darrell conclusory assertion that “[u]sing Workman’s predictive model to identify the horizon line would have therefore combined 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” is not supported by any facts. “[T]here is nothing ‘predictable’ about how the Workman CNN model would be incorporated into Choe’s system.” Ex_2003, ¶97.

In sum, despite Dr. Darrell’s testimony, Petitioner does not identify any motivation in Choe for a POSITA to go look for other publications disclosing the use of image-trained predictive models to identify lines, much less horizon lines, in a video. *See id.*, ¶80. “Choe discloses the use of predictive models based on driving statistics for sensor calibration and self-driving assistance but does not suggest their use for line identification in any way.” *Id.* “Workman is in an unrelated field as it does not pertain to automotive systems and provides no motivation to combine its image-trained models with a sensor calibration system like Choe’s.” *Id.* Thus, “[n]either the Petitioner nor its expert provide any rational for why a POSITA would have been motivated to change the ‘camera-hardware-

based’ approach for identifying the horizon line in Choe with the type of image-trained algorithms disclosed in Workman.” *Id.* While the cases discussed above rely on an identified “known problem” as the reason motivating a POSITA to look to the combined reference, Petitioner here has failed to do so. It is apparent that “Ppetitioner’s proposed combination of teachings plainly takes into account knowledge gleaned only from applicant’s disclosure, i.e., impermissible hindsight.” *See* IPR2023-00656, Paper No. 33 at 52 (citing *In re McLaughlin*, 443 F.2d 1392, 1313-14 (CCPA 1971); *see also ActiveVideo Networks*, 694 F.3d at 1327. As such, Ground 3 does not rely on a viable combination.

2. The Choe-Workman Combination Does Not Teach Limitations [1A]-[1E]

Because for Ground 3 Petitioner relies exclusively on Choe with respect to the limitations of claim 1 other than [1B], given that, as shown above with reference to Ground 1, Choe fails to disclose limitations [1A], [1C], [1D], and [1E] the Choe/Workman combination similarly fails to disclose those limitations. Thus, even if the combination disclosed limitation [1B], which it does not, it still fails to render claim 1 obvious for those additional reasons.

The Board also found that “[a]part 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.” I.D., p.11. However, as the Board noted, limitation [1B] requires identifying the horizon line **in a video**, something Workman does not describe. Petitioner does not assert that Workman identifies a horizon line in a video. Instead, it relies on its analysis of Choe in Ground 1 as supporting its Ground 3 arguments. But this analysis does not provide such support.

As described above with reference to Ground 1, Choe does not describe identifying horizon lines in video. Any predictive models in Choe, at best, may be trained with driving statistics to determine calibration parameters, not horizon lines in a video. Ex_2003, ¶¶51-53. “Choe does not teach or suggest the use of a predictive model for any purpose, much less for determining a horizon line in video images.” *Id.*, ¶53. To determine the horizon line, Choe teaches the use of hardware parameters of the camera, not the use of predictive models with video. *Id.*, ¶54. Further, while Choe refers to capturing video by a video camera, Choe’s processing operates on a single-frame basis. Ex_2003, ¶86. There is no description or evidence provided in the Petition that shows Choe’s identification of a horizon line in a video comprising a set of frames as required by claim 1.

Further, while Petitioner does not even argue the operation on video being disclosed in Workman, Workman’s teachings are exclusively based on the use of

“a large dataset of real-world images with labeled horizon lines, captured in a diverse set of environments.” Ex_1011, p. 2. Workman’s “CNNs expect the input images to have a fixed size and a square aspect ratio.” *Id.* at 6. Workman reports experimenting “with reshaping the image to be square, but the resulting networks were far less accurate.” *Id.* Workman does not mention whether its techniques are extensible to identifying lines in a video instead of these highly specific “input images” and at no point does it describe “identifying one or more lines **in a video**” comprising **a set** of image frames as [1B] requires. In fact, such a substantial change could not only result in “far less accurate” resulting networks, but based on the performance described in Workman, its CNNs “requiring ... milliseconds per image,” it is unclear whether Workman’s approach could be used with Choe’s captured video or with any typical video, with 60 or more frames per second, which would require the horizon line to be determined in less than 16 milliseconds per frame. *See* Ex_1011, p.2. Workman clearly does not disclose any such operation. There is simply no evidence in the Petition to support this conclusion, much less a showing of a “predictable” result.

Accordingly, even if the combination of Choe with Workman was proper, which is not, it still fails to show claim 1 to be unpatentable as it does not disclose limitations [1A]-[1E].

3. The Choe-Workman Combination Does Not Teach Claims 2-4

Petitioner does not specifically address claims 2-4 in connection with Ground 3 beyond relying on its arguments regarding Choe for Ground 1. Pet. at 49. As discussed above, Choe fails to teach or suggest the limitations of Claims 2-4, thus for the same reason, the Choe-Workman combination also fails to show Claims 2-4 to be unpatentable.

In addition, given the reliance on Workman to supply the “predictive model” of element [1B], Ground 3 also fails with respect to Claims 2 and 3 for an additional reason. For example, with reference to Claims 2 and 3, Workman does not describe how “**the** predictive model” can be used to identify “at least one lane line of a roadway” (claim 2) or to “predict at least one camera parameter” (claim 3). Workman describes “the application of convolutional neural networks for directly estimating the horizon line” in “input images [with] a fixed size and a square aspect ratio.” Ex_1011, pp.1,6. Petitioner fails to address how these CNNs described in Workman could possibly be also used to identify roadway lane lines or camera parameters; neither Workman nor Choe describe such use. Accordingly, claims 2 and 3 are also patentable over the Choe-Workman combination for this additional reason.

D. Ground 4 – Claims 5-7 are Patentable Over the Choe/Westmacot Combination

1. Petitioner Does Not Allege Westmacot Discloses the Limitations of Claim 1 Missing in Choe.

Ground 4 challenges claims 5-7 based on the combination of Choe and Westmacot (Ex_1010). While not expressly stated, it appears that Petitioner's Ground 4 relies on Ground 1 with respect to the limitations of independent claim 1. Because Ground 4 relies on the failed allegations in Ground 1 with respect to Choe and claim 1, as already explained above, Ground 4 also fails as to dependent claims 5-7. Specifically, Petitioners do not identify any additional disclosure in Westmacot that would teach or suggest limitations [1A], [1B], [1C], [1D], or [1E]. Thus, for this reason, the Choe-Westmacot combination cannot render claims 5-7 obvious.

2. There is No Motivation to Combine Westmacot with Choe's System

Westmacot "relates to image annotation, such as the creation of annotated street road images which can be used (among other things) for training a machine learning road detection component." Ex_1010, p.3:5-7. Petitioner alleges that a POSITA would be motivated to combine Westmacot with Choe because Westmacot includes some formulas to compute camera height and road normal.

See Pet., p.53. However, the system described in Westmacot is wholly incompatible with Choe's camera calibration system. Ex_2003, ¶101.

Petitioner alleges that “[i]n Choe's camera calibration system, a POSA would have been motivated to calculate a camera height and road plane normal because the left and right lane lines are derived from equations that require the camera height (h) and the road plane normal (n).” Pet. at 53. Dr. Darrell more explicitly notes that “[i]n Choe's camera calibration system, a POSA would have been motivated to calculate ‘a camera height and road plane normal’ as taught in Westmacot because the left and right lane lines are derived from equations that require the camera height (h) and the road plane normal (n).” Ex_1003 at 161.

In essence, Petitioner alleges that a POSITA would be motivated to combine the equations of Westmacot in Choe's system because Westmacot uses the equations to compute lane lines. Ex_2003, ¶99. This circular argument “does not provide any motivation for a designer, starting with Choe, to use the equations provided in Westmacot” to compute lane lines. *Id.* The camera calibration system of Choe includes “a lane detector to detect one or more lanes. One or more lane lines are determined based on the first image by perception module 302.”

Ex_1005, ¶[0048]. But in Westmacot, “road or lane width may be determined based on one or more manual width adjustment inputs.” Ex_1010, p.4:24-25.

Therefore, Choe does not use the approach discussed in Westmacot for detection of

lane lines and “therefore the equations of Westmacot are not relevant to Choe’s lane line detection.” Ex_2003, ¶99. In short, “the Petition does not articulate any reason why these formulas to compute points in the road structure defined in Westmacot have any applicability or relevance to the ‘lane detector to detect one or more lanes’ in Choe’s system. A POSITA would neither be motivated to use these formulas in the system of Choe nor would there be any expectation of success in such a combination.” *Id.*

Another alleged motivation to combine Choe with Westmacot is that “[s]ince Choe’s camera calibration requires calculating the camera’s rotational orientation (pitch, yaw, and roll), a POSA would have understood that the system would need to compute these camera parameters.” Pet. at 54. But Choe describes that “[a] user can calibrate any of the sensors such as a pitch angle, a yaw angle, and/or a roll angle using an input device such as a keyboard or joystick to provide incremental calibration feedback, while displaying the calibration result on a display device concurrently. As a result, the user can visually ‘feel’ the calibration result based on user feedback.” Ex_1005, ¶[0014]. Thus, a POSITA would not have understood that the Choe system would need to compute these camera parameters using the formulas in Westmacot. Ex_2003, ¶100. “The approach in Westmacot is simply different.” *Id.*

In fact, a POSITA would not be motivated to combine Westmacot with Choe's camera calibration system because Westmacot teaches away for doing any camera calibration: "Preferably the expected road structure is determined using only information derived from image data captured by the image capture device ... without the use of any other vehicle sensor and **without any requiring any calibration of the image capture device.**" Ex_1010, p.5:25-31. This is precisely the opposite of what Choe teaches: the use of multiple sensors and calibration of the image capture device and the other sensors. Choe provides a sensor calibration system with a "perception module 302 [that] receives sensor data from a variety of sensors such as camera 211, LIDAR 215, and RADAR 214. ... an image processed by perception module 302 may be utilized by sensor calibration module 308 for sensor calibration." Ex_10005, ¶¶[0045]-[0046]. Thus, contrary to Petitioner's arguments, a POSITA would not be motivated to combine Choe's camera calibration system with Westmacot's image labeling system that operates "without requiring any calibration of the image capture device." Ex_2003, ¶101.

3. The Choe-Westmacot Combination Does Not Teach the Limitations of Claims 5-7

Because Ground 4 relies on the failed allegations in Ground 1 with respect to Choe and claim 1, as already explained above, Ground 4 also fails as to dependent claims 5-7.

In addition, with respect to Claim 5, Petitioner again fails to account for the dependency on claim 1: “**the** at least one camera parameter” that “comprises a camera height and road plane normal” must also be “comput[ed] ... based on the one or more lines” [1C] and “data representing the at least one camera parameter” must be transmitted to the camera device” [1G]. *See* Ex_1001 at claims 1 and 5. Petitioner admits that the disclosure of Westmacot teaches the opposite. Petitioner notes that “the left and right **lane lines are derived from** equations that require the camera height (h) and the road plane normal (n).” Pet. at 53. Thus, the “camera height” and “road normal vector” in Westmacot are not computed based on the one or more lines but rather the lane lines are derived from equations that use those camera parameters as input. *See* Ex_2003, ¶102. Moreover, the height and normal in Westmacot are not computed based on any lines identified with a predictive model as claims 5 and 1 require.

Moreover, Westmacot’s equations do not actually teach “computing at least one camera parameter based on the one or more lines ... wherein the at least one camera parameter comprises a camera height and road plane normal.” Ex_1001 at claims 1 and 5. The g_i equation shows the computation of road point g_i , not of the computation of the camera height h , which is an input to that equation. *See* Ex_1010, p.6:5; Ex_2003, ¶102. Instead, Westmacot teaches that “[t]he height may be **estimated** based on **an average height** of a reconstructed path of the image

capture device and a 3D road structure mesh computed from the images.” *Id.* at 7:2-4. “This has no application to the system of Choe since Choe does not reconstruct the path of the image capture device” and thus cannot use Westmacot’s approach or equations. Ex_2003, ¶102. Thus, the Choe-Westmacot combination does not disclose computing camera height or road plane normal based on the one or more lines identified by a predictive model as would be required to show claim 5 to be unpatentable.

E. Ground 5 – The Choe/Westmacot/Khan/Ali Combination Does Not Render the Challenged Claims Unpatentable.

Ground 5 relies on Petitioner’s arguments regarding Grounds 1, 2, and 4. Pet. at 73-74. For the same reasons explained above with respect to each of those grounds, Choe, Westmacot, Khan, and Ali in combination do not render the Challenged Claims obvious. The Choe-Westmacot combination is improper and does not show claims 5-7 to be obvious. The Choe-Khan-Ali combination is also improper and does not show claims 1-5 to be obvious. Thus, the Choe-Westmacot-Khan-Ali combination is also improper for the same reasons and still fail to show claims 1-7 to be obvious. In addition, Petitioner fails to provide any motivation of why a POSITA would combine Choe, Westmacot, Khan, and Ali all together. “Petitioner’s proposed combination of teachings plainly takes into account knowledge gleaned only from applicant’s disclosure, i.e., impermissible hindsight.” *See* IPR2023-00656, Paper No. 33, p.52 (citing *In re McLaughlin*, 443

F.2d 1392, 1313-14 (CCPA 1971); *see also ActiveVideo Networks*, 694 F.3d at 1327.

F. Ground 6 – Petitioner Does Not Identify Any Additional Motivation to Combine Workman or Westmacot with Choe.

Ground 6 relies on the combination of Choe with Westmacot, and Workman. Pet. at 74. Ground 6 relies on Petitioner’s arguments regarding Grounds 1, 2, and 3. Specifically, Petitioner asserts that “[a]s Ground 3 explains, a POSA would have been motivated to use Workman’s predictive models in Choe’s system. *Supra* Section VII.A. The same motivations to combine apply equally to the Choe-Westmacot combination with Workman.” Pet. at 75. Thus, Petitioner does not identify any additional motivation in Westmacot for the combination with Workman, or vice versa. Thus, for the same reasons explained above with respect to each of those grounds, Choe, Westmacot, and Workman in combination do not render the Challenged Claims obvious. Further, as explained with respect to Grounds 3 and 4 the combination of Choe with Workman and Westmacot is improperly based on impermissible hindsight and lacks motivation. And Petitioner fails to provide any motivation of why a POSITA would combine Choe with both Westmacot and Workman. Again, “Petitioner’s proposed combination of teachings plainly takes into account knowledge gleaned only from applicant’s disclosure, i.e., impermissible hindsight.” *See* IPR2023-00656, Paper No. 33, p.52

(citing *In re McLaughlin*, 443 F.2d 1392, 1313–14 (CCPA 1971); *see also ActiveVideo Networks*, 694 F.3d at 1327. Thus, Ground 6 also fails.

IV. **CONCLUSION**

For the reasons set forth above, Petitioner has failed to demonstrate that claims 1-7 are unpatentable over the prior art.

Respectfully submitted,

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CERTIFICATE OF COMPLIANCE WITH WORD COUNT

Pursuant to 37 C.F.R. § 42.24(d), I certify that this Patent Owner Response complies with the type-volume limits of 37 C.F.R. § 42.24(c)(1) because it contains 13,630 words, according to the word-processing system used to prepare this petition, excluding the parts of this response that are exempted by 37 C.F.R. § 42.24(c) (including the table of contents, a table of authorities, an exhibits list, a listing of facts, a certificate of service or this certificate of word count, or appendix of exhibits).

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CERTIFICATE OF SERVICE

The undersigned certifies that on November 19, 2025, a complete and entire copy of this PATENT OWNER RESPONSE was provided via electronic mail (by consent) to the Patent Owner by serving the correspondence address identified in the Mandatory Notices:

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