

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ARASHI VISION (U.S.) LLC (D/B/A INSTA360)
Petitioner,

v.

GOPRO, INC.
Patent Owner.

Case No. IPR2024-01052
U.S. Patent No. 11,336,832

PATENT OWNER'S RESPONSE

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PUBLIC VERSION**EXHIBIT LIST**

No.	Exhibit
2001	Declaration of Hassan Foroosh, Ph.D.
2002	<i>Curriculum vitae</i> of Hassan Foroosh, Ph.D.
2003	Chinese Pat. App. 112804444 B
2004	Certified Translation of Chinese Pat. App. 112804444 B
2005	“HERO9 Black – In-Camera Horizon Leveling,” produced as GOPRO_00059907 in <i>In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith</i> , Inv. No. 337-TA-1400
2006	Complaint, <i>In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith</i> , Inv. No. 337-TA-1400
2007	E-mail from Alex S. Yap on October 9, 2024
2008	████████████████████ produced as GP_GOPRO_00050248_T1 in <i>In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith</i> , Inv. No. 337-TA-1400
2009-2017	Intentionally Left Blank
2018	████████████████████ produced as GOPRO_00019926 in <i>In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith</i> , Inv. No. 337-TA-1400
2019	████████████████████ produced as GOPRO_00063381 in <i>In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith</i> , Inv. No. 337-TA-1400
2020	Declaration of Patrick T. Schmidt in Support of Patent Owner’s Motion for <i>Pro Hac Vice</i> Admission
2021	Supplemental Declaration of Hassan Foroosh Ph.D.

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2022	Transcript of the Deposition of Dr. Aggelos K. Katsaggelos, taken April 11, 2025
2023	“What is GoPro SuperView?”, available at https://actioncamphotographer.com/gopro-superview/
2024	Declaration of Pablo Lema
2025	Joint Stipulation Regarding Representative Domestic Industry Products, filed in <i>In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith</i> , Inv. No. 337-TA-1400
2026	Transcript of the Deposition of Dr. Aggelos K. Katsaggelos, taken March 28, 2025
2027	Respondents Insta360’s Proposed Claim Constructions from <i>In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith</i> , Inv. No. 337-TA-1400
2028	“HERO12 Black: Video Settings and Resolutions,” found at https://community.gopro.com/s/article/HERO12-Black-Video-Settings-And-Resolutions?language=en_US
2029	Excerpts of source code produced as GOPRO_SC0633 in <i>In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith</i> , Inv. No. 337-TA-1400
2030	Written Opinion of the International Searching Authority for PCT/US2015/031600
2031	“Horizon Lock,” entered as CX-1436 in <i>In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith</i> , Inv. No. 337-TA-1400
2032	████████████████████ entered as CX-0845C in <i>In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith</i> , Inv. No. 337-TA-1400, with certified translation
2033	████████████████████ entered as CX-0846C in <i>In the Matter of Certain Cameras,</i>

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	<i>Camera Systems, and Accessories Used Therewith</i> , Inv. No. 337-TA-1400, with certified translation
2034	entered as CX-1020C in <i>In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith</i> , Inv. No. 337-TA-1400, with certified translation
2035	entered as CX-0892C in <i>In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith</i> , Inv. No. 337-TA-1400, with certified translation
2036	entered as JX-0037C in <i>In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith</i> , Inv. No. 337-TA-1400
2040	entered as CX-0590C in <i>In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith</i> , Inv. No. 337-TA-1400

PUBLIC VERSION**I. INTRODUCTION**

Founded in 2002 in San Mateo, California, Patent Owner GoPro, Inc. (“Patent Owner” or “GoPro”) is a pioneer in developing cameras and digital imaging techniques. As a company built on innovation, GoPro has received numerous patents protecting its technological improvements, including for cameras designed for wide-angle views and dynamic, high-motion activities. GoPro has become a leader in the industry, receiving scores of industry praise from professionals and consumers alike. Petitioner is a recent entrant into this market that has found significant success by copying GoPro’s designs and innovations, including the patent at issue in this proceeding.

U.S. Patent No. 11,336,832 (the “’832 patent”) discloses a novel system for performing horizon-leveling of a recorded video using rotational data. In prior art systems, horizon-leveling was accomplished using rudimentary methods such as by recording the camera orientation at the beginning of a capture duration and then using this recorded orientation to apply a correction factor and constant cropping across all frames of the video. While this conventional methodology works well for traditional cameras capturing still images or videos with limited rotational motion, it was not suitable for the action cameras that GoPro developed which tend to experience a much greater

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intensity of motion causing the camera orientation with respect to the horizon to potentially vary significantly from frame-to-frame.

The '832 patent teaches a method to address this issue with a more sophisticated horizon leveling solution. Specifically, the claimed approach obtains “rotational position information for the video ... characterizing rotational positions of the image capture device as a function of progress through the capture duration.” This rotational data is used to “***determine a viewing window***” for each frame as “a function of progress through the progress length.”

This “determination of a viewing window,” which is captured by independent claims 1 and 11 of the '832 patent, recognizes that for a system experiencing dramatic motion around the axis of the horizon, a dynamic cropping operations is required based on each unique rotational position capture during the capture duration. Also, “determining the viewing window” requires a careful consideration of the viewing window size, rotation, location, and impact on image zoom, all as a function of progress through the progress length. These considerations are addressed by '832 patent dependent claims 7-10 and 17-20.

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Finally, the '832 patent introduced the novel concept of introducing distortion to the image that is horizon levelled. Conventionally, image distortion was considered undesirable and designers of image processing systems sought to avoid and eliminate distortion. GoPro, however, recognized that a degree of image distortion could help to advance the goal of horizon-leveling by causing straight lines to appear slightly curved and thus reduce the impact of a slightly off-axis horizon. This approach proved particularly useful in situations where viewing window placement alone could not perfectly align the image with the axis of the horizon. These innovations are captured in dependent claims 3-6 and 13-16.

Petitioner's prior art fails to disclose the combination of GoPro's claimed horizon leveling improvements. The prior art, at most, teaches conventional horizon leveling, which was generally limited in its ability to measure and correct camera rotation as a function of progress through the progress length. Petitioner's references either teach the application of a one-time orientation measurement (*e.g.*, Thomasson), or they fail to fully disclose the concept of a viewing window that is dynamic in size (claims 7-8 and 17-18), rotation (claims 9 and 19), and location (claims 10 and 20) (*e.g.*, Pacurariu, Voss, and Derbanne).

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In addition, none of the prior art discloses performing horizon leveling on purposely distorted images, such as images with barrel or pincushion distortion (claims 3-6 and 13-16). The only reference Petitioner relies on for such distortion, Watanabe, does not even involve horizon leveling and, besides, it fails to teach that the input distortion is preserved during and after processing, or that it has any impact on an off-axis horizon. Instead, Watanabe expressly teaches **removal** of the distortion before cropping the image to correct **image shake**, and only then adding a **different** distortion based the new crop.

II. THE '832 PATENT

A. Summary (Ex. 2021, ¶¶34-38)

The '832 patent is directed to a novel method for horizon-leveling videos. The claims and specification describe collecting rotational information from various sensors, including accelerometers and gyroscopes, on a frame-by-frame basis. Ex. 1001, 8:9-11 (“[T]he position may include gyroscope data and/or accelerometer data per individual video frames”). Using such rotational information, a viewing window is generated for each frame. *Id.*, 6:42-60, 8:6-14. The “placement (rotation, location, shape, and/or size) of the viewing window” is determined using the per-frame rotational

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data. *Id.*, 6:52-60. The “viewing window” is “determined so that the visual content with the presentation/generated video appears to be leveled with respect to [the] horizon.” *Id.*, 6:49-52.

The patent further teaches several important considerations with resizing the viewing window from frame-to-frame. The viewing window must match the desired output aspect ratio while also fitting within the optical field of view of the captured content. Thus, the patent teaches that “[t]he size of the viewing window may be determined to take into account the maximum size of the viewing window allowed based on the image capture device rotation.” Ex. 1001, 17:60-62, 18:4-21.

Dynamically resizing the viewing window, however, can create a zoom effect that “may be very pronounced within the horizon-level visual content” for an “image capture device undergoing jittery/rapid rotations.” *Id.*, 18:34-37. The patent therefore teaches the desirability of “smoothing” the changes in the maximum viewing window size “as the function of progress through the progress length” in order to create “a more cinematic feel to the horizon-leveled video.” *Id.*, 19:16-42; *see also* Fig. 6C. In some implementation, “the viewing window may be **artificially** made smaller and/or larger ... during moments that do not require the change in viewing window size to ramp-up

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and/or ramp-down to the needed viewing window size.” *Id.*, 19:38-42. This ability to artificially manipulate the sizing of the viewing window allows the system to simulate changes in zoom and create a more pleasing horizon-leveled video experience. *Id.*, 19:43-20:7.

In addition, the patent recognizes that its approach may result in “imperfect horizon leveling” as the “amount of rotation performed on the visual content may be inaccurate and/or imprecise.” Ex. 1001, 21:54-59. Thus, the patent teaches that “[a]n off-axis horizon may be less noticeable within visual content that includes a distortion than within visual content that does not include the distortion.” *Id.*, 21:60-62. Including distortion “may create curves within the image, which may make an off-axis horizon less noticeable than in an image without distortion.” *Id.*, 22:15-18.

III. LEVEL OF ORDINARY SKILL IN THE ART

For purposes of this response, Patent Owner applies Petitioner’s proposed level of skill. Ex. 2021, ¶¶19-20. Patent Owner’s expert, Dr. Hassan Foroosh, was a POSITA under Petitioner’s definition at the time of the ’832 patent. *Id.*, ¶21.

PUBLIC VERSION**IV. CLAIM CONSTRUCTION**

The Board’s Institution Decision construed “determin[ing] a viewing window for the visual content as a function of progress through the progress length” as “requiring determining a viewing window for different times of the video.” ID, 21. The Board further stated that “if the viewing window were determined only once and this single determination were applied to every frame of an entire video, this would not meet the recitation, even if the video could be played back.” ID, 19.

Patent Owner does not dispute the Board’s construction. Patent Owner also does not believe any other term requires express construction. Ex. 2021, ¶¶36-40.

V. GROUNDS 1 AND 2: THOMASON, PACURARIU, AND WATANABE

In the parallel ITC investigation, Patent Owner declined to assert the independent claims 1 and 11. As a result, Patent Owner has generally focused its arguments here on dependent claims 3-8 and 10, as well as their corresponding method claims. However, as discussed below, Petitioner has also failed to establish that the prior art obviates certain elements of the independent claims and has failed to provide an adequate motivation to combine.

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Petitioner’s combination of Thomason, Pacurariu and Watanabe fail to render obvious all of the Challenged Claims for at least three reasons: (1) for claims 3 through 6 and 13 through 16, Watanabe fails to disclose performing horizon leveling on distorted visual content—instead, Watanabe teaches **removal** of the distortion before processing and adding a **different** distortion after processing, (2) for claims 7 through 8 and 17 through 18, neither Thomason nor Pacurariu teach determination of a **size** of the viewing window as a function of progress through the progress length (3) for claims 10 and 20, neither Thomason nor Pacurariu disclose determining the **location** of the viewing window—they only teach that the viewing window is located in the center of the image and rotated, and (4) Thomason does not alone render any challenged claim obvious, and a POSITA would not have been motivated to combine Thomason and Pacurariu. Ex. 2021, ¶¶41-44

A. Summary of References

1. Thomason

Thomason is directed to a rudimentary method for horizon leveling an image from a camera. Although Thomason describes that its methods apply to “video” cameras, there is no indication that Thomason horizon levels a

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video on a frame-by-frame basis, or even performs anything other than a one-time orientation measurement and correction. Ex. 2021, ¶45.

Thomason’s method “measures the angle of the camera” by using an accelerometer. Ex. 1004, ¶29. Notably, an accelerometer can, at best, crudely infer rotation about just a single axis. Ex. 2021, ¶46. It is therefore apparent that Thomason’s camera is not intended to be hand-held operated. Thomason uses a rotation angle (singular) from the accelerometer data to apply a one-time correction to a captured image. Ex. 1004, ¶36. Thomason has no ability to dynamically change the size of cropped image portion—rather, Thomasson teaches only that the image is “cropped to eliminate blank space.” *Id.* This is depicted in Figure 3, reproduced below.

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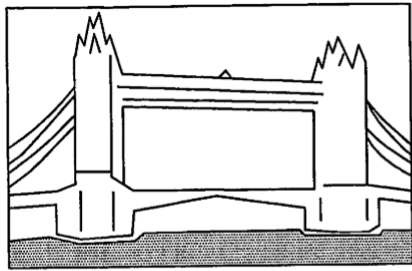


Fig.3a

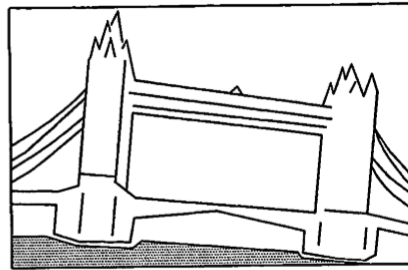


Fig.3b

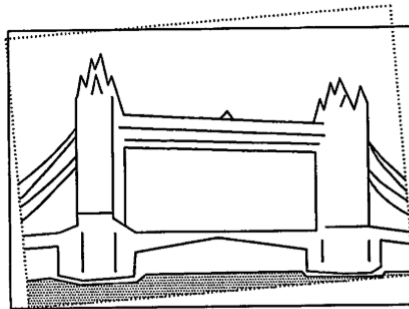


Fig.3c

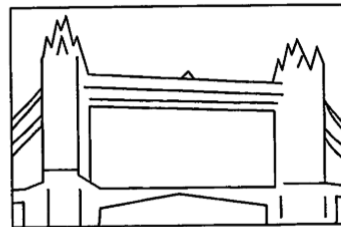


Fig.3d

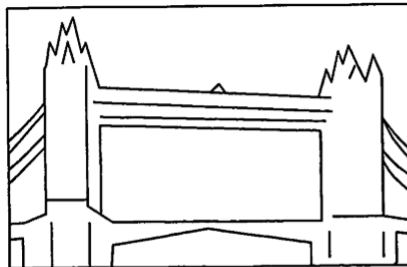
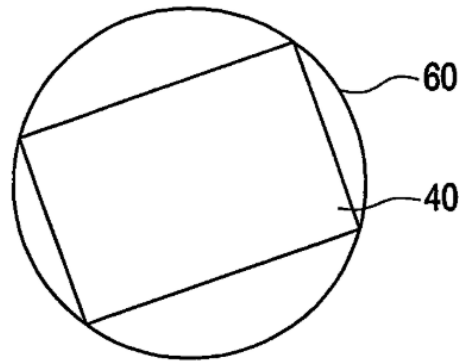
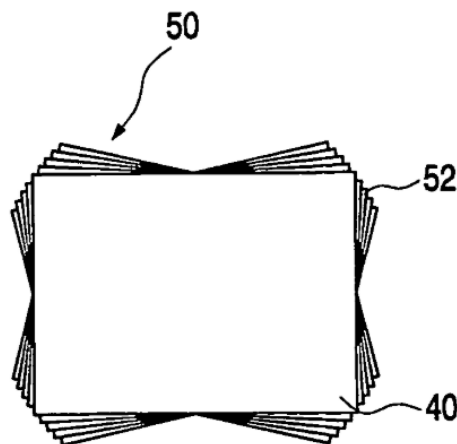


Fig.3e

In fact, Thomason expressly avoids any attempt to provide a means for a dynamically sized crop, teaching instead a “circular sensor” where “[r]otation to any angle is possible without size reduction.” Ex. 1004, ¶39; Ex. 2021, ¶47.

PUBLIC VERSION**Fig.5**

Thomason also does not dynamically “locate” a viewing window. Rather, the cropped portion is always located in the center of the original image and rotated, as shown in Figure 4. Ex. 2021, ¶48.

**Fig.4****2. Pacurariu**

Pacurariu also describes a rudimentary method for horizon-leveling. Although Pacurariu describes collecting rotational information on a per-frame basis, its horizon-leveling approach still lacks determination of a viewing

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window as a function of progress through the progress length as required by the claims of the '832 patent. Ex. 2021, ¶49.

Specifically, Pacurariu teaches an “image area” (305) that defines a number of image sensor elements within the image sensor array (300). Ex. 1005, ¶40. While Pacurariu states that the “aspect ratio, size, position, and/or orientation of the image area 305 may be changed at any time” and that it is “dynamic,” it does not teach the ability to alter these parameters as a function of the progress length. Ex. 2021, ¶50.

Indeed, Figure 5A and its associated disclosure teaches a “reduced area of the image sensor 305” to “compensate for any rotation.” *Id.* ¶44. This demonstrates that Pacurariu did not contemplate a dynamic resizing of the image sensor 305, as a function of progress through the progress length. Ex. 2021, ¶50.

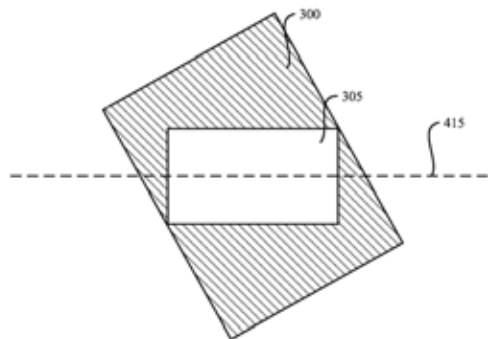


Figure 5A

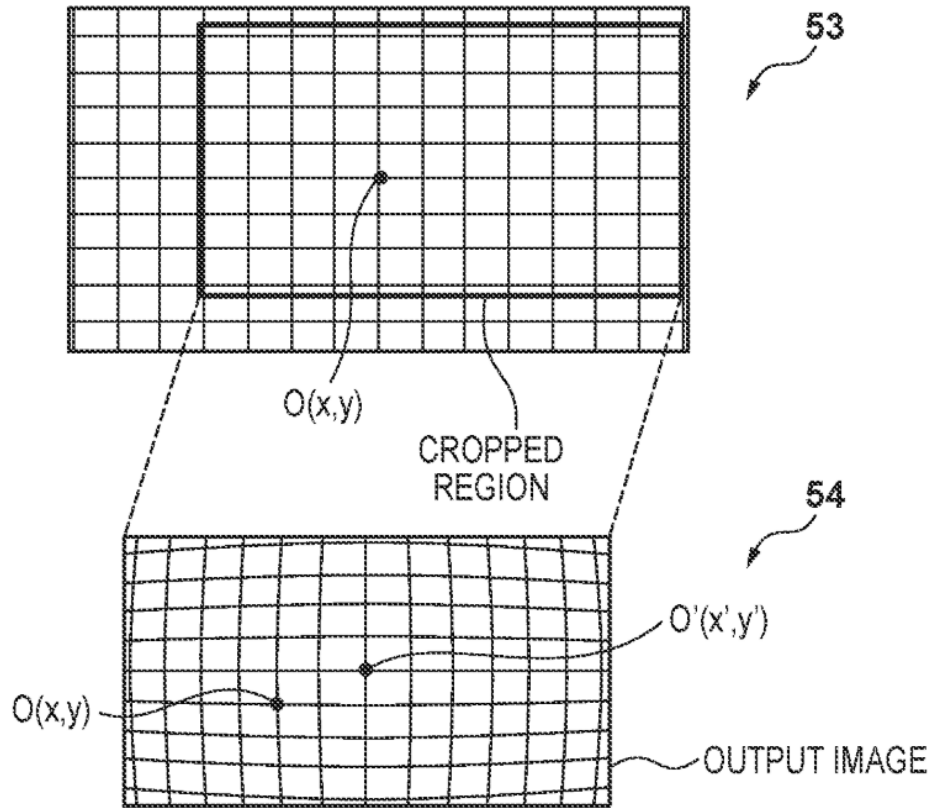
PUBLIC VERSION**3. Watanabe**

Watanabe is not directed to horizon-leveling. Ex. 2021, ¶¶51-52. Instead, Watanabe teaches a method for performing “image shake correction” on an image containing distortion from a wide-angle lens, such as barrel distortion from a fisheye lens. Ex. 1006, 9:33-35. Watanabe’s process is to distortion correction to *remove the distortion*. Ex. 1006, 11:21-23. The system then performs “image shake correction” by cropping the image. Ex. 1006, 11:26-30. Once the image is cropped, Watanabe’s system “adds a distortion effect.” Ex. 1006, 11:37-39.

Because the cropped portion of the image is often located off-center from the original image, Watanabe describes that the added distortion is modified from the original fisheye lens distortion in at least two ways: (1) the amount of distortion is modified, and (2) the center of the distortion is modified. Ex. 2021, ¶53. For example, Watanabe describes that the added distortion has an “effect of about 30% of the degree of the distortion of the photographing lens.” Ex. 1006, 9:64-10:2. Watanabe also discloses that the center of the distortion is corrected to accommodate the new center of the cropped image. For example, because the center of the original image ($O(x,y)$) “do not match coordinate (x',y') of a center O' of the image subjected to

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image shake correction,” the added distortion instead uses the new center coordinates, as shown below from Figure 5. *Id.*, 11:39-46.



B. Claims 3-6 / 13-16: No Distortion Within the Visual Content

Petitioner relies on combining Thomason and Pacurariu with Watanabe. Petitioner’s argument fails for several reasons. Ex. 2021, ¶54. *First, none* of Petitioner’s references disclose reducing the impact of an off-axis horizon by including distortion, as recited in claim 3. *Second*, Watanabe **removes** the original distortion and adds a completely different distortion. *Third*, a POSITA would not be motivated to combine Thomason and Watanabe

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because Watanabe’s technique is specific to fisheye lenses, which Thomason and Pacurariu do not teach. Also, as Petitioner’s own expert admitted, Watanabe’s algorithm is particular to its image shake removal, and there is thus no indication that this algorithm is suitable for different image processing techniques. *Fourth*, for claim 6, Petitioner’s combination utterly fails to show any disclosure for adding distortion to an image before it is horizon-leveled.

1. The proposed combination fails to teach the distortion reducing the impact of an off-axis horizon

Claim 3 recites that the “visual content includes a distortion” and that “the distortion of the visual content reducing impact of an off-axis horizon depicted within the horizon-leveled visual content.” Claim 4 further specifies that the distortion is a “barrel distortion or pincushion distortion.” Specifically, the inventors of the ’832 patent discovered that a barrel or pincushion distortion may be added to the visual content to “reduce the impact of imperfect horizon leveling” (*i.e.*, reduce the impact of an off-axis horizon). Ex. 1001, 21:60-22:25, Fig. 7; Ex. 2021, ¶55.

None of Petitioner’s references are directed at the problem of reducing the impact of an off-axis horizon, let alone disclose including a distortion to reduce impact of an off-axis horizon. Ex. 2021, ¶56. Watanabe does not disclose horizon leveling or an off-axis horizon. At deposition, Petitioner’s

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expert admitted that “I do not see horizon leveling” in the disclosures of Watanabe he relied upon. Ex. 2022, 43:17-19. Nor is horizon leveling discussed elsewhere in Watanabe. Similarly, Thomason and Pacurariu do not address the problem of an off-axis horizon or suggest the use of a distortion to reduce its impact.

Indeed, Petitioner relies upon the conclusory assertion of its expert that “[a] POSITA would have understood that the distortion of the visual content can reduce impact of an off-axis horizon depicted within the horizon-leveled visual content.” Ex. 1002, ¶153. Petitioner’s expert does not cite to any evidence for this conclusory assertion or otherwise present a reference suggesting that the impact of an off-axis horizon may be reduced by including distortion. And Petitioner admits that such distortion might only potentially reduce the impact—Petitioner provides no explanation for how Watanabe’s distortion **would actually** impact an off-axis horizon as required by the claim. Moreover, since Thomason and Pacurariu do not disclose that their algorithms result in an off-axis horizon, and Petitioner does not even assert that they do, the combination of references simply does not result in any reduction of impact of a non-existent off-axis horizon. Ex. 2021, ¶57. In other words, Petitioner’s claim of obviousness fails because neither Watanabe (nor any

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other reference) discloses or teaches including a distortion to reduce the impact of an off-axis horizon.

2. The proposed combination fails to teach that the distortion remains in the image

Claim 3 requires that the “visual content includes a ***distortion***,” such as a barrel distortion or pincushion distortion. Claim 3 also requires that “***the*** distortion ... reduc[es] impact of an off-axis horizon depicted within the horizon-leveled visual content.” In other words, Claim 3 requires that the ***original*** visual content upon which horizon leveling is performed contain a distortion, and that this distortion remain in the “horizon-leveled visual content” in order to reduce the impact of imperfect horizon leveling. Ex. 2021, ¶¶58-59.

Claims 5 and 6 further provide that the distortion of the visual content can either be introduced by the “wide field of view optical element,” *i.e.* a lens (claim 5), or added to “non-distorted visual content” (claim 6).

As Petitioner admits, Watanabe’s lens distortion does not remain after the image is processed. Ex. 2021, ¶60. Instead, when Watanabe processes an image containing a “barrel distortion” caused by a fisheye lens, the very first step of its process is to “perform[] distortion correction to ***remove the distortion***.” Pet. 47 (citing Ex. 1006, 11:9, 11:13, 11:21-23). In Watanabe,

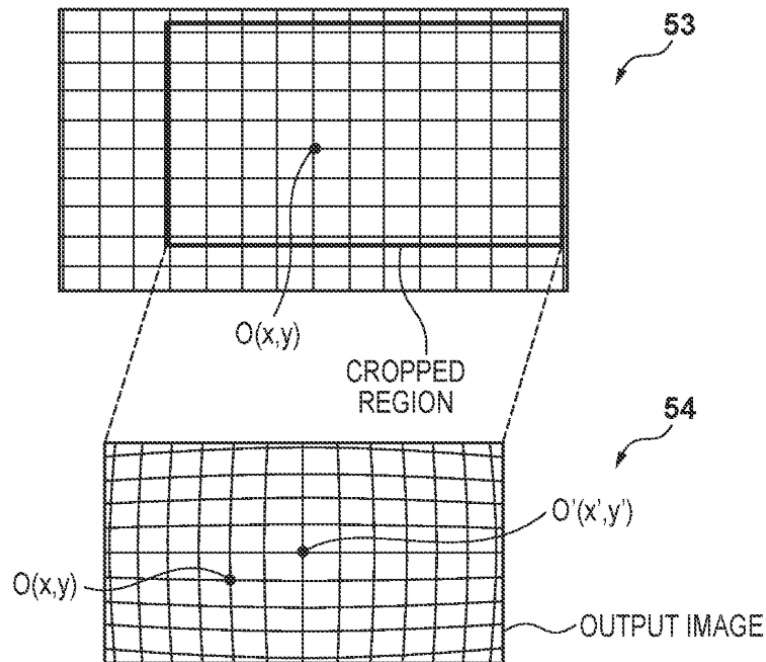
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the system then performs “image shake correction” by cropping the image. Pet. 47-48; Ex. 1006, 11:26-30. Once the image is cropped, Watanabe’s system “adds a distortion effect.” Ex. 1006, 11:37-39.

However, Watanabe does not perform its image shake correction on the originally distorted content. And, the distortion that is reintroduced into the output is ***significantly different*** from the original barrel distortion of the fisheye lens. Ex. 2021, ¶61. Specifically, Watanabe describes that the added distortion is modified from the original fisheye lens distortion by (1) significantly reducing the amount of distortion, and (2) moving the center of the distortion. Watanabe describes these modifications as “correction[s].” Ex. 1006, 6:35-39.

Watanabe describes that the amount of added distortion is reduced to “about 30%” compared to the original distortion from the lens. Ex. 1006, 9:64-10:2. Watanabe also discloses that the center of the distortion is corrected to accommodate the new center of the cropped image. For example, because the center of the original image ($O(x,y)$) “do not match coordinate (x',y') of a center O' of the image subjected to image shake correction,” the added distortion instead uses the new center coordinates, as shown below from Figure 5. *Id.*, 11:39-46; Ex. 2021, ¶62.

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The Petition proposes that Watanabe’s algorithm be applied to Thomason-Pacurariu such that a barrel distortion be removed and then a different distortion added in after image processing. Ex. 2021, ¶63. Specifically, according to Petitioner, the purported combination “may **remove** image distortions from a captured image (*e.g.*, caused by characteristics of the image sensor) as taught by Watanabe, obtain horizon-leveled visual content as taught by Thomason and Pacurariu, and ***intentionally add certain distortions*** such that the resulting image appear more natural looking ***as taught by Watanabe.***” Pet. 50. This simply fails to meet the language of the claim, which requires “the distortion” of the un-leveled image to remain in the horizon-leveled image in order to “impact” its horizon. The claim does not

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accommodate a removal of the original distortion prior to the image processing step. Ex. 2021, ¶64. Nor does it cover replacement of the original distortion with significantly less distortion. *Id.*

Thus, Petitioner’s own articulation of the combination fails to establish that the combination meets the requirements of claim 3. Petitioner’s ground should be rejected on this basis alone.

3. A POSITA would not be motivated to combine Thomason-Pacurariu with Watanabe

Petitioner proposes that Thomason-Pacurariu be combined with Watanabe because it would “generate horizon-leveled video content that also appears more natural looking.” Pet. 50. This alleged motivation stems from Watanabe’s disclosure that its techniques “generate a moving image that appears natural after image shake correction.” Ex. 1006, 1:47-48.

The Petition, however, leaves out an important detail with respect to that teaching: Watanabe is clear that adding (significantly modified) barrel distortion results in a more “natural” image only because the *original* image had barrel distortion. Ex. 2021, ¶¶65-67. Specifically, Watanabe teaches that for an image taken with a fisheye lens, when distortion is corrected (as Watanabe’s technique teaches), “volume distortion occurs in which the image of an object reflected in a peripheral portion of an image appears to be

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enlarged, and thus an observer feels that something is amiss.” Ex. 1006, 9:35-39. In other words, removing the barrel distortion makes the image look unnatural only because of the specific manner in which the image was captured in Watanabe. Ex. 2021, ¶67.

In addition, Watanabe teaches that because each frame of the video is cropped to accommodate image shaking distortion, keeping the original barrel distortion results in the “peripheral portion of a moving image” to “change over time,” resulting in “a moving image that [] appear[s] unnatural when observed.” *Id.*, 10:30-34. Thus, Watanabe teaches adding a barrel distortion that is reoriented and has significantly less distortion, which results in a more natural image. Ex. 2021, ¶68.

Thus, contrary to Petitioner’s representation, Watanabe does not express some generalized motivation in the field to add distortion to videos to make them look “more natural.” Rather, Watanabe teaches that its ***specific*** technique results in a more natural image for two reasons: (1) removing the original distortion results in an unnatural look that is corrected when the new distortion is added, and (2) removing the original distortion and adding a “corrected” distortion with a reoriented center results in a more natural look because the distortion does not appear to change over the length of the video.

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Watanabe describes this as “correct[ing]” the original distortion. Ex. 1006, 6:35-39. In other words, it is the **original** distortion that is the direct cause of any unnatural look, and Watanabe teaches that **correcting** that distortion causes the image to look “more natural.” Ex. 2021, ¶¶69-70.

The conclusion that Watanabe fails to reflect any generalized motivation for introducing distortion is confirmed by Petitioner’s expert, who admitted that the original presence of the barrel distortion is an “important part” of Watanabe’s algorithm. Ex. 2022, 37:16-38:15; 32:8-21 (“All of these are specific algorithmic steps that are important.”). Dr. Katsaggelos explained that the initial presence of the barrel distortion is important for the algorithm, because “[y]ou need the model of how to add the barrel distortion, the model includes the distance of the camera of the objects, the distance from the center and so on and so forth.” *Id.*, 32:23-33:9.

There would be no motivation to incorporate any of the foregoing techniques from Watanabe into the Thomason-Pacurariu combination, because neither Thomason nor Pacurariu describe using a lens that causes barrel distortion. Ex. 2021, ¶71. As a result, Watanabe’s teaching of a more “natural” image simply does not apply to either Thomason or Pacurariu.

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Indeed, a POSITA would have considered it ***undesirable*** to add barrel distortion to an image that did not already have it, as the addition of such distortion was known to look ***unnatural*** for typical images. Ex. 2021, ¶72; Ex. 2026, 87:21-23 (“If one has to choose distortion or non-distortion, one probably would choose the non-distortion option.”); Ex. 2023, 6 (“[T]he highly distorted and compressed look [of barrel distortion] is going to appear strange. So you wouldn’t usually use it for standard people shots, for example, where it’s going to distort their face and body in a distracting way.”). Watanabe itself makes this clear by describing that such barrel distortion is a result of “aberration of a photographing lens,” and the entire motivation for Watanabe is to correct such a distortion. Ex. 1006, 9:10-44. In fact, Watanabe teaches that aberration must be dealt with when an image is shot using a fish-eye lens, but that “it is preferred that image distortion caused by aberration does not exist.” *Id.*

Nor would a POSITA be motivated to modify Watanabe’s algorithm to use Thomason or Pacurariu’s horizon-leveling. As Dr. Katsaggelo described, the “specific steps” of Watanabe’s algorithm “are important.” Ex. 2022, 32:8-21 (“It teaches to remove the distortion inclusion, how to remove the shaking distortion, how to add the pin cushion inclusion distortion. All of these are

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specific algorithmic steps that are important.”). Given their importance, a POSITA would not be motivated to make changes to Watanabe’s algorithm to instead use Thomason’s horizon-leveling instead of Watanabe’s image shake removal. Ex. 2021, ¶73.

Indeed, the entire purpose of Watanabe’s algorithm is to accommodate known issues with image shake correction, specifically “in the case of performing image shake correction on a moving image, the positional relationship between the optical axis of the imaging optical system and the center of each moving image frame changes over time ***due to image shake correction.***” Ex. 1006, 1:27-32. Notably, in Thomason and Pacurariu, the center of the image does ***not*** change, and therefore does not exhibit this problem with image shake correction described by Watanabe. Ex. 2021, ¶74. There is therefore no reason for Watanabe’s distortion correction to be applied to an image that is horizon-leveled in accordance with Thomason and Pacurariu.

4. **Thomason, Pacurariu, and Watanabe do not render obvious claim 6**

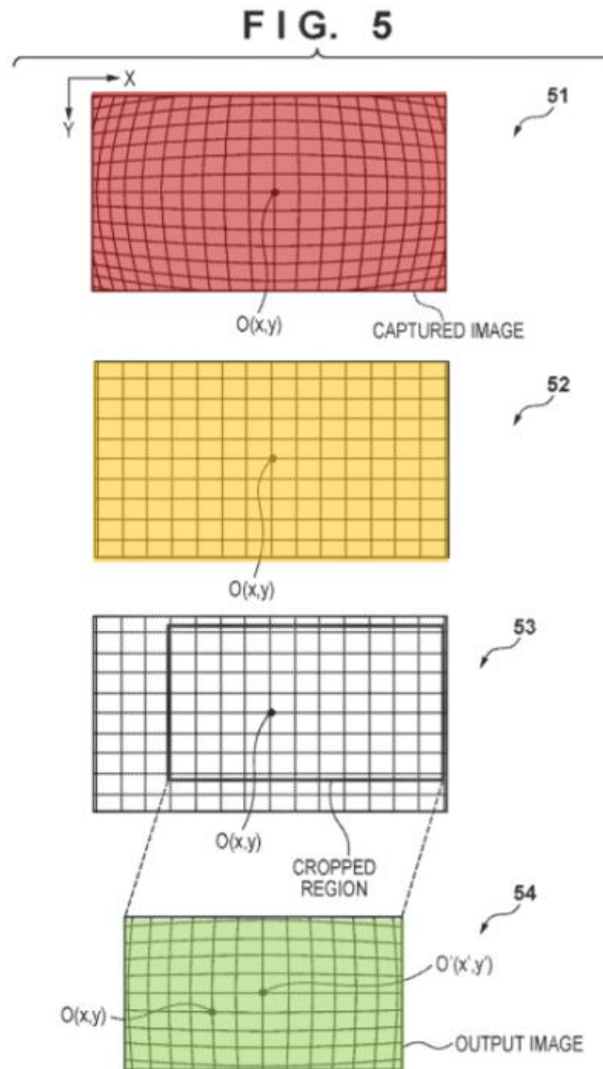
Claim 6 specifically requires that the distortion be applied to “non-distorted visual content,” as opposed to distortion caused by a lens (as claimed in claim 5). In particular, because of the antecedent basis of “visual content,”

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the distortion must be applied ***before*** the image is processed into the claimed “horizon-levelled visual content.”

Watanabe does not teach adding distortion to an image ***prior*** to image correction. Ex. 2021, ¶¶75-77. As discussed above, Watanabe teaches that the original distortion is caused by a fisheye lens, not added to the image. Instead, the Petition relies on the addition of distortion to the image that has already been corrected for image shake. Pet. 53 (“In Figure 5 below, the ***image 52*** is the ‘non-distorted visual content’ to which a distortion is applied.”).

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**Watanabe Figure 5 (annotated by Petitioner)**

As an initial matter, Watanabe does not teach applying distortion to “image 52.” Ex. 2021, ¶¶78-79. Instead, Watanabe teaches adding distortion to a “cropped region” of image 52. Ex. 1006, 11:37-54. Thus, under Petitioner’s own mapping, Watanabe does not teach this claim.

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Moreover, Petitioner’s claim 6 theory is plainly inconsistent with Petitioner’s articulation of the proposed combination for claim 3: “[T]he Thomason-Pacurariu-Watanabe combination may remove image distortions from a captured image (e.g., caused by characteristics of the image sensor) as taught by Watanabe, obtain horizon-leveled visual content as taught by Thomason and Pacurariu, and intentionally add certain distortions such that the resulting image appear more natural looking as taught by Watanabe.” Pet. 50. Yet for claim 6, Petitioner has proposed that the same combination for a limitation requiring that barrel distortion be applied **before** the image is horizon-leveled. Ex. 2021, ¶¶80.

Thus, Petitioner fails to show obviousness of claim 6, which requires that the distortion be applied **before** the visual content is horizon-leveled.

C. Claims 7 and 17: No Determining a “Size” of the Viewing Window

Claims 1 and 11 require “determin[ing] a viewing window for the visual content as a function of progress through the progress length.” Dependent claims 7 and 17 further recite that the determination of the viewing window includes determining “a **size** of the viewing window as the function of progress through the progress length.” Ex. 2021, ¶¶81-82.

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As discussed above, the Board construed the “determin[ing] a viewing window” limitation as “requiring determining a viewing window for different times of the video.” ID, 21. This decision was based on the Board’s analysis of the term “function of progress” mentioned in the claims and the specification. ID, 13-21. The Board noted that in the ’832 patent, “function of progress refers to different frames corresponding to different points in the video.” ID, 18. Accordingly, claims 7 and 17 require a determination of a size of the viewing window at “different points in the video.” Ex. 2021, ¶83.

Petitioner **only** relies on Thomason for these claims, and in particular its description of Figure 3. Pet. 37-39. Petitioner argues that “the size of the viewing window may be dependent on the rotational position of the camera—a more tilted camera angle may result in a smaller viewing window because there is less visual content in the image that may be horizon-leveled.” Pet. 38. However, Thomason never discloses that it determines a size of the viewing window for **multiple frames in a video**. Ex. 2021, ¶84. Petitioner’s assertion that the size of the viewing window is determined “for each image in the video” is not supported by any citation to Thomason but rather improper hindsight extrapolation from what Thomason actually teaches. Pet. 38.

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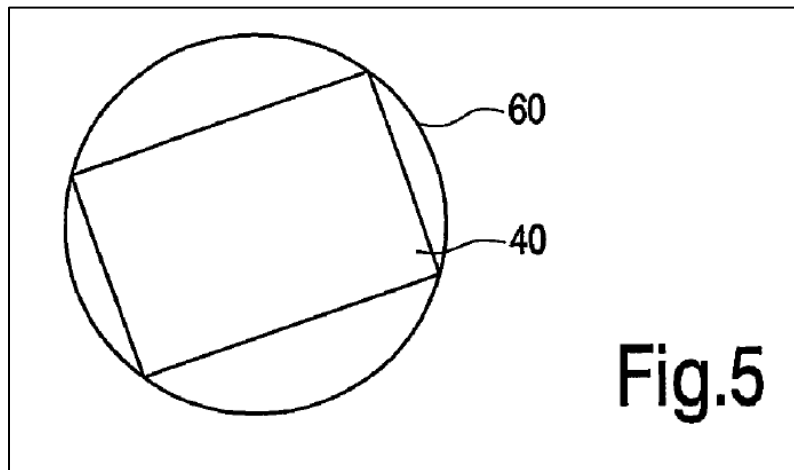
Thomason never even discloses capturing rotation data for multiple frames of a video. While Thomason discloses storing “angle data representing the angle measured by the rotation sensor,” it never discloses that it captures such data for multiple different frames. Nor does it contemplate using orientation data across multiple frames to dynamically determine and size a viewing window. Ex. 2021, ¶85. All of Thomason’s disclosures are consistent with, and best read, as an approach that merely takes an initial, one-time orientation measurement and applies that measurement as a correction factor across all subsequent frames. *Id.*

For example, Thomason’s approach is described as suitable for “still” digital cameras, which is consistent with a one-time orientation measurement and correction. Ex. 1004, ¶1. While Thomason does make passing reference to capturing videos, it notes that video cameras “are frequently used by amateurs who may have difficulties correctly orienting the camera.” *Id.*, ¶2. This passage suggests that Thomason is directed to an approach involving a fixed, yet slightly misaligned video camera that would merely require a one-time orientation measurement and correction. Ex. 2021, ¶86. Indeed, Thomason describes “process[ing] the recorded image data 8 [*i.e.* the captured video] and **rotation angle**,” (note, singular), Ex. 1004, ¶32, indicating that the

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rotation angle is only captured once for the video, not multiple times across the video.

In fact, the **only** teaching in Thomason that even remotely suggests that the camera may undergo an “arbitrary rotation” is provided as part of a possible “further modification” described in paragraph 39. Ex. 2021, ¶87. There, Thomason teaches a “circular sensor 60 with nominal image frame 40” that allows “[r]otation to any angle ... **without size reduction.**” Ex. 1004, ¶39; see also Fig. 5.



Significantly, this embodiment is expressly designed to avoid any need to dynamically resize the purported viewing window 40. This confirms that Thomason’s other teachings do not contemplate arbitrary rotations throughout a video capture duration requiring dynamic resizing of the frame based on rotational positions. Ex. 2021, ¶88.

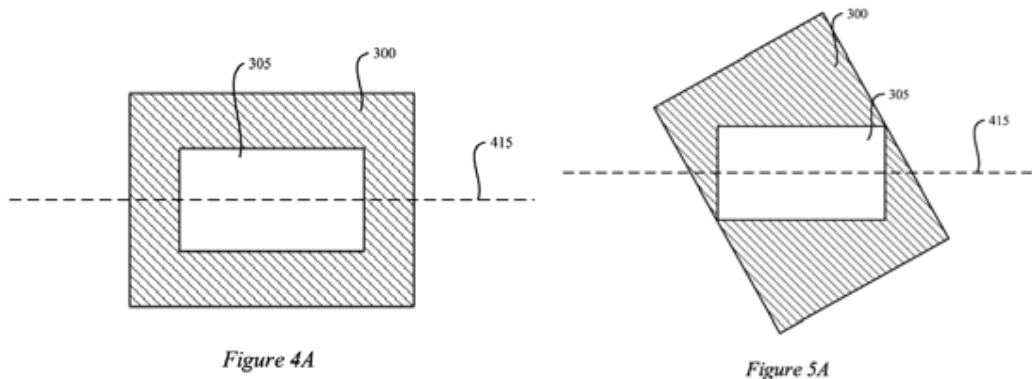
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Finally, Thomason only discloses the use of a single accelerometer for collecting rotational information. Ex. 1004, ¶29. A POSITA would understand that a single accelerometer is not suitable for capturing rotational information and determining viewing windows for multiple frames in a video. Ex. 2021, ¶89. This is because a single accelerometer is not suitable for a moving camera. An accelerometer can only infer rotation in one dimension, whereas a moving camera may rotate in three dimensions. *Id.* Thus, Thomason’s rotational data is simply not suitable for determining viewing windows for multiple frames in a video.

While Petitioner does not rely on Pacurariu for this claim, Pacurariu likewise does not disclose determining different viewing window sizes for multiple points in a video. Ex. 2021, ¶90. Instead, the size of Pacurariu’s viewing window remains constant across the frames of a video. Specifically, in Pacurariu, the alleged “viewing window” of a rotated image is the “image area 305” which is specifically reduced in size “to compensate for future or potential rotations of the image area 305 relative to the image sensor array 300.” Ex. 1005, ¶¶42, ¶44 (“A reduced area of the image area 305 may be used to compensate for any rotation.”). In other words, the size of the image area is made small enough so that it can accommodate any rotation of the

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image. Figures 4A and 5A illustrate this, as the size of image area 305 remains the same as the camera is rotated.



Thus, neither Thomason or Pacurariu disclose determining the *size* of the viewing window as a function of progress through the progress length as required by claims 7 and 17.

D. Claims 8 and 18: No “Simulat[ing] Changes in Zoom”

Claims 8 and 18 are dependent from 7 and 17 respectively and further recite that the “size of the viewing window *changes* as the function of progress through the progress length *to simulate changes in zoom* for the visual content.” Because neither Thomason nor Pacurariu disclose claim 7/17’s requirement for determining the size of the viewing window, they also fail to disclose the additional limitations of claim 8/18 that the viewing window size changes as a function of progress through the progress length to simulate changes in zoom for the visual content. Ex. 2021, ¶¶91-92.

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Additionally, Petitioner’s claim 8 theory misunderstands the claim language. Ex. 2021, ¶93. Petitioner suggests that this limitation is met simply by changing the size of the viewing window. Pet. 39 (“A POSITA would understand that a smaller viewing window may make the object in the viewing window appear more zoomed-in..”). This cannot be sufficient. Claim 8 depends from claim 7 and should be interpreted so that its additional limitations are not rendered meaningless. *See Seachange Int’l, Inc. v. C-COR, Inc.*, 413 F.3d 1361, 1368 (Fed. Cir. 2005) (“The doctrine of claim differentiation stems from ‘the common sense notation that different words or phrases used in separate claims are presumed to indicate that the claims have different meanings and scope.’”).

Specifically, claim 8 further recites that change of viewing window size is performed specifically “**to simulate changes in zoom**” for the visual content. This plainly requires more than just an change in viewing window size (as already covered by claim 7) and includes a requirement that the resizing accomplish a controlled zooming effect, as a POSITA understands. Ex. 2021, ¶93.

This understanding is supported by the ’832 patent specification, which teaches that merely resizing the viewing window without regard to zoom

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“may result in pronounced (e.g., rapid, jittery) changes in zoom/viewing window size within the horizon-leveled visual content.” Ex. 1001, 18:32-37; *see also id.* Fig. 6A. To alleviate this problem, the ’832 patent explains that “the viewing window may be **artificially** made smaller and/or larger (e.g., **artificially** zoom-in and/or zoom-out) during moments that do not require the change in viewing window size to ramp-up and/or ramp-down to the needed viewing window size.” *Id.*, 19:38-42. The artificial (*i.e.* **simulated**) zooming can be implemented using a “smoothed zoom curve 604,” such as depicted in Figure 6C, which “allow[s] for rapid changes in zoom to be replaced with smoothed zooms, creating a more cinematic feel to the horizon-leveled video than use of the zoom curve 600” from Figure 6A. Ex. 2021, ¶94.

Petitioner does not even attempt to show that either Thomason or Pacurariu disclose or render obvious making changes to the size of the viewing window as a function of progress through the progress length to simulate changes in zoom as required by claims 8 and 18. In fact, Thomasson teaches that a rotated image is “cropped to eliminate blank space.” Ex. 1004, ¶36. In other words, the viewing window is the maximum-sized rectangular window, as only blank space is removed. Ex. 2021, ¶95. Thomasson does

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not teach or suggest dynamically changing the size of any viewing window for purposes of simulating a zoom effect.

Thus, Neither Thomasson nor Pacurariu disclose or render obvious claims 8 and 18.

E. Claims 10/20: No Determining a “Location” or “Framing”

Claims 1 and 11 require determination of a viewing window that “includes determination of a **placement** of the viewing window.” Claims 10 and 20 further recite that the determination of placement include determining “a **location** of the viewing window” which determines “framing of the visual content.” Note that claims 9 and 19 recite that the **placement** of the viewing window includes determination of the window’s “**rotation**.” Accordingly, under the doctrine of claim differentiation, determining the **location** of the viewing window is not the same as determining the **rotation** of the viewing window. *Seachange*, 413 F.3d at 1368; Ex. 2021, ¶96.

In addition, Petitioner’s expert Dr. Katsaggelo testified that “determination of the viewing window” requires some “process” by the camera “based on some logic,” where there is some potential for change Ex. 2022, 60:7-20; 61:1-6 (“It is just to be based on some **algorithmic** logic”); 61:8-16 (“[T]he placement could potentially change, yes.”). The Board also

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construed “determining a viewing window as a function of progress” to require some change. ID, 19-21. In other words, determination of the location of the viewing window requires an algorithmic process that allows for change of the location. Ex. 2021, ¶97. The viewing window cannot have the same location throughout the video.

The plain meaning of the “location of the viewing window” refers to the x-y coordinate at which the viewing window is placed. Ex. 2021, ¶98. This is consistent with the claim language and the specification, which consistently refer to the four properties of the viewing window: “rotation, location, shape, and/or size.” Ex. 1001, 15:6-10. This is also consistent with the description in the specification teaching that changing the “location” of the viewing window may “simulate panning in the horizon-leveled visual content.” Ex. 1001, 10:51-54.

In addition, the claims and specification describe that the location of the viewing window determines “framing of the visual content.” In the context of photography, framing refers to drawing the viewer’s attention to certain elements within the image. Ex. 2021, ¶99; Ex. 1001, 20:29-50 (“One or more of location, shape, size, and/or other characteristics of the viewing window may be determined based on the content detection so that the horizon-

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leveled visual content includes portions of the visual content ***framed based on one or more things depicted within the visual content***. ... [T]he viewing window may be positioned to include one or more particular depictions (e.g., faces, smiles) within the viewing window.”); *see also* Ex. 1001, 20:62-63 (“The location of the viewing window may be changed to pan from one thing of interest to another thing of interest.”). In order for the location of a viewing window to frame a certain element within the image, the center of the viewing window must correspond with the center of the element of interest, as the center is where the user’s attention is naturally drawn.

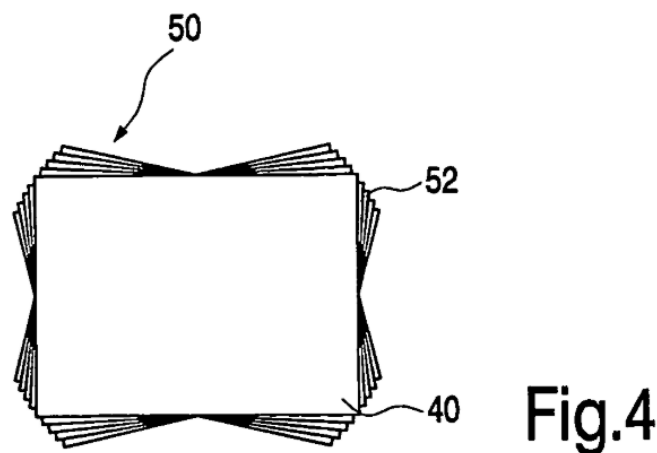
Thus, in accordance with its plain meaning, changing the “location of a viewing window” cannot simply be met by changing its rotation or its size. Ex. 2021, ¶100.

Thomason does not disclose determining the location of a viewing window as a function of progress, much less one that determines framing of the image. Ex. 2021, ¶101. The Petition’s analysis for this limitation is conclusory, simply asserting without explanation that “Thomason determines a location for each ***viewing window*** within the ***field of view*** such that the viewing window includes horizon-leveled visual content.” Pet. 41-42 (emphasis in original). The Petition cites to its analysis for the “viewing

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window” limitations of claim 1, yet those portions merely describe Thomason’s algorithm of rotating the image and cropping it.

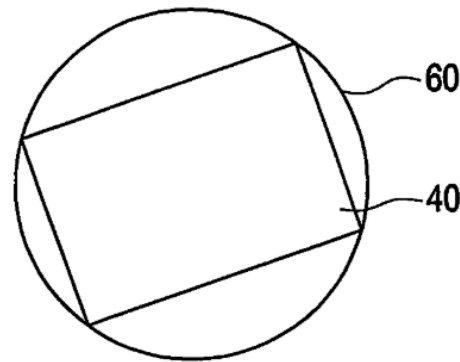
Regardless, Thomason only describes that the image is rotated and then “cropped to eliminate blank space.” Ex. 1004, ¶36. In other words, the viewing window is the maximum-sized rectangular window, as only blank space is removed. Ex. 2021, ¶102. This therefore always results in a viewing window that is located in the *center* of the image, without any possibility of dynamically determining its “location.” *Id.* For example, Thomason’s Figure 4 clearly depicts that the image is rotated about its center, and therefore the location of the viewing window is always in the center.



Similarly, for Figure 5, Thomason describes a “circular sensor” where “[r]otation to any angle is possible without size reduction,” indicating that the

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image is rotated about its center and therefore no change in the location of the viewing window occurs. Ex. 1004, ¶39; Ex. 2021, ¶103.

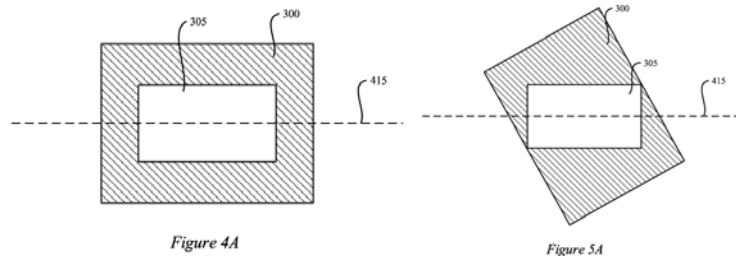
**Fig.5**

In addition, Petitioner provides no explanation for how the location of the viewing window in Thomason determines the framing of the visual content. Pet. 41-42. Again, Thomason simply describes rotating the image and, to the extent necessary, cropping the image “to eliminate blank space.” Ex. 1004, ¶36. There is no teaching in Thomason of locating the viewing window such that a certain element within the image is framed. Ex. 2021, ¶104. Thomason’s algorithm simply uses the maximum-sized viewing window based on its rotation without concern of the content of the image. *Id.*

The Petition also “relies” on Pacurariu, though merely states in a single, cursory sentence that “Pacurariu also discloses this limitation,” with a citation to the Petition’s analysis for claim 1’s “viewing window” limitations. Pet. 42-43. Pacurariu similarly does not disclose determining a location of the

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viewing window, or that such a location determines the framing of the image. Ex. 2021, ¶105. The only teachings in Pacurariu indicate that the viewing window is located in the center of the image, such as the “image area 305” depicted in Figures 4A and 5A.



F. All Claims

Thomason alone does not anticipate or render obvious claims 1 and 11, and a POSITA would not be motivated to combine Thomason and Pacurariu. Ex. 2021, ¶106.

1. **Thomason does not anticipate or render obvious claims 1 or 11**

As for Thomason, Petitioner does not assert that it alone renders obvious any challenged claim. See Pet. 8. Moreover, Thomason fails to disclose limitation 1[c]’s “obtain[ing] rotational position information characterizing rotational positions of the image capture device *as a function of progress through the capture duration.*” Thomason further fails to disclose limitation 1[d][i]’s limitation “determin[ing] a viewing window as a

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function of progress through the progress length.” As the Board held, the determining a viewing window limitation requires a determination be made “for different times of the video.” ID, 21. The same reasoning would also apply to the determination of rotational position information, that is, rotational position information must be collected for different times of the video. Ex. 2021, ¶¶107-08.

As discussed above, Thomason never discloses that rotational position information is collected for different frames of a video or that such information is used to determine a viewing window for multiple video frames. Ex. 2021, ¶109. While Thomason discloses storing “angle data representing the angle measured by the rotation sensor,” it never discloses that it captures such data for different frames. Thomason’s disclosure of a video is cursory, simply stating that the image data could be “moving.” Ex. 1004, Abstract. And yet Thomason describes “process[ing] the recorded image data 8 [i.e. the captured video] and **rotation angle**,” indicating that the rotation angle is only captured once for the video, not multiple times across the video—for example, the camera could be mounted or otherwise held still in place. Ex. 1004, ¶32.

Indeed, Thomason only discloses the use of a single accelerometer for collecting rotational information. Ex. 1004, ¶29. Yet a POSITA would

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understand that a single accelerometer is not suitable for capturing rotational information for a moving camera. Ex. 2021, ¶110. Thus, Thomason’s rotational data is simply not suitable for performing horizon leveling on a moving camera.

2. No motivation to combine Thomason and Pacurariu

Petitioner’s “rationale” to combine the references is merely a series of conclusory statements that parrot language from *KSR* and do not provide any specificity beyond that. The entirety of Petitioner’s analysis is reproduced below:

Combining the technical features of Pacurariu with the teachings of Thomason would improve the horizon-leveling capabilities of Thomason in the same way. (*Id.*) Combining the teachings of Thomason and Pacurariu as such would yield predictable results of effectively and efficiently horizon-leveling video data. (*Id.*) Further, it would have been obvious to try combining the technical features of Pacurariu with the teachings of Thomason, as there is a finite number of identified, predictable solutions, without requiring much effort and with a reasonable expectation of success. (*Id.*) The known benefits of Pacurariu would prompt the application of Pacurariu in the same field based on design incentives and other market forces. (*Id.*)

Pet. 23-24. Petitioner’s expert provides the same unexplained, conclusory statements as the Petition. Ex. 1002, ¶81. As is clearly evident, Petitioner’s rationale is essentially that Pacurariu would somehow improve Thomason, but Petitioner provides no articulated reasoning for how the combination would

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result in an improvement or why it would yield predictable results or why there would be a reasonable expectation of success. Ex. 2021, ¶¶111-12.

Petitioner also asserts the combination would be “obvious to try” by merely parroting the standard for that doctrine. *KSR*, 550 U.S. at 421 (“When there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp.”). Yet Petitioner does not articulate what the “finite number of identified, predictable solutions” are, nor explain what “design incentives and other market forces” would give reason to a POSITA to try the combination. Ex. 2021, ¶113.

Petitioner’s failure to provide an adequate articulation of the reasons to combine the references further fails because it is not directed to providing a rationale to combine the particular teachings identified in Thomason and Pacurariu. Ex. 2021, ¶114. Specifically, Petitioner asserts that the combination would use the “tilt value as taught by Pacurariu ... obtained for each frame in Thomason’s video content [and] saved as metadata or as part of each video frame as taught by Pacurariu, and be used to generate a rotated image for each video frame in Thomason’s video content.” Pet. 23. However,

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none of Petitioner’s analysis explains why a POSITA would be motivated to incorporate Pacurariu’s per-frame tilt values into Thomason, how that would yield predictable results or a reasonable expectation of success, or why that particular combination would be obvious to try. Ex. 2021, ¶114.

In its Institution Decision, the Board interpreted the Petition as alleging that “combining Pacurariu would predictably improve Thomason by allowing a horizon-leveled video frame to be obtained effectively.” ID, 34 (citing Pet. 23, 30, 34-36). However, nothing in those cited portions (or anywhere else in the Petition) explains how the combination would improve Thomason’s horizon-leveling. Ex. 2021, ¶115.

In fact, Petitioner’s proposed combination would not improve Thomason. Petitioner proposes that the combination “results in a system in which rotational position information, such as a tilt value as taught by Pacurariu, may be obtained for each video frame in Thomason’s video content, be saved as metadata or as part of each video frame as taught by Pacurariu, and be used to generate a rotated image for each video frame in Thomason’s video content.” Pet. 23.

Yet Thomason’s accelerometer-only camera is simply not capable of generating a rotated image for each video frame. Ex. 2021, ¶116. In

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particular, Thomason discloses a camera whose “rotation sensor is an accurate accelerometer” or “tilt meter.” Ex. 1004, ¶29. Notably, Petitioner’s expert admitted that he did not consider whether “horizon leveling frame by frame” could be performed with an “accelerometer alone” system like Thomason, which renders his opinions regarding motivation to combine unreliable.” Ex. 2022, 10:20-11:7.

A POSITA would also understand that Thomason’s accelerometer only camera is designed to correct for basic motion (*e.g.*, a one-time tilt adjustment), but would not be suitable for a frame by frame horizon-leveling algorithm. Thomason’s accelerometer, for instance, cannot accurately differentiate between a tilt motion and lateral acceleration. Ex. 2021, ¶¶117-18. Thus, where, as in Thomason, the camera is mostly stationary the accelerometer can be used to correct for basic movement, but where the camera is subject to frame-to-frame movements the lateral acceleration will result in erroneous measurement readings that accumulate across the frames of the video. *Id.*

Similarly, a POSITA would understand that Thomason’s accelerometer-only camera is not designed to detect certain movements, such as the camera spinning around a vertical axis (yaw movements) and that

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accelerometers and video data are typically recorded using different clocking mechanisms, such that frame by frame horizon-leveling requires overcoming problems related to synchronization and alignment of the position and video data. Ex. 2021, ¶118. Obtaining rotational position information for frame by frame horizon leveling would thus require completely overhauling Thomason’s position sensor in a manner that would add unwanted complexity and computational cost in terms of processing power, processing time, and/or battery consumption. Ex. 2021, ¶119. Petitioner has not explained why a POSITA would be motivated to extensively redesign the camera of Thomason by combining teachings of Pacurariu that are directed to cameras having entirely different movements, such as “wearable” cameras or security cameras with a “rotatable camera core.” Ex. 1004, ¶2 (“portable video cameras that are often wearable”), ¶70 (“a camera housing 1005 and a rotatable camera core 1010 that is removable and/or rotatable.”).

Petitioner has failed to advance a reasoned motivation to combine, and Grounds 1 and 2 can be rejected on this basis as well.

VI. GROUND 3 AND 4: VOSS, DERBANNE, AND WATANABE

The combination of Voss, Derbanne, and Watanabe fail to render obvious all of the challenged claims for similar reasons discussed for Grounds

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1 and 2, specifically (1) for claims 3 through 6 and 13 through 16, Petitioner relies on the same flawed theory relying on Watanabe, which teaches **removing** distortion, (2) for claims 1 and 11, neither Voss nor Derbanne teach determination of a **viewing window** as a function of progress through the progress length; (3) for claims 7 and 17, neither Voss nor Derbanne teach determination of a **size** of the viewing window as a function of progress through the progress length; (4) for claims 8 and 18, neither Voss nor Derbanne teach than any change in size of the viewing window **simulate changes in zoom** for the visual content; (5) for claims 10 and 20, neither Voss nor Derbanne disclose determining the **location** of the viewing window—they only teach that the viewing window is located in the center of the image, and is modified by rotation of the image, and (6) Neither Voss nor Derbanne does not alone render any challenged claim obvious, and a POSITA would not have been motivated to combine Voss and Derbanne. Ex. 2021, ¶¶120-21.

A. Summary of References

1. Voss

Like Thomason and Pacurariu, Voss describes a fairly rudimentary horizon-level technique implemented in a camera of a mobile device. Voss teaches when the capture sensor of a mobile is selected, the system requests

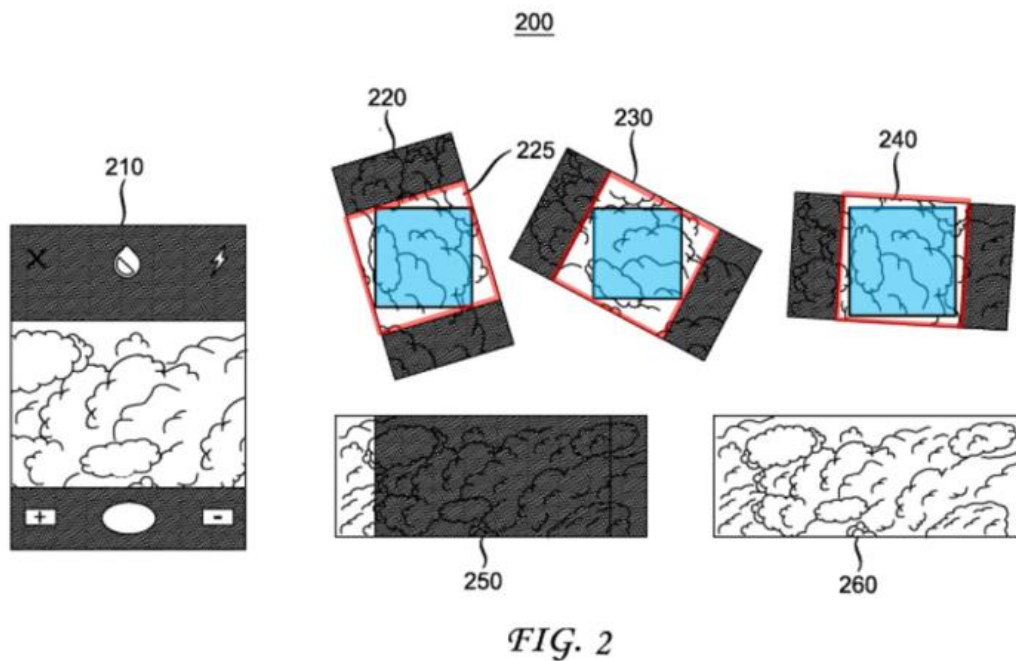
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an initial measurement from an inertial sensor 330 indicating whether the mobile device is in a “horizontal and/or vertical” position. Ex. 1007, 12:4-7. The sensor may also send “periodic” measurements to the processor thereby continuously indicating the vertical and/or horizontal orientation of the mobile device. *Id.*, 12:7-10. Voss is thus inherently based on simply distinguishing between a vertical and horizontal orientation. Ex. 2021, ¶122. Voss also recognizes that the measurements from its inertial sensor and the time stamps of the video or still image may not be ideally synchronized, resulting in an inaccurate orientation for the video or image or “choppy” looking video. *Id.*, 15:12-16.

Once the initial horizontal/vertical orientation is determined, the mobile device of Voss depicts an inset rectangle on the display. *Id.*, 12:14-16, 10:2-4. The aspect ratio of the inset rectangle depends on whether the device is in a vertical or horizontal orientation, and an “optimal” aspect ratio is chosen for each of the vertical and horizontal orientations. *Id.* 9:23-10:2. The inset rectangle 225 is inscribed within the overall sensor that is “best-fit” to the maximum boundaries of the sensor given the desired optimal aspect ratio for the orientation. *Id.* 10:2-4.

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Petitioner's theory relies heavily on its annotated version of Figure 2, shown below. Ex. 2021, ¶¶123-24.



Voss Fig. 2 (annotated by Petitioner)

Neither Petitioner nor its expert, however, make clear whether they are relying on the blue shaded box or the red outlined box as the “inset” rectangle described in Voss. Ex. 2021, ¶125.

The description in Voss also fails to shed light. *Id.* Voss states that “[t]he inset rectangle 225 is transformed to compensate for rotation 220, 230, 240 by essentially rotating in the inverse of the device’s own rotation.” Ex. 1007, 10:5-7. However, neither the red outline box nor the blue shaded box

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in Figure 2 appear to meaningfully change in size or aspect ratio. For example, the Figure 2 embodiment describes a 1:1 aspect ratio for the inscribed rectangle in portrait mode and a 16:9 aspect ratio in landscape mode, but Voss Figure 2 does appear to depict any such change from the portrait to the landscape orientation. *Id.* at 10:13-16. Note that while the output box 260 in Voss is described as a 16:9 aspect ratio, the blue shaded box for the device in landscape mode 240 appears to have a completely different aspect ratio that is much closer to that of the blue rectangle of the device in other orientations. Ex. 2021, ¶125.

Moreover, while Voss describes that its technique allows the user to “visualiz[e] the final output in an overlay on the device’s viewfinder during shooting,” *id.* at 9:15-19, Figure 2 in Voss does not show the preview screens depicting horizon-levelled content at all. Rather, the clouds depicted on the preview screen of Voss appear to rotate with the device as the blue shaded rectangle appears to remain fixed in orientation, aspect ratio, and size. Ex. 2021, ¶126.

Notably, in its Written Opinion, the World International Patent Office Searching Authority expressed serious confusion about the relevant disclosures of Voss. Ex. 2030; Ex. 2021, ¶127. In paragraph 3.2, for example,

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the Office noted a “potential contradiction between description and figure 2.” *Id.*, 5. In paragraph 4, the Office noted a “contradiction” in the expression that “the framing . . . is maintained by zooming.” *Id.*, 7.

Finally, the inset rectangular of Voss does not define the extent of the visual content to be included within the horizon-levelled content. Ex. 2021, ¶128. Instead, after video capture is complete, Voss teaches that the “inscribed rectangle is sampled and then transformed to fit an optimal output dimension.” *Id.*, 10:16-17. This new output dimension may have a completely different aspect ratio from the aspect ratios selected for the inset rectangle during video capture and thus may require “cropping data as necessary.” *Id.* For example, “[i]f a user records a video that is mostly portrait ... the video will be portrait and fill the output optically, cropping any landscape content that falls outside of the **output rectangle**.”

Thus, the inset rectangle in Voss is not a “viewing window” as required by the ’832 claims. Rather, Voss teaches the creation of a new “output rectangle” that may have a different size and shape, and may comprise a mere subset of the content that was defined within the extents of the inset rectangle during video capture.

PUBLIC VERSION**2. Derbanne**

Derbanne is a patent filed and assigned to Patent Owner that is directed to a different feature in its action cameras called HyperSmooth. It is directed to “systems and methods for stabilizing videos.” Ex. 1008, Title. Derbanne is not directed to horizon leveling, and does not mention the concept at all. Ex. 2021, ¶129.

Given that Derbanne is a patent deriving from Patent Owner, it does use some common terminology. For example, Derbanne describes “punch-outs” (portions that are cropped). In Derbanne, “punch-outs” are created from a “capture field of view” that Derbanne determines from the “optical field of view” based on rotation of the image capture device. However, Derbanne’s determination of a “capture field of view” is different from the determination of the “viewing window” in the ’832 patent—they are for different purposes and involve different considerations as reflected in the claim language of the respective inventions. Ex. 2021, ¶130.

For example, the capture field of view in Derbanne is generated to stabilize a video. Ex. 2021, ¶131. It is determined based on the calculation of what Derbanne calls a “capture trajectory of the image capture device.” Ex. 1008, 3:58-63. The intent of the “capture trajectory” is to smooth camera

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motion through the minimization of a combination of rotational velocity and rotational acceleration of the camera housing. *Id.*, 10:61-66. The “capture trajectory” at any point in a video is therefore based on past and subsequent points of positional information within that video—which Derbanne calls the “observed trajectory.” *Id.*, 3:52-58. As shown in Figure 5C, the “capture yaw trajectory” is a smoothed version of the “observed yaw trajectory.”

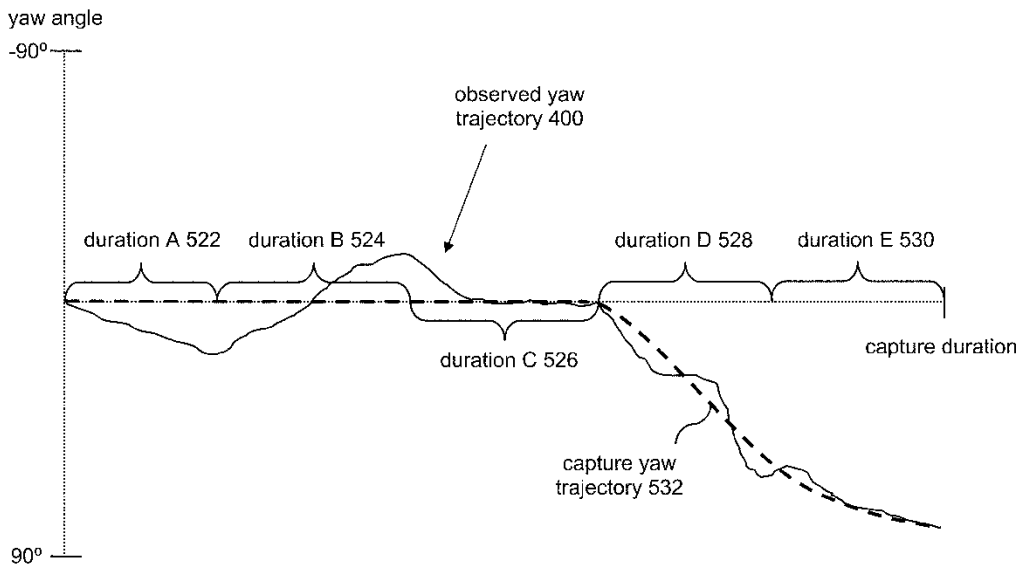


FIG. 5C

Derbanne explains that the smoothed “capture trajectory” may define “yaw angle position, pitch angle position, and/or roll angle position” and may be generated by “minimiz[ing] a combination of a time derivative, a second time derivative, and/or other time derivative(s) of the yaw angle position,

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pitch angle position, and/or roll angle position while respecting the set of constraints. Ex. 2021, ¶132.

$$\min \left(\left\| \frac{d}{dt} \theta \right\|^2 + \left\| \frac{d^2}{dt^2} \theta \right\|^2 + \dots \right)$$

Ex. 1001, 11:2-15. In addition, the “capture trajectory” accounts for “jitters” from the image capture by using “exposure start time and exposure duration time” and “the position information (e.g., position sensor readings).” *Id.*, 11:23-37. The “capture trajectory” also attempts to remove “inter-frame motion” while preserving “intra-frame motion.” *Id.*; Ex. 2021, ¶133.

Thus, while Derbanne does disclose the determination of a window based on rotation of an image capture device, this determination is substantially different from the determination of a “viewing window” in accordance with the ’832 patent. Derbanne’s determination is intended to provide improved video stabilization by taking into account yaw, pitch, roll information, positional information, exposure information, and other relevant information. Ex. 2021, ¶134. The purpose of Derbanne is not to level the horizon but rather to stabilize the video. Indeed, the tilt of the camera may be

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deliberate, and Derbanne’s methods will preserve such a tilt—previous methods failed to “take into account how the positions/motions changes during the capture duration” and therefore failed to “preserve the intent of the user that captured the images.” *Id.*, 8:65-9:1.

B. Claims 3 through 6 / 13 through 16: Voss, Derbanne, and Watanabe Fail to Render Obvious Distortion Within the Visual Content

Petitioner’s Ground 4 arguments with respect to claims 3 through 6 and 13 through 16 are identical to its arguments for Ground 2. Petitioner relies on the same teachings in Watanabe as allegedly disclosing claim 3. Pet. 81. Petitioner’s rationale to combine Voss-Derbanne with Watanabe is also substantively identical with its rationale to combine Thomason-Pacurariu with Watanabe. Pet. 82-83 (proposing that the combination “results in a system that achieves horizon-leveling of visual content while incorporating the advantages of Watanabe to generate natural looking horizon-leveled vide content.”).

Accordingly, these arguments fail for the same reasons discussed for Grounds 1 and 2. Ex. 2021, ¶¶135-36.

Specifically, Watanabe does not teach that the distortion remains in the image after horizon-leveling. Instead, Watanabe removes the barrel distortion

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caused by a fisheye lens, crops the image to remove image shake distortion, and then adds a significantly different barrel distortion that reduced by 70%. Ex. 1006, 11:9-39, 9:64-10:2. Since Watanabe’s image processing is applied to undistorted images, and the re-added distortion is significantly different from the original distortion, it does not meet the claim requirement that the original distortion remain following the horizon-leveling. Ex. 2021, ¶137.

In addition, a POSITA would not be motivated to combine Voss-Derbanne with Watanabe for the same reasons discussed for Ground 2. Watanabe’s algorithm is directed to the specific problems caused by performing image shake correction on an image with a barrel distortion. Ex. 2021, ¶138. Neither Voss nor Derbanne disclose barrel distortion or image shake correction.

Finally, for claim 6, as in Ground 2, Petitioner’s combination simply does not involve adding distortion prior to horizon leveling. Pet. 83; Ex. 2021, ¶139.

C. Claim 1[d][i]: Voss Fails to Disclose Determining a “Viewing Window” as Claimed

Claim limitation 1[d][i] requires “determining a viewing window for the visual content as a function of progress through the progress length based

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on the rotational positions of the image capture device as the function of progress through the capture duration.” Ex. 2021, ¶¶140-41.

Petitioner asserts that this claim limitation is satisfied by the disclosure of the “inset rectangle 225” of Voss, which is inscribed on the preview screen and transformed to compensate for rotation of the device during image capture. Pet. at 68. The “inset rectangle” is **not** a “viewing window” of claim 1 because it does not define the extents of horizon leveled content that the system punches out to effectuate horizon leveling of the visual content.

To understand this, the claim must first be considered in context. Immediately following the “determining a viewing window” limitation, claim limitation 1[d][ii] goes on to recite that “the viewing window” must “defin[e] extents of the visual content to be included within horizon-leveled visual content as the function of progress through the progress length.” Claim limitation 1[e][i] further recites that the system must “generate the horizon-leveled visual content based on the viewing window,” and that the “horizon-leveled visual content” must “***include[] a punchout of the extents of the visual content defined by the viewing window.***” The “extents of the visual content” punched out to create the “horizon-leveled visual” is the same “extents” defined by the “viewing window” that is determined in limitation

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1[d][i]. And, inclusion of the punchout of these extents is what “effectuates horizon leveling of the visual content.”

Thus, put simply, the “viewing window” must bound the same content that is ultimately horizon-leveled. Ex. 2021, ¶¶141-42. The “extents” of visual content defined by the viewing window must equate to the horizon-leveled visual content. This is consistent with the function of the viewing window as discussed in the specification. Ex. 1001, 6:44-47 (“The portions of the visual content presented on the display/used to generate a video may include those portions of the visual content defined by (e.g., within) a viewing window.”), 21:7-10 (“Inclusion of the extent(s) of the visual content defined by the viewing windows in video may effectuate horizon leveling of the visual content via selective cropping.”), 28:1-3 (“At operation 204, the horizon-leveled visual content may be generated based on the viewing window and/or other information.”). This is also consistent with a POSITA’s understanding of the plain and ordinary meaning of the term “viewing window,” which implies a window for defining the extent of content that will ultimately be processed and available for viewing. Ex. 2021, ¶142. It is also consistent with Petitioner’s claim construction in the ITC proceeding of “punchout” (Ex. 2027, 8) in which it proposed that the term mean “a cropped portion of the

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visual content defined by the viewing window.” Ex. 2021, ¶143. In other words, the “punchout” that is “include[d]” within the “generated horizon-leveled visual content” must be the portion of the visual content “defined by the viewing window,” and not some different portion of visual content as taught in Voss.

With this understanding, Petitioner’s theory for the “viewing window” is flawed, because inset rectangle 225 in Voss does not define the extents of the visual content to be included within horizon-leveled visual content as the function of progress through the progress length. Ex. 2021, ¶144. Nor does the system generate horizon leveled content **based on** the visual content bounded by the viewing window. *Id.* Specifically, as Voss teaches, *after* the video is captured, “[t]he inscribed rectangle is sampled **and then transformed** to fit an optimal output dimension.” Ex. 1007, 10:16-17. In fact, Voss teaches that the “optimal output dimension” may be completely different from the aspect ratios of the inset rectangle during capture, requiring “**cropping data as necessary.**” *Id.*, 10:17-21.

Thus, the inset rectangle is not a “viewing window” as claimed by the ’832 patent—rather, Voss contemplates creation of a completely separate, post-capture “output rectangle” that may have a different size and shape, and

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may include different content. *Id.*, 11:7-10 (“If a user records a video that is mostly portrait the opposite applies (the video will be portrait and fill the output optically, cropping any landscape content that falls outside the bounds of the ***output rectangle***).”); Ex. 2021, ¶145-46.

Petitioner ignores these teachings of Voss, and gives short shrift to its analysis of the further claim limitations requiring use of the extents of the viewing window to generate the horizon-levelled content. *See* Pet. 70-71, 72, 73-74. That is because Petitioner’s analysis goes fundamentally awry with its identification of the inset rectangle 225 of Voss as the viewing window of claim limitation 1[d][i]. The inset rectangle is ***not*** a “viewing window” as required by claim 1, because it does not define the extents of the visual content to be included within horizon-leveled visual content. Ex. 2021, ¶146. And, whatever horizon-leveled visual content may be eventually output by Voss does not include a punchout of the extents of the visual content defined by the inset rectangle. To the contrary, the output content of Voss is generated only through the creation of an entirely separate output rectangle whose content does not correspond to the content of the viewing window. Thus, Voss fails to render claim element 1[d][i] obvious.

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Petitioner’s cursory reliance on Derbanne does not cure this deficiency. As discussed above in Section VI.A.2, Derbanne does not disclose or suggest determining a “viewing window” as a function of progress through the progress length. Derbanne’s “capture field of view” is determined for purposes of video stabilization, not horizon leveling. And, Derbanne’s determination of the “capture field of view” is based on completely different considerations, such as the minimization of a combination of rotational velocity and acceleration of the housing. Derbanne’s determination of a capture field of view would not render the ’832 patent’s determination of a viewing window obvious. Ex. 2021, ¶147.

For these reasons, Petitioner has failed to show that Voss or Derbanne disclose “determining a viewing window for the visual content as a function of progress through the progress length based on the rotational positions of the image capture device as the function of progress through the capture duration” as required by claim limitation 1[d][i].

D. Claims 7/17: Voss Fails to Disclose Determining a “Size of the Viewing Window Size”

As discussed above in Grounds 1 and 2, claim 7 requires that the determination of the viewing window “further includes determination of a size of the viewing window as a function of progress through the progress length

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based on the rotational positions of the image capture device as the function of progress through the capture duration.” As discussed above, Petitioner fails to show that Voss determines a viewing window as claimed. Even if Voss’s inset rectangle could be the “viewing window,” however, Petitioner still fails to demonstrate that Voss determines the size of this viewing window as claimed. Ex. 2021, ¶¶148-49.

Petitioner’s analysis for the additional limitation of claim 7 consists of just a few conclusory sentences and a perfunctory statement that a POSITA would “understand” that the size of the viewing window would be determined as the function of progress through the progress length based on Figure 2. Pet. at 75-76. But, as discussed above, it is far from clear that Figure 2 depicts a dynamically changing size for the inset rectangle, much less a preview of horizon-levelled visual content as the device rotates in the various images. See Section VI.A. Figure 2 does not appear to show this, and the accompanying written description in Voss is vague and contradictory as the World Patent Office found. Ex. 2021, ¶150.

At most, Voss appears to disclose an approach of interpolating between a portrait and a landscape aspect ratio for inset rectangle 225 as the device changes between the two orientations, *id.*, 10:9-11, but the description and

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figure are vague as to how this is accomplished and what impact it has on the “size” of the inset rectangle throughout the video duration. Ex. 2021, ¶150. Petitioner therefore fails to show that Voss renders claims 7 and 17 obvious.

E. Claims 8/18: Voss Fails to Disclose Determining a Viewing Window Size In Order “To Simulate Changes in Zoom”

Claim 8 further recites that the “size of the viewing window *changes* as the function of progress through the progress length *to simulate changes in zoom* for the visual content.”

Petitioner, and its expert, cite the disclosure at page 13, lines 10-16 as allegedly disclosing this limitation with scant explanation. While this passage makes brief mention of “zooming,” Petitioner fails to acknowledge that this discussion is dealing with the “*output box*” disclosed in Voss, *not* the purported “viewing window” that Petitioner relies upon for the previous limitations. Ex. 2021, ¶¶151-52. As the cited passage states “the framing of the image inside the *output box* is maintained regardless of the aspect ratio.” Ex. 1007, 13:10-11. Voss teaches that this can be accomplished by zooming in on the scene or cropping the image to maintain size regardless of orientation or aspect ratio. As a POSITA recognizes, the zooming operation in Voss refers to a separate processing step *after* the viewing window has been determined. Ex. 2021, ¶152.

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Indeed, as discussed above for claim limitation 1[d][i], Voss draws a distinction between its “inset rectangle” (e.g., 225 in figure 2) and the “output rectangle” (e.g., 260 in figure 2). Petitioner relies upon the “inset rectangle” as the purported viewing window, which is flawed. Ex. 2021, ¶153. But, even if Petitioner were correct, it *still* fails to show that changes in size of the “inset” rectangle simulate changes in zoom as required by the claim. As Voss makes clear, any simulation of zoom is accomplished only through a post-capture process that involves determining a completely different “output box.” Voss thus fails to render the additional limitations of claim 8 obvious for this independent reason.

Finally, as discussed above in Section V.D, Petitioner’s claim 8 theory misunderstands the claim language. Ex. 2021, ¶154. Again, Petitioner suggests that this limitation is met simply by changing the size of the viewing window. Pet. 76 (“As shown for claim 7, the viewing window may change its size.”). Again, this violates the doctrine of claim differentiation, and it ignores claim 8/18’s additional requirement that the changes in size of the viewing window be determined “*to simulate changes in zoom* for the visual content.”

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Petitioner does not even attempt to show that Voss or Derbanne disclose or renders obvious making changes to the size of the viewing window as a function of progress through the progress length to simulate changes in zoom as required by claim 8. To the contrary, Voss expressly states that the change in the size of the purported viewing window (inset rectangle 225) is strictly a result of the change in rotation—*i.e.*, the “maximum available bounds of the overall sensor minus the padding,” which merely “provide[s] ‘breathing room’ for correction.” *Id.*, 10:4-9. No teaching is provided of modifying the size of the viewing window for the purpose of simulating changes in zoom. Ex. 2021, ¶155.

Thus, Petitioner fails to establish that claims 8 and 18 are obvious for this independent reason.

F. Claims 10/20: Voss Fails to Disclose Determining a “Location” of the Viewing Window to Determine “Framing”

Petitioner’s argument that Voss discloses claims 10 and 20 is similar to its argument that Thomason discloses claims 10 and 20. In particular, Petitioner argues that as shown in the below figure (annotated by Petitioner), “the location of the inset rectangle within the field of view changes over time

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based on different rotational positions of the image capture device.” Pet. 77-78.

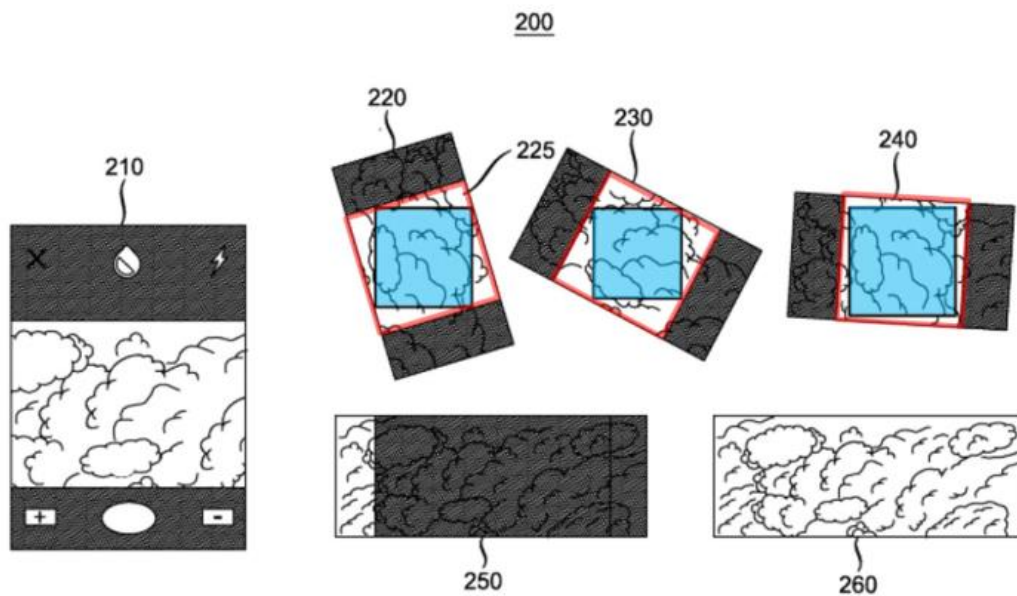


FIG. 2

Yet as is clearly evident, the location of the alleged viewing window in 220, 230, and 240 is in the middle of the frame. Ex. 2021, ¶¶156-58. What is different between them is their **rotation**, not their location. Indeed, Dr. Katsaggelos agreed that this alleged “viewing window” is located in the center for all three images. Ex. 2022, 66:3-9 (“So 220, 230, 240 show different amounts of rotation of the original frame and this rectangle in the middle ... is shown 225.”).

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Thus, because the location of Voss’s alleged viewing window does not change, it does not meet this claim.

In addition, Voss does not disclose that the location of the alleged viewing window determines the framing of the visual content. Petitioner argues that as shown in the above Figure 2, “different locations of the inset rectangle result in framing of different visual content.” Pet. 78. But the image clearly shows that the same portion of the cloud is framed despite the different rotations of the viewing window. Ex. 2021, ¶159. Moreover, nothing in Voss teaches locating the inset rectangle such that a certain element within the image is framed. *Id.* Voss’s algorithm simply uses the maximum-sized rectangle based on its rotation without concern of the content of the image.

G. All Claims: Voss and Derbanne Do Not Render Obvious any Challenged Claim

Petitioner’s rationale to combine is essentially identical to its rationale for Grounds 1 and 2, further highlighting that Petitioner’s motivations to combine are insufficient. The entirety of Petitioner’s analysis is reproduced below:

The Voss-Derbanne combination results in a system in which data (captured video data, rotational position information) is captured, stored, and maintained in accordance with the teachings of Derbanne, and a punchout may be generated, yielding the predictable result of improving the video management and processing capabilities of Voss.

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(EX1002, ¶184.) A POSITA would be motivated to use the known techniques of Derbanne to improve Voss in the same way. (Id.) Further, it would have been obvious to try combining the teachings of Voss and Derbanne, as these technical features of Derbanne may be combined with the teachings of Voss without requiring much effort and with a reasonable expectation of success. (Id.) The known benefits of Derbanne would prompt the application of Derbanne in the same field based on design incentives and other market forces. (Id.)

Pet. 62. Petitioner’s expert provides the same unexplained, conclusory statements as the Petition. Ex. 1002, ¶184. Petitioner’s rationale to combine is that Derbanne would somehow “improve[] the video management and processing capabilities of Voss”—which is merely a bare assertion of improvement that lacks any specificity or explanation as to how the teachings in Derbanne would improve Voss, or be reasonably expected to succeed. *Id.*; Ex. 2021, ¶¶160-61. The remainder of Petitioner’s rationale simply parrots language from *KSR* without any further explanation. Indeed, Petitioner’s “obvious to try” argument does not even recite the proper standard, which requires showing a limited number of “identified, predictable solutions.” *KSR*, 550 U.S. at 421; Ex. 2021, ¶47.

Moreover, Petitioner’s reasons for combining are not in any way directed to the specific teachings from Derbanne that Petitioner wishes to combine with Voss. Ex. 2021, ¶162. For example, Petitioner relies on Derbanne’s disclosure of “defin[ing] visual content viewable as a function of

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progress through a progress length,” but fails to explain how that teaching in any way improves Voss. Pet. 61 (quoting Ex. 1008, 13:49-53). Nor does Petitioner explain a POSITA would be motivated to incorporate Derbanne’s disclosure of “rotational positions ... as a function of progress,” such as how it would improve Voss’s device. Pet. 67 (quoting Ex. 1008, 5:53-57). As discussed above, Petitioner’s analysis fails to meet the requirements set out by precedent.

VII. OBJECTIVE EVIDENCE FURTHER DEMONSTRATES THAT THE ’832 PATENT WAS NOT OBVIOUS

Objective indicia of non-obviousness “may often be the most probative and cogent evidence in the record.” *Medtronic, Inc. v. Teleflex Innovations Sarl*, 70 F.4th 1331, 1342 (Fed. Cir. 2023). In considering such evidence, the Board should conduct a “a reasoned, collective weighing of its evidence of secondary considerations,” and not rely on “overly vague and ambiguous” “assignments of weight to different considerations.” *Volvo Penta of the Americas v. Brunswick Corp.*, 81 F.4th 1202, 1213-16 (Fed. Cir. 2023). Objective evidence includes “(1) commercial success, (2) copying, (3) industry praise, (4) skepticism, (5) long-felt but unsolved need, and (6) failure of others.” *Id.*, 81 F.4th at 1212.

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Patent Owner GoPro markets and sells action cameras. Since 2020, these products have included GoPro’s novel Horizon Leveling functionality, which embodies the ’832 patent. Ex. 2006, ¶23; Ex. 2005, 1 (“HERO9 Black has a new feature called in-camera Horizon Leveling.”); Ex. 2021, ¶163.

There is strong and indisputable objective evidence of nonobviousness directed to the Horizon Leveling functionality found in GoPro’s cameras.

A. Horizon Leveling Practices the ’832 Patent

GoPro documentation establishes that GoPro’s Horizon Leveling functionality when used on a GoPro camera practices at least claims 1, 3, 7 and 8 of the ’832 patent. Ex. 2021, ¶164.

Claim 1. GoPro’s cameras are a system for horizon leveling that practice Limitations 1[a] and 1[b] because they include physical processors and obtains the claimed video information defining a video. Ex. 2021, ¶165;

[REDACTED]

[REDACTED] For Limitation 1[c] the Horizon Leveling functionality utilizes [REDACTED]

[REDACTED]

[REDACTED]

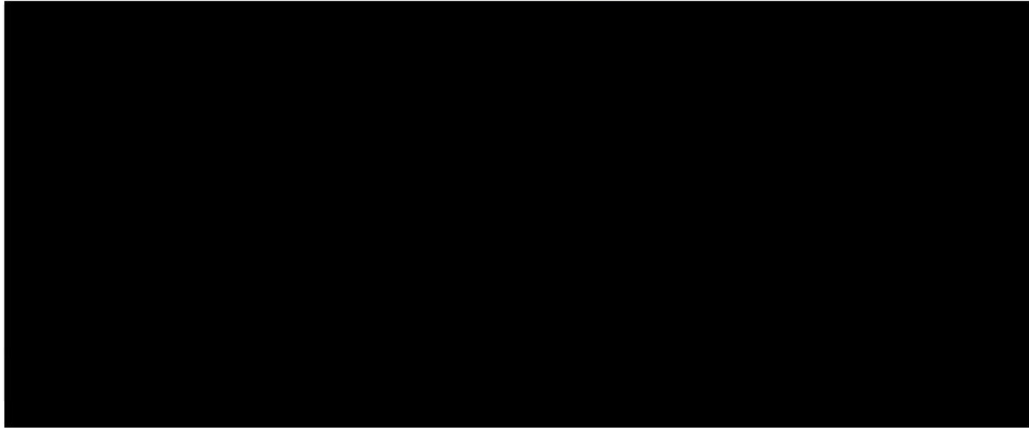
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Ex. 2008, 7; Ex. 2021, ¶165.

Ex. 2008 at 7.

Ex. 2021, ¶166.

GoPro’s Horizon Leveling functionality is able to perform Limitation 1[d]—
“determin[ing] a viewing window ... as a function of progress ... based on
the rotational positions”—and

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Ex. 2008, 4-5; *see also id.*, 6 (“ ”); Ex. 2021, ¶75. 


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Ex. 2008, 8; Ex. 2021, ¶167.



Claims 3-4. GoPro’s cameras also practice the additional limitations of
Claims 3 and 4. GoPro’s Horizon Leveling functionality can be used with

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GoPro's SuperView projection. Ex. 2028. Superview introduces a barrel distortion that can mask an off-axis horizon, as illustrated below. Ex. 2021, ¶168.

Horizon Leveling – Distortion

Claims 7-8.

Ex. 2021, ¶169.

B. Nexus

As explained by Patent Owner's Senior Vice President of Product Pablo Lema, there is a direct nexus between GoPro's Horizon Leveling and the objective evidence. Ex. 2024. Beyond the industry praise and copying of

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Horizon Leveling by others, including Petitioner, Horizon Leveling was a key reason for the success of GoPro’s HERO9, which was released in 2020. Ex. 2024, ¶9. Mr. Lema explains that “[i]n our earlier customer evaluation studies and surveys, the Horizon Leveling functionality was evaluated within the broader category of digital image stabilization technologies.” *Id.* Yet over time, GoPro “learned that the feature was so popular and impactful to customers that we began to isolate it track it separately for purposes of marketing and analyzing customer demand.” *Id.*

In 2022, GoPro performed a hardware segmentation study. *Id.*, ¶¶14-19; Ex. 2040. The purpose of the study was to segment GoPro’s customers into four groups, and to evaluate which features mattered most to each group. Ex. 2024, ¶16. While the study focused on the relative importance of 33 features, GoPro considers *all* of those 33 features its key drivers of customer demand. *Id.*

The “Advanced video stabilization” feature encompassed HyperSmooth and Horizon Leveling. *Id.*, ¶17. Among the “Core HEROes” segment, for example, “Advanced video stabilization” was ranked the most important. Ex. 2040, 10. This category were also ranked highly for other segments representing GoPro’s historical customer base (Lightweighters,

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Overcapturers, and Easygoing HEROes). *Id.*, 12-14; Ex. 2024, ¶¶19, 15. This confirms that Horizon Leveling is a driver of GoPro’s commercial success.

In another GoPro study conducted at the end of 2022, actual purchasers of the HERO11 Black were surveyed to identify which features drove their purchase decisions. Ex. 2024, ¶20; Ex. 2019. Horizon Leveling was ranked second in terms of reasons for purchase, ranked only behind HyperSmooth. Ex. 2019, 14.

C. Copying

Copying is “strong evidence of nonobviousness.” *Volvo Penta*, 81 F.4th at 1213 (quotation and citation omitted). Importantly, “the relevant copying inquiry involves a comparison of the competitor’s product with the allegedly copied product, rather than the patent’s claims.” *Medtronic*, 70 F.4th at 1340. Copying can be established by circumstantial evidence such as access to and development of a substantial similar product. *Id.* at 1340.

Here, there is significant direct evidence of copying, including by Petitioner. Ex. 2021, ¶¶171-72. [REDACTED]

[REDACTED]

[REDACTED] Ex. 2031. [REDACTED]

[REDACTED]

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[REDACTED]

[REDACTED]

[REDACTED] [REDACTED]

[REDACTED]

[REDACTED]

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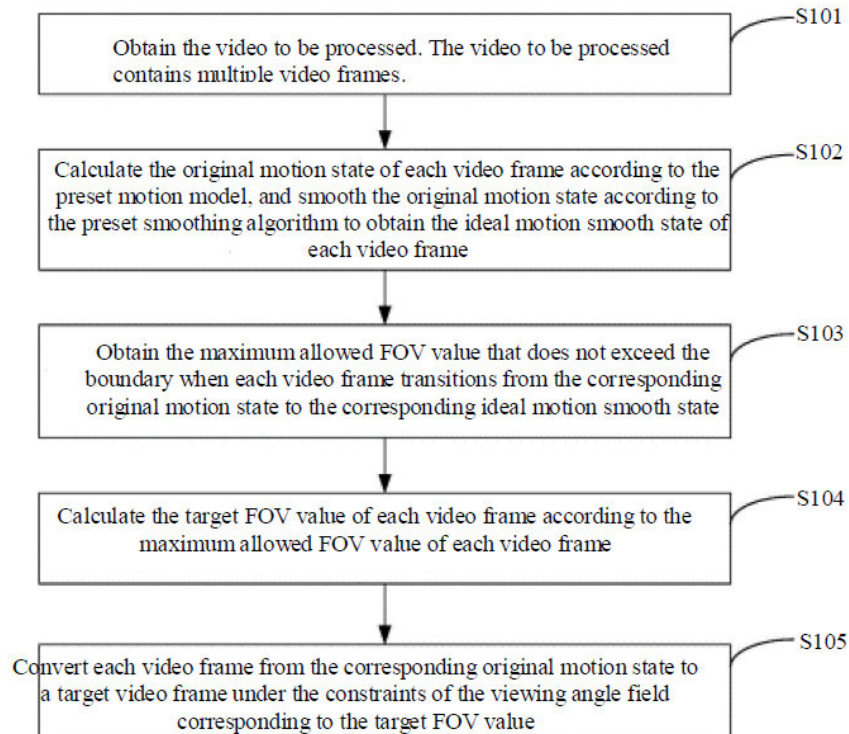
[REDACTED]

[REDACTED]

In addition, '444 Chinese application describes what GoPro earlier claimed in the '832 patent and implemented in the Horizon Leveling functionality. Ex. 2021, ¶173. The '444 application describes obtaining video information, obtains rotational position information captured as a function of progress through a capture duration, and then, based on the

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rotational position information and boundary constraints, determining a **dynamic FoV** (i.e., a dynamically changing “viewing window” size) for each frame with a adequate stabilization margin.



Ex. 2004, ¶¶27-44.

The Board indicated that this application alone is not adequate evidence of copying because there it does not relate to a “unique characteristic of a claim of the ’832 patent.” ID, 53. However, with respect, the allegation is that Petitioner copied Patent Owner’s Horizon Leveling feature, which has viewing window smoothing that is both described in the ’832 patent (Ex. 1001, 18:34-37, 19:16-20:7) and Petitioner’s Chinese application. Ex. 2021,

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¶174. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

D. Commercial Success

GoPro’s HERO line of cameras has been the top-selling action camera in the United States for nine consecutive quarters, capturing between 80 to 85 percent of the consumer market historically. Ex. 2036. Horizon Leveling contributed to such high demand. *Cont’l Can Co. USA, Inc. v. Monsanto Co.*, 948 F.2d 1264, 1273 (Fed. Cir. 1991) (“It is not necessary ... that the patented invention be solely responsible for the commercial success, in order for this factor to be given weight appropriate to the evidence, along with other pertinent factors.”).

As Mr. Lema explained, objective surveys taken by GoPro in the course of business prove that Horizon Leveling consistently ranked highly amongst GoPro’s top drivers of demand. Ex. 2024, ¶¶14-20; Ex. 2040, 10-14; Ex. 2019, 14; Ex. 2018, 23; Ex. 2021, ¶¶176-79.

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VIII. CONCLUSION

For the foregoing reasons the Board should deny institution of this petition.

Date: April 18, 2025

By: /s/ James Glass

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PUBLIC VERSION**CERTIFICATE OF LENGTH (37 C.F.R. §§ 42.24)**

The undersigned hereby certifies that, according to the word-processing system used to prepare the foregoing document, this document has 13,982 words and thus complies with the applicable word limit.

Date: April 18, 2025

By: /s/ James Glass

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CERTIFICATE OF SERVICE (37 C.F.R. §§ 42.6(E), 42.105(A))

The undersigned hereby certifies that the foregoing document was served in its entirety on April 18, 2025 upon the following parties via Electronic Mail:

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