

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. IPR2024-01165
U.S. Patent No. 10,958,840

PATENT OWNER'S SUR-REPLY

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EXHIBIT LIST

No.	Exhibit
2001	Declaration of Hassan Foroosh, Ph.D.
2002	<i>Curriculum vitae</i> of Hassan Foroosh, Ph.D.
2003	“GoPro Celebrates Surpassing 50 Million Cameras Sold,” produced as GOPRO_00063291 in <i>In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith</i> , Inv. No. 337-TA-1400
2004	CONFIDENTIAL BUSINESS INFORMATION SUBJECT TO PROTECTIVE ORDER - [REDACTED] in <i>In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith</i> , Inv. No. 337-TA-1400
2005	“NHL, NHLPA Partner with GoPro To Deliver Hockey Fans Unique Perspectives Of The Game,” produced as GOPRO_00063270 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	“GoPro Named Exclusive Action Camera of Red Bull Rampage, the World’s Biggest Freeride Mountain Bike Event,” produced as GOPRO_00063323 in <i>In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith</i> , Inv. No. 337-TA-1400
2009	“GoPro and Adobe Collaborate to Bring Unique Content to Adobe Stock Users,” produced as GOPRO_00063341 in <i>In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith</i> , Inv. No. 337-TA-1400

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2010	"73 rd Annual Technology & Engineering Emmys," produced as GOPRO_00000009 in <i>In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith</i> , Inv. No. 337-TA-1400
2011	"Believe the Hype: GoPro Showcases Award-Winning HERO7 Cameras at CES 2019," produced as GOPRO_00063251 in <i>In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith</i> , Inv. No. 337-TA-1400
2012	"GoPro Wins Second Emmy® Award for Groundbreaking Digital Imaging Technology," produced as GOPRO_00063339 in <i>In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith</i> , Inv. No. 337-TA-1400
2013	"J.P. Morgan – North America Equity Research (21 September 2018)," produced as GOPRO_00359592 in <i>In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith</i> , Inv. No. 337-TA-1400
2014	"GoPro Hero 9 Black vs Hero 8 Black: 9 key differences you need to know," produced as GOPRO_00010039 in <i>In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith</i> , Inv. No. 337-TA-1400
2015	CONFIDENTIAL BUSINESS INFORMATION SUBJECT TO PROTECTIVE ORDER - [REDACTED] [REDACTED] in <i>In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith</i> , Inv. No. 337-TA-1400
2016	CONFIDENTIAL BUSINESS INFORMATION – SOURCE CODE - SUBJECT TO PROTECTIVE ORDER – [REDACTED] [REDACTED] served in <i>In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith</i> , Inv. No. 337-TA-1400

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2017	Declaration of Patrick T. Schmidt in Support of Patent Owner's Motion for <i>Pro Hac Vice</i> Admission (March 14, 2025)
2018	Supplemental Declaration of Hassan Foroosh, Ph.D.
2019	U.S. provisional patent application Ser. No. 61/407,630 filed on Oct. 28, 2010 ("Kwatra provisional application")
2020	Transcript of April 4, 2025, Deposition of Petitioner's Expert Dr. Katsaggelos
2021	Excerpt of ITC Trial Transcript including Testimony of Petitioner's Expert Mr. Goodin
2022	Screenshot of Dr. Katsaggelos lecture on Coursera
2023	U.S. Patent 10,027,893 ("Bell")
2024	CONFIDENTIAL BUSINESS INFORMATION SUBJECT TO PROTECTIVE ORDER - [REDACTED]
2025	CONFIDENTIAL BUSINESS INFORMATION SUBJECT TO PROTECTIVE ORDER - [REDACTED]
2026	CONFIDENTIAL BUSINESS INFORMATION SUBJECT TO PROTECTIVE ORDER - [REDACTED]
2027	CONFIDENTIAL BUSINESS INFORMATION – SOURCE CODE - SUBJECT TO PROTECTIVE ORDER - [REDACTED]
2028	CONFIDENTIAL BUSINESS INFORMATION – SOURCE CODE - SUBJECT TO PROTECTIVE ORDER - [REDACTED]
2029	CONFIDENTIAL BUSINESS INFORMATION – SOURCE CODE - SUBJECT TO PROTECTIVE ORDER - [REDACTED]
2030	User Manuel for GoPro HERO7 Black (CX-0522)

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2031	CONFIDENTIAL BUSINESS INFORMATION – SOURCE CODE - SUBJECT TO PROTECTIVE ORDER - [REDACTED] [REDACTED]
2032	CONFIDENTIAL BUSINESS INFORMATION – SOURCE CODE - SUBJECT TO PROTECTIVE ORDER - [REDACTED] [REDACTED]
2033	CONFIDENTIAL BUSINESS INFORMATION – SOURCE CODE - SUBJECT TO PROTECTIVE ORDER - [REDACTED] [REDACTED]
2034	CONFIDENTIAL BUSINESS INFORMATION – SOURCE CODE - SUBJECT TO PROTECTIVE ORDER - [REDACTED] [REDACTED]
2035	CONFIDENTIAL BUSINESS INFORMATION – SOURCE CODE - SUBJECT TO PROTECTIVE ORDER - [REDACTED] [REDACTED]
2036	CONFIDENTIAL BUSINESS INFORMATION – SOURCE CODE - SUBJECT TO PROTECTIVE ORDER - [REDACTED] [REDACTED]
2037	CONFIDENTIAL BUSINESS INFORMATION – SOURCE CODE - SUBJECT TO PROTECTIVE ORDER - [REDACTED] [REDACTED]
2038	CONFIDENTIAL BUSINESS INFORMATION – SOURCE CODE - SUBJECT TO PROTECTIVE ORDER - [REDACTED] [REDACTED]
2039	CONFIDENTIAL BUSINESS INFORMATION – SOURCE CODE - SUBJECT TO PROTECTIVE ORDER - [REDACTED] [REDACTED]
2040	CONFIDENTIAL BUSINESS INFORMATION SUBJECT TO PROTECTIVE ORDER – [REDACTED] [REDACTED]

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2041	CONFIDENTIAL BUSINESS INFORMATION SUBJECT TO PROTECTIVE ORDER – [REDACTED]
2042	Technical Review of HERO8 Black (CX-1388)
2043	CONFIDENTIAL BUSINESS INFORMATION SUBJECT TO PROTECTIVE ORDER - [REDACTED]
2044	CONFIDENTIAL BUSINESS INFORMATION SUBJECT TO PROTECTIVE ORDER - [REDACTED]
2045	CONFIDENTIAL BUSINESS INFORMATION SUBJECT TO PROTECTIVE ORDER - [REDACTED]
2046	CONFIDENTIAL BUSINESS INFORMATION SUBJECT TO PROTECTIVE ORDER - [REDACTED]
2047	CONFIDENTIAL BUSINESS INFORMATION SUBJECT TO PROTECTIVE ORDER - [REDACTED]
2048	Insta360 Speeds Up Workflow with New 360 Reframing Tool, Better Stabilization & Quick Reader (CX-0077)
2049	Transcript of August 28, 2025, Deposition of Petitioner's Expert Dr. Katsaggelos
2050	Redline of Model Protective Order
2051	Stipulated Protective Order
2052	CONFIDENTIAL BUSINESS INFORMATION SUBJECT TO PROTECTIVE ORDER - INITIAL DETERMINATION ON VIOLATION OF SECTION 337 AND RECOMMENDED DETERMINATION ON REMEDY AND BOND (July 10, 2025), <i>In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith</i> , Inv. No. 337-TA-1400

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I. INTRODUCTION

The parties dispute the construction of “*low-light high-pass parameter*.” PO’s construction gives effect to both “*low-light*” and “*high-pass*.” Under that proper construction, Zhou’s stabilization strength metric is not a “low-light high-pass parameter” because it does not allow more high frequencies to pass based on low-light conditions.

Zhou also does not disclose the separately recited “*stickiness parameter*.” Its Gaussian weighting function merely implements the stabilization strength metric—calculated purely as a function of blur—and applies to past and future frames symmetrically, which does not disclose controlling an extent to which preceding portions of the observed trajectory influence the smoothed trajectory.

Further, all of Petitioner’s grounds rely on Cai, but its approach—using a motion threshold to determine whether the camera is stationary or in motion for the current frame—does not meet the requirement for a “*temporal horizon enabling approximation of intentional motion*.”

Finally, the Bell Paper’s jitter removal and/or reduction falls far short of “*determin[ing] a smoothed trajectory of the housing based on . . . a*

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weight-balance parameter [that controls] minimiz[ing] rotational velocity and rotational acceleration [of the housing],” as required by claim 13.

II. CLAIM CONSTRUCTION

A. “Low-Light High-Pass Parameter” Has A Plain And Ordinary Meaning

Petitioner asserts for the first time that “low-light high-pass parameter” is a “coined” term with no ordinary meaning. Reply, 2. This contradicts the Petition, which stated that each claim term “carries its ‘ordinary and customary meaning.’” Petition, 6-7.

Petitioner’s expert admitted he applied plain and ordinary meaning in his original Declaration. EX2049, 26:18-27:6. Indeed, Dr. Katsaggelos previously explained that a POSITA “would have understood that darker images have typically *low light* because they would be captured in environments having lower light and therefore require longer integration times.” EX1003, ¶87. He admitted that the term “low-light” has an ordinary meaning, (EX2049, 52:16-53:13), and previously confirmed that “high-pass” indicates a system allowing more high-frequency information through while attenuating low-frequencies. EX2020, 94:6-15; EX1003, ¶83; EX2022. PO’s construction is based on these ordinary meanings.

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Only after PO showed the deficiencies in the prior art did Petitioner suddenly claim a lack of ordinary meaning and a need to resort to what Petitioner claims is a broader understanding in the specification.

Petitioner's new position contradicts precedent. In *Malvern Panalytical Inc. v. TA Instruments-Waters LLC*, the Court vacated construction of “pipette guiding mechanism,” finding it was not “coined” and had a plain meaning. 85 F.4th 1365, 1372 (Fed. Cir. 2023). The Court held: “It is appropriate to construe this term by looking to the words “pipette,” “guiding,” and “mechanism” individually. *Id.*, citing *Littelfuse, Inc. v. Mersen USA EP Corp.*, 29 F.4th 1376, 1381 (Fed. Cir. 2022) (proper to construe “fastening stem” by looking to the meaning of the words “fastening” and “stem”).

Petitioner claims PO's construction disregards “the inventor's intention, as expressed in the specification,” which “is regarded as dispositive.” Reply, 9, citing *Phillips*, 1316. But Petitioner's quote concerns “intentional disclaimer, or disavowal”—which Petitioner does not allege here. *Id.* Petitioner asserts it is improper to rely “on single words . . . as opposed to the limitation[] as a whole.” Reply, 9, citing *Apex*, 1372. But the quote addresses a means-plus-function analysis, where the court prematurely ended its analysis after determining the term “circuit” lacked sufficient structure,

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without considering the “additional adjectival qualifications further identifying sufficient structure.” *Id.*, 1373-74. That is not this case.

Under well-settled precedent, “it is highly disfavored to construe terms in a way that renders them void, meaningless, or superfluous.” *Intel Corp. v. Qualcomm Inc.*, 21 F.4th 801, 809-810 (Fed. Cir. 2021). Petitioner’s construction violates this principle. Under Petitioner’s construction, the term “low-light high-pass parameter” becomes a generic blur compensation parameter that applies regardless of lighting and with no regard for whether more high-frequencies are preserved.

B. The Claimed Parameter Is Based On Low-Light Indicated By Exposure Time

Petitioner proposes a broad construction: “a parameter that controls the amount or strength of smoothing used in motion blur compensation.” Reply, 2. It emphasizes the parameter ranges between 0 (full smoothing) and 1 (no smoothing), managing the trade-off between motion smoothing and blur compensation. *Id.*, 2-3. But these points are not disputed.

What Petitioner ignores is how the ordinary meanings of “low-light” and “high-pass” limit the parameter to one that addresses blur (1) ***based on*** low-light conditions indicated by longer exposure times, and (2) by

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controlling a high-pass system. POR, 28-29; EX2018, ¶¶37-39. The claim does not recite a generic “motion blur parameter.”

The specification links low-light to longer exposure time: “***longer exposure time*** may be used with ***low light*** conditions,” (EX1001, 19:18-21), and “[h]igher exposure time” . . . “may result in ***greater amount of motion blur.***” *Id.*, 19:25-26 (emphasis added); EX1003, ¶87. Petitioner’s expert conceded that there is a correlation between lighting conditions and exposure time. EX2049, 50:11-25.

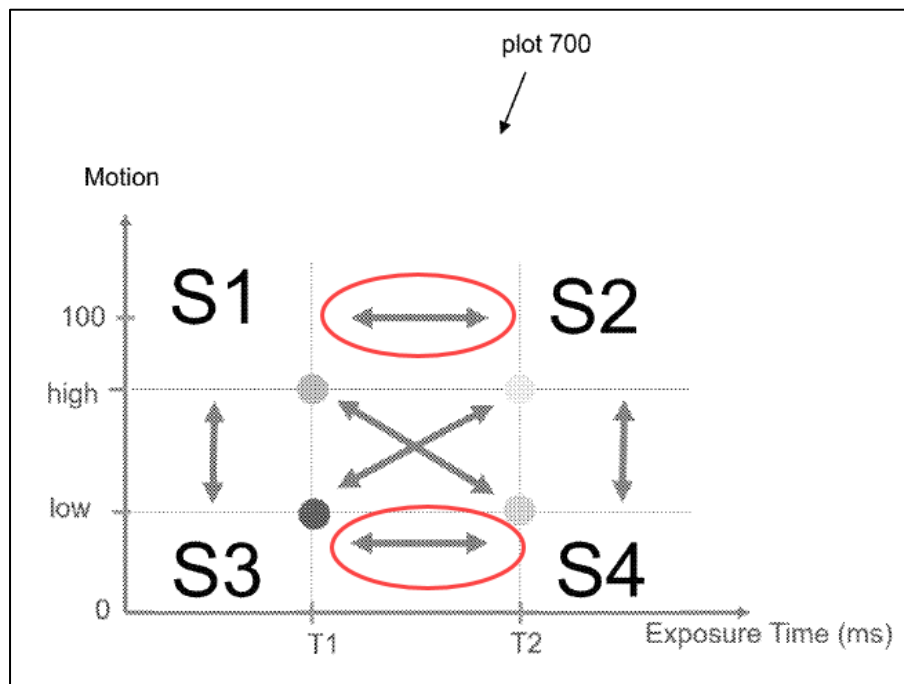
The specification also teaches reducing smoothing based on low-light. For example, the specification teaches “***deactivation of the stabilization*** of the captured visual content ***when the exposure time is longer than T2***” and that “the smoothing value may change linearly between 0 and 1 ***as the exposure time increases*** from T1 to T2.” EX1001, 19:34-40.

Petitioner cites Figure 7. Reply, 5-6, *citing* EX1001, 18:62-19:25. But Figure 7’s description does not mention the “low-light high-pass parameter”—it certainly does not equate the parameter with every blur scenario in Figure 7. *See August Tech. Corp. v. Camtek, Ltd.*, 655 F.3d 1278, 1285 (Fed. Cir. 2011) (“The mere fact that there is an alternative embodiment disclosed . . . that is not encompassed by our claim construction does not

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outweigh the language of the claim”); *TIP Systems, LLC v. Phillips & Brooks/Gladwin, Inc.*, 529 F.3d 1364, 1373 (Fed. Cir. 2008) (“Our precedent is replete with examples of subject matter that is included in the specification, but is not claimed.”).

In fact, Figure 7 supports PO’s construction, illustrating scenarios where smoothing strength changes *solely* due to exposure time (e.g., transitions from S1 to S2, and S3 to S4):



EX1001, Fig 7. These transitions are governed by the “low-light high-pass” parameter. As the Figure 7 description states: “[t]he smoothing value may change linearly *between 0 and 1* as the exposure time increases from T1 to

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T2.” *Id.*, 19:38-40; *see also id.*, 22:8-10 (teaching how “low-light high-pass parameter” may range *between 0 and 1* to compensate for motion blur).

Petitioner cites no definitional or disavowal language that would justify ignoring the “low-light” qualifier in the plain claim language.

C. “High-Pass” Allows More High-Frequencies

Petitioner contends the claim does not “require the parameter to allow more high frequencies to pass through.” Reply, 6. But that is what “high-pass” means to a POSITA. EX2020, 94:6-15.

This understanding is consistent with the specification: “high frequencies in the input *may be kept* based on the image capture configuration, such as exposure start time and exposure duration time,” to compensate for “motion blur and/or lowlight image capture conditions.” EX1001, 17:61-18:9. The specification describes *preserving* high-frequency motion to mask blur. *Id.*, 22:8-25 (“[T]he output motion *may include high frequencies* that mask motion blur”).

Petitioner latches onto the case where the smoothed trajectory is the “same” as the observed trajectory—claiming here that both high- and low-frequency motion are preserved. Reply, 7. But PO’s construction does not preclude preservation of low-frequency motion; it merely requires “allowing

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more high frequencies to pass based on low-light conditions.” EX1001, 17:64-66 (“Certain portions of high frequencies in the input may be kept based on the image capture configuration, such as exposure start time and exposure duration time . . .”). The sentence following the one Petitioner relies on confirms the full-blur compensation case reflects a “high-pass” system:

“The low-light high-pass parameter of 1 may result in the smoothed trajectory being same as the (observed) trajectory during the exposure periods. *That is, the output motion may include high frequencies* that mask motion blur within the visual content.”

EX1001, 22:14-18 (emphasis added); EX2018, ¶39.

D. The Provisional Supports The Plain Meaning

Petitioner misinterprets the provisional contending it discloses a broader “motion blur masking control” unrelated to lighting or high-pass filtering. Reply, 7-8.

First, Petitioner ignores the first sentence in its excerpt: “*Taking into account the exposure time of every frame*, Hypersmooth decomposes the observable camera motion in two categories . . .” EX1021, 22. This confirms the parameter is based on exposure time to identify intra-frame motion causing blur. The document describes no other mechanism (*e.g.*, no pixel-

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motion analysis as in Petitioner's prior art). This supports that the low-light high-pass parameter is based on low-light conditions.

Second, Petitioner misreads the statement that the low-light high-pass parameter "does not need to evolve in function of the exposure time." EX1021, 22. Petitioner claims this means "no matter the exposure time—and thus regardless of the lighting condition—the parameter stays the same and performs blur compensation." Reply, 8. That is nonsensical. Exposure time is the only mechanism described for measuring intra-frame motion. Petitioner's reading would render the parameter constant, defeating its purpose.

The cited statement actually means the parameter need not evolve *over the duration* of the exposure. This is supported by the context of the following two bullets, which provide that in a "highly illuminated scene," the exposure is short, meaning there is no need to further adjust the parameter during exposure. Similarly, in a scene with minimal motion, any necessary correction for intra-frame displacement is limited regardless of the exposure duration. In other words, PO determined that exposure time *alone* sufficed to set the parameter for each frame and there was no need for the parameter to further "evolve" (*i.e.* change) over the duration of the exposure. This is exactly why it is called a "*low-light* high-pass parameter."

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Third, the provisional confirms the parameter controls a high-pass filter to adjust the extent of motion blur compensation:

There is a positive scalar parameter controlling the gain of the corresponding *high-pass filter*.

* * *

When set to 1, the entire camera displacement during the exposure periods is preserved. The output motion *contains high frequencies* that mask motion blur.

In sum, the prosecution history supports PO's construction, not Petitioner's.

E. Extrinsic Evidence Supports PO's Construction

Contrary to Petitioner (Reply, 9), Dr. Katsaggelos' testimony supports PO's construction. As discussed above, Dr. Katsaggelos demonstrated a clear understanding of the terms' ordinary meanings. POR, 30-31; EX2018, ¶¶40-42; EX2020, 94:6-15; 103:22-104:8; EX2022. Those meanings are reflected in PO's construction.

Petitioner claims "no software-only technique can selectively mitigate blur based solely on lighting conditions." Reply, 9. This is a red herring. PO's construction does not require that blur compensation be perfectly tailored to correct only blur arising from low-light. PO's construction merely requires

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that the amount of blur compensation be based on low-light, and that the attenuation of smoothing strength operate in a high-pass manner.

Finally, Petitioner claims Dr. Foroosh's analysis of GoPro's HERO7 undermines PO's construction. Reply, 10. But Petitioner overlooks Dr. Foroosh's testimony that the [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] EX2018, ¶164 (emphasis added). Petitioner also overlooks the

[REDACTED]

[REDACTED]

(emphasis added).

III. GROUND 1 FAILS ON THE MERITS

A. Zhou's "Stabilization Strength Parameter" Is Not A "Low-Light High-Pass Parameter"

Petitioner does not dispute these facts:

- Zhou's "stabilization strength parameter" is not calculated or adjusted based on low-light conditions. POR, 33; EX2018, ¶33.
- It is adjusted based on estimated blur. *Id.*, citing EX1006, 6:38-7:16; 7:57-60.
- Zhou calculates its image blur metric based on how much the image translates within a frame—not lighting. *Id.*, citing 5:65-6:1.

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- Zhou's stabilization strength metric does not allow more high-frequencies to pass. POR, 35; EX2018, ¶91.
- For any given frame, Zhou's stabilization strength parameter applies smoothing equally across the entire frequency spectrum. *Id.*, citing EX1006, 7:24-38.

Thus, under the proper construction, Zhou's stabilization strength metric is not a "low-light high-pass parameter," because it neither controls smoothing strength based on low-light conditions nor allows more high-frequencies to pass. POR, 28.

Petitioner does not dispute Zhou's approach is a general blur compensation technique, arguing instead it also "addresses videos taken in low-light conditions." Reply, 11. Yet, as Petitioner's expert conceded, Zhou's technique is not based on low-light conditions indicated by longer exposure times, but on how much an image translates within a frame. POR, 34; EX2020, 121:12-22; 122:23-123:3; 124:5-15; EX2018, ¶89.

Petitioner does not dispute that Zhou applies its stabilization strength equally across all motion frequencies. While Petitioner argues it "allows high-frequency motion to pass," Reply, 11, it is undisputed Zhou treats high- and low-frequency motion equally—its approach is not selective, as in a high-pass system. POR, 31, EX2020, 94:6-15; EX2018, ¶42.

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Petitioner challenges the real-world implications of Zhou's general blur compensation as compared to the '840 patent's low-light high-pass parameter. Reply, 11-12. But PO's point was not that the '840 patent is limited to sports cameras—it was to illustrate how differences between GoPro's commercial use case and those of conventional cameras help explain the different trade-off GoPro makes between smoothing strength and blur compensation. POR, 36-37; EX2018, ¶¶92-95. That unique trade-off is reflected in the plain language of the low-light high-pass parameter.

B. Nor Is Zhou's Gaussian Weighting Function A "Stickiness Parameter"

Petitioner's Reply confirms that Zhou's Gaussian weighting function is symmetrically centered at the current frame. Reply at 14-16; POR, 38-41; EX1006, 7:61–8:3; Fig. 4. This conflicts with the claimed "stickiness parameter," whose agreed construction requires a parameter "that *control[s] the extent by which preceding portion(s)* of the (observed) trajectory impacts determination of the smoothed trajectory." EX1001, 22:22–25.

Zhou's weighting function is therefore best understood as proximity-based weighting—not control over how much the past influences the present. Because any added influence of a past frame is offset by an equal future frame,

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Zhou's function is not a parameter that "control[s] the extent by which *preceding portion(s)*" impact determination of the smoothed trajectory. *See* EX2018, ¶¶101-102.

Petitioner argues the claim does not exclude future motion. Reply, 14. But the question is whether Zhou discloses a parameter that controls the influence of *preceding* trajectory portions. It does not. A symmetric averaging function is fundamentally different from a stickiness parameter that controls the extent of the past's impact. As Dr. Katsaggelos testified, there are, in general, two parameters for controlling a Gaussian function like those disclosed in Zhou—adjustment of the mean and adjustment of the standard deviation. EX2049, 33:24-34:19. But Zhou provides no teaching for adjusting the mean, and its weighting function is thus only centered on the present frame. *Id.*, 32:4-8.

Petitioner's remaining arguments fare little better. *First*, Petitioner argues PO wrongly faults Zhou's weighting function for not being "independent," noting parameters can be dependent or independent. Reply, 13. But Petitioner does not dispute that Zhou's weighting function is a downstream implementation of the stabilization strength metric, which itself is based only on blur. Zhou's weighting function is thus not a parameter for

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controlling stickiness, but rather a function implementing what Petitioner already relies on as the blur metric. POR, 38-40, EX2018, ¶¶96-101.

Petitioner asserts Zhou's weighting function is tunable. Reply, 14. But Dr. Katsaggelos admitted at his deposition that Zhou's weighting functions are a function only of the stabilization strength metric, EX2049, 34:21-35:3, which in turn is calculated on the basis of motion blur, *id.*, 35:24-38:16. That confirms the function is not a parameter for stickiness, but rather a function whose standard deviation varies with blur and is otherwise fixed. Unlike the claimed stickiness parameter, Zhou's function cannot tune or control the impact of past frames on the smoothed trajectory.

Petitioner raises a new argument: that Zhou's weighting function operates independently of blur compensation when stabilization strength (S) is not capped by the blur threshold. Reply, 15. This mischaracterizes Zhou. Whether capped or not, Zhou teaches that S is calculated entirely as a function of blur. EX1006, 6:38-7:16. Petitioner identifies no disclosure of calculating S based on anything but blur—let alone based on the extent to which preceding portions influence the smoothed trajectory. Indeed, Dr. Katsaggelos admitted that even in an “extreme case,” where Zhou's trajectory was

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“perfectly stable,” the metric value would result from “small amounts of blur.” EX2049, 65:23-67:4; EX1017 ¶50.

Finally, Petitioner cites a plot from Dr. Katsaggelos's supplemental declaration showing Zhou's function could theoretically assign zero or nonzero weight to past frames. Reply, 15. These plots, which do not appear in Zhou, still do not show a parameter that enables control over the influence of preceding trajectory portions. In fact, for the set of similar plots at ¶71 of his supplemental declaration, Dr. Katsaggelos himself attributed the difference in shape between the depicted curves to the amount of motion blur. EX2049, 36:10-38:16. This is an admission that the weighting functions are not tunable parameters for independently controlling stickiness.

IV. CAI DOES NOT DISCLOSE THE CLAIMED “TEMPORAL HORIZON ENABLING APPROXIMATION OF INTENTIONAL MOTION”

A. Cai's Zero-Motion Detection Technique Is Merely A Threshold Based On Past And Current Frames

In its Reply (at 16–17), Petitioner argues that PO is “wrong that Cai cannot distinguish intentional movements once ‘the camera is deemed [] non-stationary,’” and claims Cai “teaches distinguishing and preserving” (1) true zero motion, (2) unintended motion, and (3) intended motion. But Petitioner

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relies solely on Cai's "zero-motion detection technique"—a coarse thresholding mechanism that determines whether the camera is stationary based on differences between *past* and *current* frames. Cai does not analyze a temporal horizon of future frames to determine whether motion is intentional. POR, 42–50; EX2018, ¶¶106–116.

Moreover, this zero-motion detection does not reflect any attempt to approximate intentional motion when the camera is in motion. Petitioner cites to disclosures referencing "intended" motion, EX1009, 3:58-59, 6:20-24, but read in context they merely reference a binary decision between a zero-motion frame and a frame representing a filtered trajectory at the corresponding time, *id.* 4:3-11. In other words, Cai's approach merely defaults to a low-pass filtered trajectory once it determines that motion exceeds a zero threshold without analyzing or considering the nature of motion in future frames. POR, 50-52; EX2018, ¶¶117-119. This cannot constitute use of a temporal horizon to enable approximation of intentional motion. Dr. Katsaggelos admitted that Cai's low-pass filtered trajectory "cannot completely remove all jitter," EX2049, 85:1-14; *see also* EX1017 ¶88 (opining there are "situations where the filtered motion *does not reflect the intended motion* as it still contains jitter."); EX1009, 2:24-28. Thus, Cai's binary choice between a zero motion

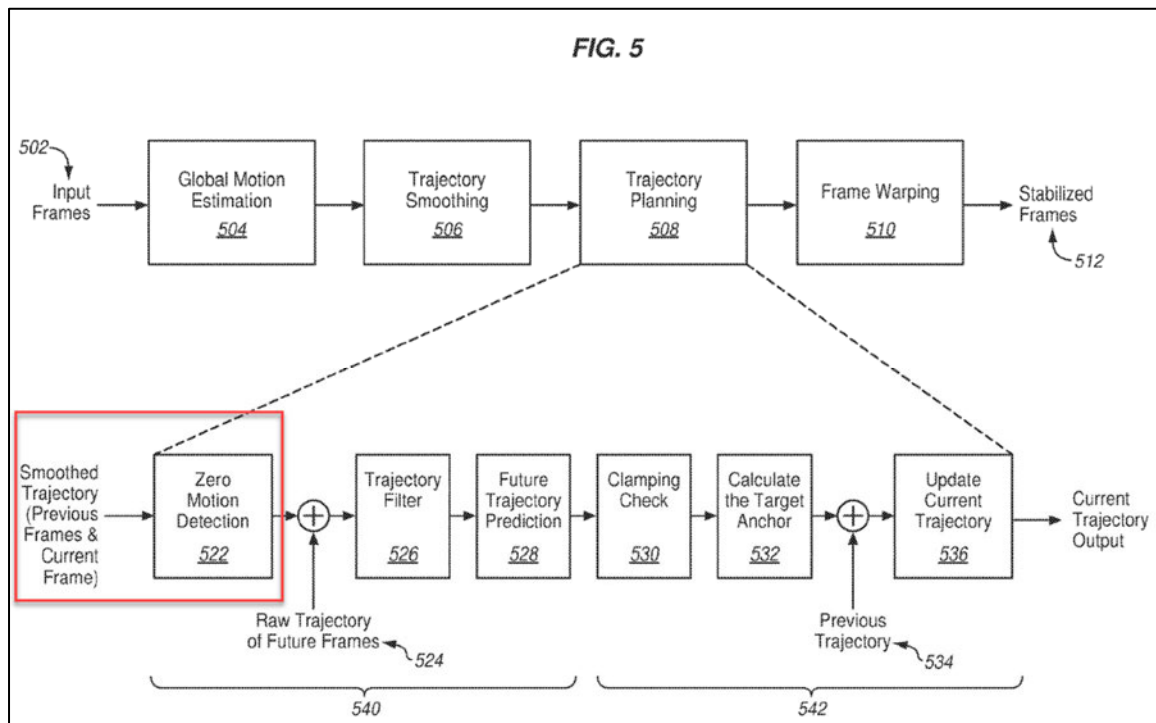
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condition and the low-pass filtered trajectory does not disclose the claim limitation.

B. Cai's Use Of A "Mean" Or "Variance" Is Based On Past Frames—Only With Hindsight Does Petitioner's Expert Create A Version Of Figure 2 Adding Future Frames

Petitioner argues that Cai's zero-motion detection may consider future frames when it uses "a mean or a variance or both of the coordinate values for a short set of frames." Reply, 17-18. But Cai never discloses comparing a mean or variance to a set of *future* frames. EX1009, 5:8-14 (describing the difference between (1) a mean or variance of a short set of frames for the low-pass filtered predicted trajectory; and (2) a mean of the *corresponding* refined or planned trajectory). That the "short set of frames" refers to past and current frames is fully consistent with the zero-motion detection logic depicted in Figure 5. POR, 44-45; EX2018, ¶108.

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Other than dismissing it as a mere embodiment, Reply, 23, Petitioner does not meaningfully address Figure 5's teaching that Cai's zero-motion detection process is fundamentally limited to past and current frames.

Instead, Petitioner resorts to the hindsight of its expert, who annotated Figure 2 in a way that is not reflected by the reference. Reply, 19. Cai does *not* describe Figure 2 as depicting future data or comparisons between current and future frames. The actual discussion describes two techniques for comparing the filtered and zero-motion trajectories: (1) comparing a threshold to "the gap between the *last* low pass filter coordinate and the current low pass filter coordinate," EX1009, 4:33-36, and (2) comparing a threshold to the gap

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between the current filtered coordinate and the *corresponding* zero-motion coordinate, *id.*, 4:45-56. Neither involves a “look-ahead” to future frames.

**C. Cai Uses Future Frames For Anchoring And Clamping—
Not Zero-Motion Detection**

Petitioner argues that Cai teaches the use of future frames for zero-motion detection by citing Cai's statement that input frames are “buffered so that present and future frames are available.” Reply, 20, *citing* EX1009, 8:66-9:1. But this buffering of *raw* input trajectory data relates to later *anchoring and clamping* steps, not zero-motion detection. As Dr. Foroosh explains, Cai's zero-motion detection occurs earlier, based solely on past and current filtered frames, separate from the clamping procedure used to smooth transitions in the stabilized trajectory. POR, 20-21, 46–48; EX2018, ¶¶75, 112–115. Again, this is confirmed by Figure 5, which introduces the “Raw Trajectory of Future Frames” only *after* zero-motion detection is complete, as part of Cai's separate clamping and anchoring steps.

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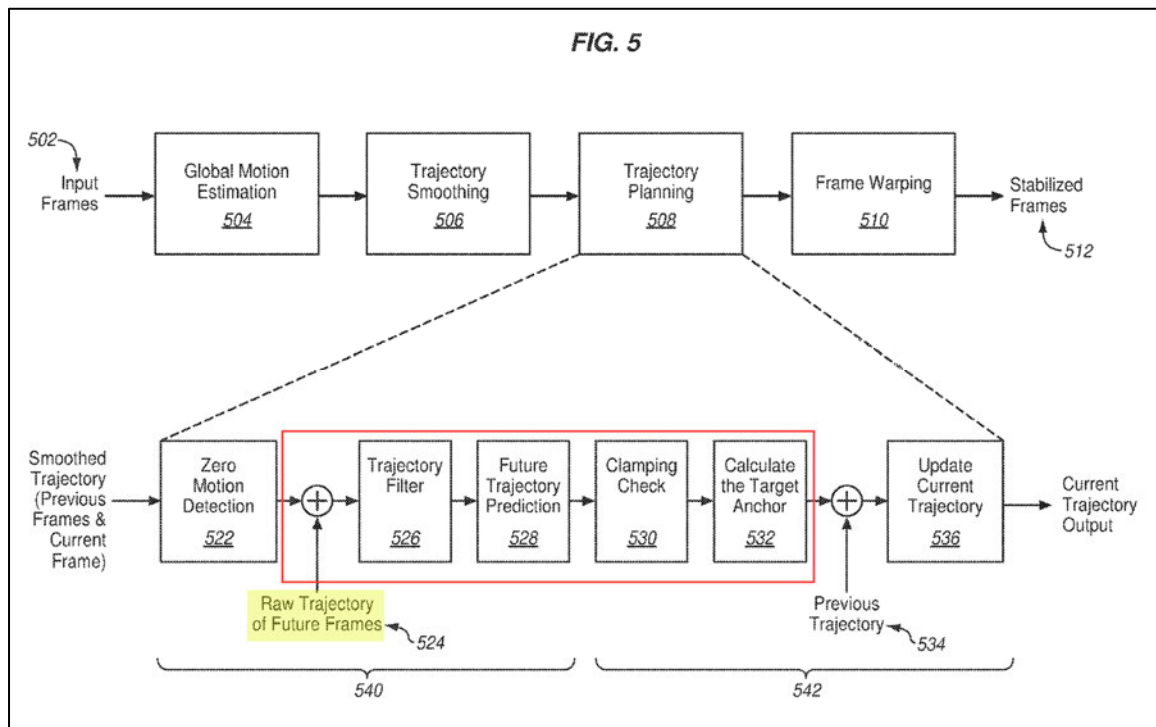
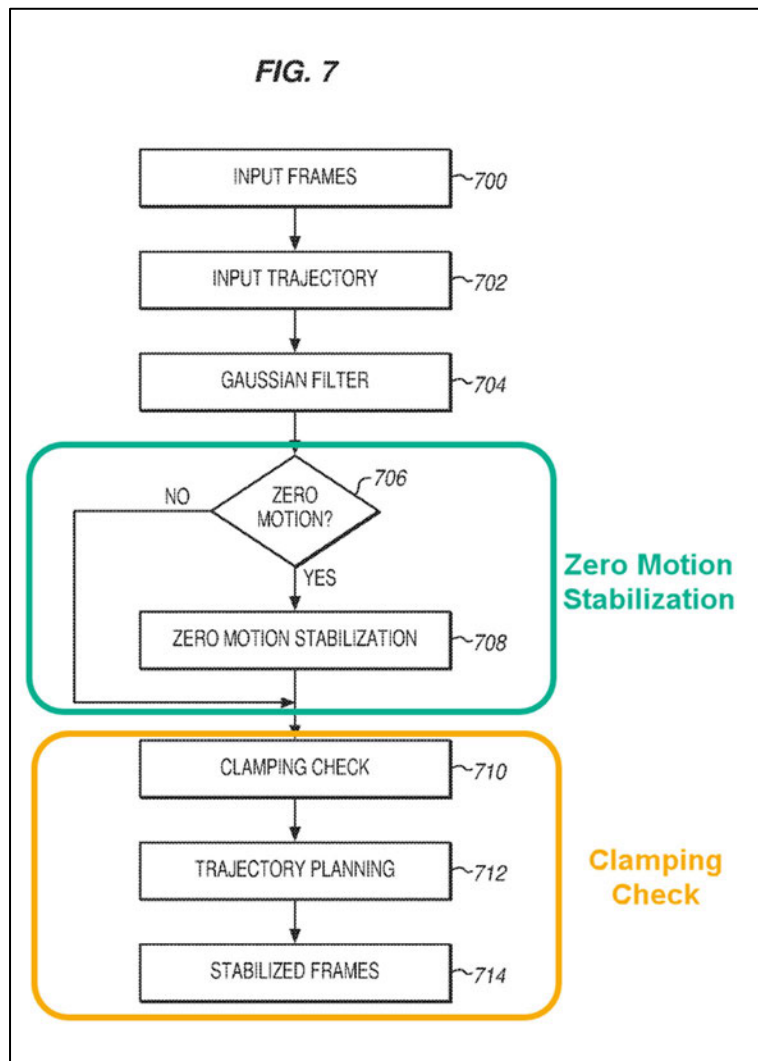


Figure 7 confirms this distinction, describing zero-motion detection at block 706, followed by a set of distinct steps for “jitter motion clamping.” EX1009, 9:8-24. While the clamping process may involve checking for clamping in future frames and recalculating the current frame accordingly, EX1009, 9:34-53, this is only done to avoid “jumps between anchor points or to minimize the jumps,” *id.*, 9:34-37. The zero-motion stabilization process upon which Petitioner relies involves no such consideration of future frames.

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Petitioner's reliance on column 9:12-17 does not disclose the use of a temporal horizon enabling approximation of intentional motion. This disclosure relates to comparing the zero-motion trajectory and the filtered trajectory, *not* the buffered raw trajectory Petitioner cites earlier in its analysis. EX1009, 9:12-17. Petitioner is conflating disparate passages of Cai. In any event, the cited passage never discloses a consideration of future frames as

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part of processing current frames. Consistent with the disclosures in Figure 2, the passage merely describes comparing the projected, next five frames of the smoothed (zero motion) trajectory to the next five frames of the Gaussian filtered trajectory.

D. Petitioner Fails To Explain Away Figure 4

As Dr. Foroosh explains, Cai's zero-motion detection process suffers from a lag. POR, 48; EX2018, ¶114. During the lag period, the planned trajectory fails to follow the actual camera motion—that is, it fails to approximate the intended turn.¹ *Id.* If Dr. Katsaggelos were correct about Figure 2, there would be no lag before adjusting the planned trajectory in Figure 4. POR, 48-49, EX2018, ¶¶114-116.

Petitioner argues that the predicted trajectory (line 402) of Figure 4 is not “the intended path,” and the planned trajectory (line 404) is not the “final trajectory used for video stabilization.” Reply, 24-25. But this is belied by Cai's actual disclosure, which states “[t]he planned trajectory 404 of FIG. 4

¹ Petitioner's assumption in footnote 3 is correct. The sentence at page 48 of the POR reading “As shown, the *predicted* trajectory initially appears to follow a straight path . . . ,” should read “the *planned* trajectory.”

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starts initially as a straight line but as the predicted trajectory 402 continues to move away from the planned trajectory, the planned trajectory is *adjusted*.” EX1009 at 6:53-56. Indeed, the cross-hatched dots of Cai are labeled as the “Trajectory from Proposed Method,” indicating that line 404 is the output that Cai’s approach produces in the situation described by Figure 4.

E. A POSITA Would Not Have Been Motivated To Combine Zhou And Cai

Petitioner disputes that Cai’s “maximalist” approach to zero motion conflicts with Zhou’s blur management, arguing that “Zhou in fact discloses a similar zero-motion detection technique.” Reply 25-26. But Petitioner provides no explanation as to how this general statement regarding one possible approach to video stabilization, EX1006, 3:51-53, can be reconciled with the specific embodiments relied upon in the Petition where Zhou “intelligently and gradually attenuate[s] or limit[s] the value of the video stabilization strength metric . . . as the amount of motion blur in the detected in the current frame increases,” EX1006, 4:14-19; *see Abiomed, Inc. v. Maquet Cardiovascular, LLC*, IPR2017-01204, -01205, Paper 9 at 11 (PTAB Oct. 23, 2017) (denying institution where Petitioner “fail[ed] to provide a sufficient rationale to combine the teachings of [the prior art references’s]

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different embodiments. Petitioner simply fails to explain sufficiently *why* one skilled in the art would have found it obvious to combine those teachings.”).

Besides, if as Petitioner now contends, Zhou already discloses zero-motion detection and enforcement functionality, a POSITA would have had no reason to seek out Cai to replicate it. The proposed combination would be duplicative, with no indication that Cai's technique is superior or complementary. *See Taiwan Semiconductor Manufacturing Company (TSMC), Ltd. v. Godo Kaisha IP Bridge 1*, Case IPR2016-01442, Paper 7 (Jan. 27, 2017) (denying institution where “[the primary reference] already purports to solve the problem”); *see also In re Nuvasive, Inc.*, 842 F.3d 1376, 1384–85 (Fed. Cir. 2016).

To the extent Petitioner argues that Cai adds value by using future frames to approximate intentional motion, that theory lacks factual support. As discussed above, Cai does not use future frames for zero-motion detection—only in later anchoring and clamping steps. POR, 20-21, 46–48; EX2018, ¶¶75, 112–115. Even if it did, Petitioner fails to explain why or how a POSITA would have been motivated, with a reasonable expectation of success, to alter Zhou's existing approach of gradually attenuating smoothing strength with Cai's approach of enforcing a strict zero-motion condition.

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Petitioner's argument not only relies on hindsight, it fails to harmonize Cai and Zhou's contradictory approaches to adjusting smoothing strength.

Indeed, attempting to integrate a zero-motion approach as taught by Cai (or, in the alternate embodiment Petitioner now cites in Zhou) would undermine Zhou's blur mitigation strategy. Zhou explains that blur can be masked by gradually reducing the strength of stabilization, rather than maximizing it, and this gradual tuning process would be disrupted by importing Cai's all-or-nothing method. POR, 52–54; EX2018, ¶¶121–122. As Dr. Foroosh explains, Cai removes all motion when zero motion is detected. *Id.* While Petitioner quibbles with describing this approach as “maximalist,” it does not dispute that this is how Cai operates. Thus, applying Cai's maximum stabilization under “zero-motion” conditions would disrupt Zhou's blur mitigation strategy—which adjusts stabilization strength to reduce motion blur. *Id.*

In sum, Petitioner offers no valid motivation to combine the blur mitigation embodiments from Zhou with any zero-motion detection and enforcement approach.

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V. GROUND 2 AND 3 FAIL FOR THE SAME REASONS AS GROUND 1

Grounds 2 and 3 fail for the same reasons as Ground 1. Reply, 27; POR, 55; EX2018, ¶124.

VI. GROUND 4: NEITHER ZHOU NOR THE BELL PAPER DISCLOSE THE CLAIMED “WEIGHT-BALANCE PARAMETER”

Claim 13 requires a “weight-balance parameter” that “controls types of motion that are minimized in smoothed trajectory generation, the types of motion including rotational velocity and rotational acceleration.” EX1001, 32:1-5. According to the '840 patent, the value of the weight-balance parameter “may control to what extent a combination of rotational velocity and rotational acceleration is minimized when determining the smoothed trajectory.” *Id.*, 21:26-58.

The Petition does not identify a parameter in either Zhou or the Bell Paper that controls the extent to which rotational velocity and rotational acceleration are minimized—nor does it assert that either reference discloses such a parameter. Instead, the Petition contends that Zhou's stabilization metric merely controls the amount of smoothing, and that the Bell Paper provides insight into types of motion affected. But the claim requires a

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parameter that controls (*i.e.*, enables weighting and balancing) how much a combination of rotational velocity and acceleration is minimized—not just general smoothing or discussion of motion types.

In its Reply, Petitioner concedes that the Bell Paper itself does not disclose a “weight-balance parameter,” claiming that the Petition instead relies on Zhou’s “stabilization strength parameter as the claimed ‘weight-balance parameter.’” Reply, 29. This is an improper new argument—the Petition nowhere asserts that Zhou discloses a “weight-balance parameter.” Petition, 23-28, 71-72. Rather, it asserts that Zhou discloses that its “stabilization strength parameter controls the amount of smoothing applied to generate the smoothed trajectory” and that “video may be stabilized . . . against rotation,” but concedes that Zhou “does not specify the types of rotational motion minimized.” Petition, 71.

Neither Zhou nor the Bell Paper disclose minimizing rotational velocity or rotational acceleration, much less a single parameter that enables weighting and balancing the minimization of both, as the claim requires. The Petition relies on the Bell Paper as purportedly disclosing “the details of the types of motion minimized.” Petition, 71-72. But the Bell Paper discloses only a method for filtering angular velocity. POR, 56, EX2018, ¶127. As Dr. Foroosh

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explains, filtering is not the same as minimizing rotational velocity. *Id.*; *see also* EX2049, 12:25-13:18 (agreeing that mere smoothing does not necessarily constitute minimizing). The Petitioner also contends that removing all jitter when the camera is deemed to be stationary “means that the rotational velocity is minimized” because rotational velocity is zero. But merely “removing all jitter”—under certain, limited circumstances—does not constitute a parameter for controlling the types of motion that are minimized in smoothed trajectory generation, as claimed.

Petitioner's citation to vague statements from the Bell Paper about removing “most” of the angular acceleration or “dramatically reduc[ing] the jitter in angular velocity” and removing it “when possible,” Reply, 28, also do not disclose any optimization or minimization of rotational acceleration, much less a combination of rotational velocity and rotational acceleration. In an effort to support this theory, Dr. Katsaggelos attempted to suggest that the claim could be met by a mere “reduction” of rotational velocity and rotational acceleration, EX2049, 9:21-10:22, but that is clearly wrong—it is commonsense that “reducing” is not “minimizing.”

Contrary to Petitioner (Reply at 28), PO's argument is not based on the lack of a “rigorous method”—but rather the lack of any disclosure from the

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Bell Paper suggesting that the combination of the recited types of motion are minimized as claimed. POR, 57-58, EX2018, ¶¶129-130.

VII. SECONDARY CONSIDERATIONS SUPPORT NON-OBVIOUSNESS

A. HERO7 Practices The '840 Patent

In the ITC, Petitioner did not dispute HERO7 practices claims 1, 13, and 14, other than “temporal horizon” of claim 1, which the ITC found was met. EX2052, 99-101. Dr. Foroosh relied on this in forming his opinion. POR, 60; EX2018, ¶165.

Dr. Foroosh also independently confirmed HERO7 practices the claims. He reviewed PO's DI charts (EX2016), analyzed [REDACTED] [REDACTED] and code. POR, 60-61, EX2018, ¶¶132-168.

Petitioner isolates two paragraphs (¶¶152, 158), asserting for limitations 1[g](ii) and 1[h] he cited only [REDACTED]. Reply, 29. But Petitioner ignores the majority of his analysis. EX2018, ¶¶132-168.

B. Nexus Exists

Petitioner's attempt to deny nexus (Reply, 31-34) was rejected by the ITC, finding: “[t]he record supports that evidence of secondary considerations were the direct result of the unique characteristics of the '894 and '840

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patents.” EX2052, 70-72, 107, 111. The ITC relied on many of the same documents cited by Dr. Foroosh, and testimony of Mr. Lema, who submitted a detailed, *unrebutted* declaration here. *Id.*, 70-72; EX2024.

Petitioner's arguments disputing nexus and the underlying objective indicia lack merit. Reply, 31-34.

First, Petitioner misrepresents the record in attempting to dismiss the 2022 Technology & Engineering Emmy® Award (EX2010) as relating to “EIS technology in 2015.” Reply, 32. As Mr. Lema testified, and a contemporaneous press release (EX2012) confirms, the Emmy was awarded in 2022 for GoPro's HyperSmooth stabilization—not for generic legacy EIS. POR, 64; EX2024, Lema Decl. ¶¶13, 22. The National Academy of Television Arts & Sciences recognized “the technology powering GoPro's industry-leading HyperSmooth video stabilization.” EX2012. The ITC credited this award as industry praise directly tied to the '840 patent. EX2052, 72-73, 111.

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Second, Petitioner contends commercial success and praise are attributable to “other features—not the purported novel ones.” Reply, 31-32.² But Mr. Lema’s declaration as well as the cited consumer surveys tie commercial success and praise directly to the unique characteristics of the ’894 and ’840 patents. POR 59-61. The ITC agreed that nexus was satisfied. EX2052, 70-72.

Finally, Petitioner contends there is no evidence of long-felt need, unexpected results, or copying. Reply, 32. But GoPro submitted contemporaneous evidence—including [REDACTED]

[REDACTED]

[REDACTED]

² Petitioner points to Mr. Derbanne’s testimony [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

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[REDACTED].³

Combined with expert testimony and surveys, this supports findings of industry praise, unexpected results, and long-felt need. Petitioner offers no rebuttal and ignores the [REDACTED].

Date: September 4, 2025

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³ Petitioner notes the review concerns HERO9 and HERO8. But Mr. Lema testified—without rebuttal—that HyperSmooth “played a pivotal role in the commercial and critical success of the HERO7 Black *and our HERO camera line more broadly.*” EX2024, ¶24 (emphasis added).

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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 5,563 words and thus complies with the applicable word limit.

Date: September 4, 2025

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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 September 4, 2025 upon the following parties via

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