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Paper 51
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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.

IPR2024-01164
Patent 10,958,840 B2

Before WILLIAM V. SAINDON, NABEEL U. KHAN, and BRIAN D. RANGE, *Administrative Patent Judges*.

SAINDON, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining No Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

A. Background and Summary

Arashi Vision (U.S.) LLC (d/b/a Insta360) ("Petitioner") filed a Petition (Paper 2, "Pet.") requesting an *inter partes* review of claims 1–21 ("the challenged claims") of U.S. Patent No. 10,958,840 B2 (Ex. 1001, "the '840 patent"). We instituted an *inter partes* review under 35 U.S.C. § 314. Paper 11 (Dec. on Inst.). Patent Owner filed a Response (Paper 21, "PO Resp."), Petitioner filed a Reply (Paper 28, "Pet. Reply"), and then Patent Owner filed a Sur-reply (Paper 34, "PO Sur-reply").[1] An oral hearing was held. Paper 50 ("Tr.").

We have authority to enter this final written decision ("Decision") under 35 U.S.C. § 318(a). The standard for review is set forth in 35 U.S.C. § 316(e), which provides that "the petitioner shall have the burden of proving a proposition of unpatentability by a preponderance of the evidence." For the reasons provided below, we determine that Petitioner has not met this burden of establishing unpatentability of any of the challenged claims.

B. Real Parties in Interest

The parties both assert that they are the sole real parties in interest. Pet. 80; Paper 5, 2 (Patent Owner's Mandatory Notice).

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[1] Our citations are only to the public, redacted versions of these briefs because this paper does not discuss confidential information.

C. Related Matters

The parties both identify *In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith*, Inv. No. 337-TA-1400 (USITC) and *GoPro, Inc. v. Arashi Vision Inc. et al.*, No. 8:24-cv-00681-HDE-JCV (C.D. Cal.) as related matters outside the USPTO. Pet. 80–81; Paper 5, 2.

Related matters within the USPTO include: IPR2024-00984 (US Pat. 10,015,413); IPR2024-01052 (US Pat. 11,336,832); IPR2024-01065 (US Pat. 10,958,840); and IPR2024-01086 (US Pat. 10,574,894). Paper 5, 2.

D. Prior Art and Asserted Grounds

Petitioner's grounds rely on the following prior art references:

Name	Reference	Exhibit No.
Kwatra	US Pat. 8,531,535 B2, iss. Sept. 10, 2013	1012
Sokeila	US Pat. 8,994,838 B2, iss. Mar. 31, 2015	1008
Karpenko	US Pat. 9,071,756, iss. June 30, 2015	1009
Bell	US Pat. 10,027,893 B2, iss. July 17, 2018	1006
Shi	US Pat. 10,462,370 B2, iss. Oct. 29, 2019	1007
Corey	US Pub. No. 2013/0044228 A1, pub. Feb. 21, 2013	1011
Bell Paper	Steven Bell, Alejandro Troccoli, and Kari Pulli, "A Non-Linear Filter for Gyroscope-Based Video Stabilization," *ECCV (4), Vol. 8692 of Lecture Notes in Computer Science*, pp. 294-308, Springer (2014).	1005

Petitioner asserts that the challenged claims would have been unpatentable on the following grounds:

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1–3, 5, 8–11, 14, 16, 18, 19	103	Bell, Shi
4, 20	103	Bell, Shi, Karpenko
6, 7, 21	103	Bell, Shi, Bell Paper
12	103	Bell, Shi, Sokeila

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
13	103	Bell, Shi, Kwatra
15	103	Bell, Shi, Corey
17	103	Bell, Shi, Kwatra, Corey

Petitioner relies on the testimony of Dr. Aggelos Katsaggelos, Ph.D, a professor of Electrical and Computer Engineering who has taught courses in "digital image and video processing, including image and video compression, algorithms, analysis, and enhancement techniques." Ex. 1003 ¶ 6. Patent Owner relies on the testimony of Dr. Hassan Foroosh, Ph.D, a professor of Computer Science who has taught courses in "computer vision and 3D modeling, including 3D Computer Vision, Image Processing, Special Topics in 3D Computer Vision, and Visual Simulation." Ex. 2001 ¶¶ 8–9.

E. Overview of the '840 Patent

In general, the '840 patent is directed to the stabilization of videos using smoothing techniques to ameliorate the motion of the camera during filming. Ex. 1001, 1:18–40. However, because stabilized video can exacerbate the appearance of motion blur, the '840 patent teaches to, at times, attenuate the stabilization when there is significant blurring. *Id.* at 17:61–18:24. The '840 patent considers several parameters for controlling stabilization. *Id.* at 21:17–25. Most relevant to this Decision is the '840 patent's use of a "low-light high-pass parameter." The '840 patent explains that the exposure time of the image capture device may be automatically adjusted based on light conditions. *Id.* at 19:15–17. In general, longer exposure times are used in low-light conditions, and vice versa. *Id.* at 19:18–21. However, longer exposure times are associated with higher

amounts of motion blur in the recorded video. *Id.* at 19:25–26. Thus, the low-light high-pass parameter controls smoothing based on exposure times. *See id.* at 21:59–22:21.

F. Challenged Claims

Claims 1–21 are challenged. Claims 1 and 16 are independent. Claim 1 is reproduced below, with the phrase "low-light high-pass parameter" underlined.

> 1. A image capture system that stabilizes videos, the image capture system comprising:
>
> a housing of an image capture device;
>
> an optical element carried by the housing and configured to guide light within a field of view to an image sensor;
>
> the image sensor carried by the housing and configured to generate a visual output signal conveying visual information based on light that becomes incident thereon during a capture duration, the visual information defining visual content having the field of view, the field of view being larger than a size of a viewing window for generating stabilized visual content;
>
> a position sensor carried by the housing and configured to generate a position output signal based on positions of the housing during the capture duration, the position output signal conveying position information that characterizes rotational positions of the housing at different moments within the capture duration; and
>
> one or more physical processors configured by machine-readable instructions to:
>
> determine a trajectory of the housing during the capture duration based on the position information, the trajectory reflecting the rotational positions of the housing at the different moments within the capture duration, the trajectory including a first portion corresponding to a first moment within the capture

duration and a second portion corresponding to a second moment subsequent to the first moment within the capture duration;

determine a smoothed trajectory of the housing based on a look-ahead of the trajectory and one or more of a weight-balance parameter, a low-light high-pass parameter, and/or a stickiness parameter, the lookahead of the trajectory including use of a subsequent portion of the trajectory to determine a preceding portion of the smoothed trajectory such that a portion of the smoothed trajectory corresponding to the first portion of the trajectory is determined based on the second portion of the trajectory, the smoothed trajectory having smoother changes in the rotational positions of the housing than the trajectory, wherein the determination of the smoothed trajectory based on the look-ahead of the trajectory includes use of a temporal horizon of motion experienced by the image capture device, the temporal horizon enabling approximation of intentional motion of the image capture device while causing a delay in the determination of the smoothed trajectory;

determine placement of the viewing window for the visual content with respect to the field of view of the visual content based on the smoothed trajectory of the housing, the viewing window defining one or more extents of the visual content to be included within a punchout of the visual content; and

generate the stabilized visual content of a video based on the viewing window, the stabilized visual content including the punchout of the one or more extents of the visual content within the viewing window, wherein inclusion in the stabilized visual content of the one or more extents of the visual content within the viewing window effectuates stabilization of the visual content via selective cropping.

II. ANALYSIS

A. Legal Standards Used in the Merits Analysis

"In an IPR, the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable." *Harmonic Inc. v.*

Avid Tech., Inc., 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring *inter partes* review petitions to identify "with particularity . . . the evidence that supports the grounds for the challenge to each claim")); *Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (discussing the burden of proof in *inter partes* review).

A claim is unpatentable under 35 U.S.C. § 103 if "the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious . . . to a person having ordinary skill in the art to which said subject matter pertains." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) when in evidence, objective indicia of non-obviousness. *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17–18 (1966).

B. Level of Ordinary Skill in the Art

Petitioner asserts that:

> A person of ordinary skill in the art (POSITA) in the field of the '840 patent would have a bachelor's degree in engineering or computer science, or equivalent field, and two years of experience working on image or video processing, or digital cameras. Alternatively, a POSITA would have four years of experience working on image or video processing, or digital cameras. An advanced graduate degree in the disciplines cited above may make up for the work experience indicated above.

Pet. 5 (citing Ex. 1002 ¶ 32). Patent Owner applies the same standard. PO Resp. 22–23. We use this agreed-upon standard for purposes of this Decision.

C. Claim Construction

Under 37 C.F.R. § 42.100(b), we apply the claim construction standard set forth in *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–13 (Fed. Cir. 2005) (en banc). That is, "the words of a claim 'are generally given their ordinary and customary meaning' . . . that the term would have to a person of ordinary skill in the art in question at the time of the invention." *Id.* at 1312–13.

Prior to institution, neither party had proposed a construction for "low-light high-pass parameter." *See* Dec. on Inst. 8. We indicated that the term was important to resolve a dispute between the parties, and set out a preliminary construction of "a parameter that controls the amount or strength of smoothing used in motion blur compensation." *Id.* at 8–9. We have reviewed the parties' arguments and the evidence cited therein in the subsequent briefing. We will first provide an overview of the parties' arguments and then analyze the specification and the extrinsic evidence.

In its Response, Patent Owner proposes that the term should be construed as "a parameter that controls the amount or strength of smoothing used in motion blur compensation by allowing more high frequencies to pass through based on low-light conditions." *See* PO Resp. 23–26; PO Sur-reply 1–10. Patent Owner argues that both the "low-light" and "high-pass" terms limit the claimed parameter to a particular condition (low light) and a particular implementation (high pass). PO Resp. 24 (citing *Lashify, Inc. v. Int'l Trade Comm'n*, 130 F.4th 948, 964 (Fed. Cir. 2025) ("A claim

construction that gives meaning to all the terms of the claim is preferred.”)). To wit, Patent Owner points to the portions of the specification stating that low-light conditions are linked to higher exposure times, which in turn are linked to motion blur. PO Sur-reply 3–6 (citing Ex. 1001, 19:18–21, 19:25–26, 19:34–40, Fig. 7). Patent Owner points to portions of the specification stating that motion blur is alleviated by retaining high frequencies in images. *Id.* (citing Ex. 1001, 17:61–18:9, 22:8–25).

Petitioner argues in its Reply that we should keep our preliminary construction. *See* Pet. Reply 1–7. Petitioner argues that the portions cited in the specification by Patent Owner merely show that “low light is simply one condition requiring higher exposure time” (*id.* at 3) and that Patent Owner “cites no language requiring only high frequencies to be retained” (*id.* at 5).

The low-light high-pass parameter is one parameter among several that helps control the generation of the smoothed trajectory. Ex. 1001, 21:17–25. During operation, light strikes the image sensor pixels of the camera to capture an image, but this does not happen instantaneously. *Id.* at 18:10–12. Some amount of exposure time is allocated to receive light onto the sensors. *Id.* at 5:59–67 (describing how “images are captured at 30 images/second), 18:11–12 (stating that “it may take a certain amount of time for image sensor pixel sites to gather light”). If there is relative motion between subject and camera while light is being gathered, the image may be blurred. *Id.* at 18:12–24 (discussing “intra-frame motion,” i.e., motion depicted in a given frame), 18:37–42 (explaining that longer capture times may result in more motion blur). Plainly, the longer the exposure time, the more an object could move during that time. Given that a longer exposure time is required to gather sufficient light during low-light conditions, it is

therefore expected that low-light conditions will tend to generate more motion blur. *Id.* at 19:12–26 (noting that, because "the exposure time of the image capture device may be automatically adjusted based on light conditions" and "[h]igher exposure time may result in greater amount of motion blur," then "exposure time and image capture device motion may determine the extent of stabilization to be performed").

The specification states that the smoothed trajectory can be controlled by various parameters, including the claimed low-light high-pass parameter. *Id.* at 21:22–25, 21:59–61, 22:8–21. The low-light high-pass parameter varies in value to effect full attenuation of the motion observed during the exposure period, or to permit the smoothed trajectory to be the same as the observed trajectory. *Id.* at 22:9–16. In the latter case, the output motion would contain "high frequencies that mask motion blur." *Id.* at 22:16–18. In summary, the specification explains that low-light conditions can cause the camera to increase exposure time, leading to more intra-frame motion, i.e., motion blur within a frame, which can be attenuated by allowing the images to have high frequency motion in order to permit the smoothed trajectory to be the same as the observed trajectory.

Given the teachings of the specification, we agree with Patent Owner that a low-light high-pass parameter is a parameter of a smoothing function that favors high frequencies (high pass) when exposure times are long (low light). *See* Tr. 42:10–18 (Patent Owner's counsel stating that "high-pass" means "there's a bias or preference for high frequencies"); Ex. 2020, 93:23–94:15 (Petitioner's declarant, Dr. Katsaggelos, agreeing that a high-pass system attenuates the low frequency of a signal). Although we acknowledge Petitioner's position that the specification provides other ways or

considerations in implementing a smoothing function, based on our above analysis of the specification, we find that the specification describes the low-light high-pass parameter as a specific component of a smoothing function. *See, e.g.*, Ex. 1001, 21:17–25 (setting out several parameters besides the low-light high-pass parameter used in trajectory smoothing).

Petitioner offers other intrinsic evidence from the prosecution history in support of its position. Pet. Reply 5–6 (citing Ex. 1021, 22). When describing the low-light high-pass parameter, the ’840 patent’s provisional application states that “[t]his parameter does not need to evolve in function of the exposure time.” Ex. 1021, 22. Petitioner argues that this means that “no matter the exposure time – and thus regardless of the lighting condition – the parameter stays the same and performs blur compensation.” Pet. Reply 6.

Patent Owner responds that this quoted line means that the parameter does not need to “change[] over the duration of the exposure.” PO Sur-reply 8. Patent Owner argues that Petitioner’s reading would hold the parameter as a constant, rendering it of limited value, and further argues that earlier in the section on the low-light high-pass parameter, the provisional application makes clear that the parameter is “[t]aking into account the exposure time of *every frame*.” *Id.* at 7–8 (quoting Ex. 1021, 22) (capitalization modified) (emphasis added). Patent Owner’s interpretation of the passage better conforms to the intrinsic evidence. Both earlier in the provisional application and in the ’840 patent specification, the smoothing function is described as varying based on the exposure time. Ex. 1021, 22 (quoted immediately above); Ex. 1001, 18:43–46 (stating that the “amount of smoothing/stabilization performed/allowed may depend on . . . the exposure

time of the image capture device"), 19:15–17 (stating that the "exposure time of the image capture device may be automatically adjusted based on light conditions"). Thus, it makes sense to read the passage in the provisional application about not needing to "evolve" in a way that does not undo these tenets of the disclosure, and Patent Owner's explanation regarding the parameter not changing during a single instance of image capture is a reasonable interpretation consistent with the whole of the disclosure. *See Renishaw PLC v. Marposs Societa' per Azioni*, 158 F.3d 1243, 1250 (Fed. Cir. 1998) ("The construction that stays true to the claim language and most naturally aligns with the patent's description of the invention will be, in the end, the correct construction.").

Petitioner's assertions regarding extrinsic evidence provides no reason to disturb the interpretation based on intrinsic evidence. Pet. Reply 6–7; *Seabed Geosolutions (US) Inc. v. Magseis FF LLC*, 8 F.4th 1285, 1287 (Fed. Cir. 2021) ("If the meaning of a claim term is clear from the intrinsic evidence, there is no reason to resort to extrinsic evidence."). Petitioner asserts that the '840 patent "compensates for blur after it has already formed" and is therefore "agnostic as to the cause of the blur," such as low light. Pet. Reply 6–7 (citing Ex. 1017 ¶¶ 30–31). Petitioner also asserts that "no software-only technique can selectively mitigate blur based solely on lighting conditions." *Id.* Lastly, Petitioner asserts that Patent Owner's expert cites only to a generic "blurCompensation" parameter in source code, rather than one having to do with low light or high frequency. *Id.* at 7 (citing Ex. 2018 ¶ 182).

Patent Owner responds that the claimed parameter "does not require that blur compensation be perfectly tailored," and that Petitioner's

arguments listed above are a "red herring." PO Sur-reply 9–10. We agree; Petitioner establishes no reason why we must find that the low-light high-pass parameter be perfect or the sole parameter. We disagree that the '840 patent is agnostic as to the cause of the blur because, as we explained above, the specification specifically considers exposure time in making its blur mitigation choices. *See, e.g.*, Ex. 1001, 18:62–19:26. As to the "blurCompensation" argument, we do not consider Patent Owner's *proprietary* source code sufficiently relevant for determining how *a person of ordinary skill in the art* would construe the claimed "low-light high-pass parameter." Reviewing the arguments and evidence regarding extrinsic evidence, we do not find evidence that a person of ordinary skill in the art would construe "low-light high-pass parameter" as something that does not involve low light or high frequencies, as Petitioner proposes. *See Bicon Inc. v. Straumann Co.*, 441 F.3d 945, 950 (Fed. Cir. 2006) ("claims are interpreted with an eye toward giving effect to all terms in the claim").

Lastly, we address the statement by the International Trade Commission that the claim "does not require that the low-light high-pass parameter be part of the entire smoothing operation." Ex. 2052, 103. Our construction is not in conflict with this statement; rather, the International Trade Commission merely observes that the claim permits other components or parameters to be part of the smoothing process. Indeed, as we acknowledged above, the '840 patent lists at least three parameters that may be part of the smoothing operation. Ex. 1001, 21:17–25. The claim is explicitly drawn to "one or more" of these parameters. *Id.* at 30:36–38. The reason we are focusing on the low-light high-pass parameter is because that is the only one of the three claimed parameters identified by Petitioner in the

prior art. Pet. 27–30. Thus, even if the claim permits other parameters, the ground before us is limited to a low-light high-pass parameter. *VLSI Tech. LLC v. Intel Corp.*, 53 F.4th 646, 654 (Fed. Cir. 2022) ("[T]he petition defines the scope of the IPR proceeding and . . . the Board must base its decision on arguments that were advanced by a party and to which the opposing party was given a chance to respond.").

In conclusion, we adopt Patent Owner's construction for a low-light high-pass parameter, namely "a parameter that controls the amount or strength of smoothing used in motion blur compensation by allowing more high frequencies to pass through based on low-light conditions."

D. Asserted Obviousness Over Bell and Shi (Claims 1–3, 5, 8–11, 14, 16, 18, and 19)

Petitioner asserts that claims 1–3, 5, 8–11, 14, 16, 18, and 19 would have been obvious in view of Bell and Shi. Pet. 8–62. The present dispute between the parties can be resolved by an analysis of independent claim 1; we limit our analysis to that claim.

Independent claim 1 is an "image capture system that stabilizes videos." Ex. 1001, 30:6–7. The image capture system has a housing, optical element, image sensor, and a position sensor. *Id.* at 30:8–18. In addition, it has one or more processors that determines: (i) a trajectory of the housing, (ii) a smoothed trajectory of the housing, based on a look-ahead trajectory and a low-light high-pass parameter, (iii) placement of a viewing window based on the smoothed trajectory, and (iv) stabilized video content. *Id.* at 30:19–67. The dispute before us is limited to item (ii) of this list, specifically the low-light high-pass parameter.

At a high level, Petitioner's ground relies on Bell to teach each limitation of the claim except the low-light high-pass parameter, which Petitioner asserts is taught by Shi. *See* Pet. 10–48 (*passim*); *id.* at 28–31 (discussion of Shi). We will provide a brief overview of Bell and Shi before turning to the parties' positions and our analysis.

1. Bell

Bell discusses real-time video stabilization for mobile devices based on on-board motion sentencing. Ex. 1006, Abstract. Bell states that "most mobile cameras use a rolling shutter, in which each horizontal scan line of pixels is exposed and read out in sequence." *Id.* at 1:22–24. When the camera is moving, however, "each image row captures a slightly different scene, causing motion distortions." *Id.* at 1:24–26. For example, vertical displacement causes the image to be squeezed or stretched vertically, whereas horizontal motions shear the image so that it appears to tilt to the left or to the right. *Id.* at 1:26–29, 7:9–39, Fig. 2 (noting image 220 depicting a squeezed image due to vertical motion and image 230 depicting a sheared image due to horizontal motion). To compensate for these motion effects, Bell proposes to model the camera's physical movement and orientation and then apply a "smoothing algorithm" that uses past, current, and future frames in a "look-ahead buffer." *Id.* at 8:57–67, 10:14–16; *see generally id.* at 7:40–10:37 (further detail).

2. Shi

Shi also discusses a video stabilization scheme that uses "look-ahead frames" to compensate for motion. Ex. 1007, 1:60–65. Shi notes a new problem that may occur when video is stabilized, however, that motion blur

in the stabilized video "may become very noticeable and unnatural." *Id.* at 17:59–63. Accordingly, to solve this problem Shi proposes a method of compensating for the motion blur by allowing the virtual camera's position to move based on the camera's real position. *Id.* at 11:12–27, 17:53–18:40. The extent of this is determined using a coefficient to weight an interpolation between frames. *Id.* at 18:30–31.

3. Petitioner's Ground

Petitioner asserts that Bell teaches an image capture system that has a housing, optical element, image sensor, and position sensor as claimed. Pet. 10–20. Petitioner then asserts that Bell teaches one or more processors as claimed that determine: (i) a trajectory of the housing, (ii) a smoothed trajectory of the housing based on a look-ahead trajectory, (iii) placement of a viewing window based on the smoothed trajectory, and (iv) stabilized video content. *Id.* at 20–26, 31–48.

The disputed "low-light high-pass parameter" limitation is part of the broader limitation: "determining a smoothed trajectory of the housing based on a look-ahead of the trajectory and . . . a low-light high-pass parameter." Petitioner starts with Bell for determining a smoothed trajectory based on a look-ahead. Pet. 26–27. In particular, Petitioner points to Bell's "smoothing algorithm," which "use[s] data from a look-ahead buffer to calculate a smoother path." *Id.* (citing Ex. 1006, 8:63–67, 10:14–16). For the low-light high-pass parameter, Petitioner points to Shi's motion-blur correction method. *Id.* at 28–30. Specifically, Petitioner identifies a "coefficient based on the motion blur kernel" that controls the amount of smoothing as the claimed low-light high-pass parameter. *Id.* at 28 (citing Ex. 1003 ¶¶ 110–120; Ex. 1007, 18:30–33); *see also* Pet. Reply 7–10 (further argument).

To explain why it would have been obvious to combine these teachings, Petitioner first notes that both Bell and Shi are directed towards the same concern, namely, video quality that is compromised by shaking. Pet. 30 (citing Ex. 1006, Abstract, 1:17–21; Ex. 1007, Abstract, 1:7–12). Petitioner identifies a desire in the art to correct motion blur. *Id.* (citing Ex. 1007, 1:13–15; Ex. 1003 ¶ 123). Thus, Petitioner asserts that it would have been obvious to improve Bell's video stabilization techniques by using the motion blur compensation technique in Shi. *Id.*; *see also* Pet. Reply 10–11 (further argument).

4. Analysis

Our analysis focuses on one dispositive issue. Patent Owner argues that Petitioner has not shown a low-light high-pass parameter as properly construed. PO Resp. 26–34; PO Sur-reply 10–12. For the reasons that follow, we find that Petitioner has not shown, by a preponderance of the evidence, that Shi discloses a low-light high-pass parameter.

Petitioner asserts that the "coefficient based on the motion blur kernel" of Shi is the claimed low-light high-pass parameter. Pet. 28 (citing Ex. 1007, 18:30–33). Similar to the '840 patent, Shi recognizes that corrected motion blur "may become very noticeable and unnatural," and provides a similar correction by allowing the frame "to at least partially track the real camera position, consistent with the natural blur in the image." Ex. 1007, 17:59–18:6. Shi estimates the amount of blur, called the "motion blur kernel." *Id.* at 18:7–10. This is done by calculating a "magnitude of the offset from the origin point" when comparing the apparent motion of a point along the frame. *Id.* at 18:7–26. A coefficient based on the motion blur kernel is used to apply a spherical interpolation between a virtual camera

position and a real device position. *Id.* at 18:27–40. In other words, the blur is addressed by *analyzing the image* to identify motion and then shifting the image. Shi, however, does not disclose how its parameter is based on low light (or the long exposure times indicative of low light).

In its Petition, Petitioner asserts that a person of ordinary skill in the art would understand that "blurs can be caused by low light conditions." Pet. 28 (citing Ex. 1003 ¶ 111). Although this is true, that does not mean that Shi's blurs are identified by a parameter that considers low light. As we just described, Shi identifies the blur by quantifying the amount of *motion* of the points in an image, not by identifying low light. This is simply a different way to determine the presence of motion blur. In Shi, blur is measured, whereas in the '840 patent, it is inferred based on low-light conditions (e.g., by observing the exposure time). *See, e.g.*, Ex. 1007, 18:7–26; Ex. 1001, 19:12–26. In its Reply, Petitioner does not point to any further disclosures. Accordingly, we find that Shi does not disclose the "low-light" aspect of the claimed low-light high-pass parameter. This is sufficient to determine that Petitioner's ground does not meet all claim limitations.

Similarly, we find that Shi does not disclose the "high-pass" aspect of the parameter. Shi's blur compensation uses a spherical interpolation to modify the image. Ex. 1007, 18:27–40. The low-light high-pass parameter, as we have construed the term, allows *more* high frequencies. To allow more high frequencies, this necessarily means either allowing fewer low frequencies, or allowing more high frequences as opposed to some counterfactual situation in which fewer high frequencies were going to be allowed. *See* Ex. 2020, 94:23–95:15; Ex. 2022. We are directed to no persuasive evidence from Petitioner that Shi's spherical interpolation favors

high frequencies over low frequencies. *Accord* Ex. 2018 ¶ 107 (Patent Owner's expert stating that Shi's spherical interpolation "reintroduce[es] both high- and low-frequency motion"). Even if Shi allows the viewing window to track the camera position "consistent with the natural blur in the image" (Ex. 1007, 17:63–67), we are not provided with sufficient evidence to conclude by a preponderance of the evidence that providing a similar visual *goal* as a high-pass parameter (Ex. 1001, 22:16–18, "the output motion may include high frequencies that mask motion blur") is the same as having a high-pass parameter. Again, *merely* preserving high frequencies is not the same as having a "high-pass parameter" because, as construed, a "high-pass parameter" also involves some degree of attenuation of low frequencies or relative increase of high frequencies. Accordingly, we find that Shi does not disclose the "high-pass" aspect of the claimed low-light high-pass parameter.

5. Conclusion for the Bell & Shi Ground Analysis

In sum, the claimed approach and Shi's approach are two different ways to identify and address the same underlying issue of motion blur. Petitioner's grounds for both independent claims 1 and 16 rely on Shi for teaching a low-light high-pass parameter. Pet. 27–30, 61. Because we find that Shi does not teach this limitation, all of Petitioner's grounds fall for this reason.

III. CONCLUSION

For the reasons given above, we determine that Petitioner has not established by a preponderance of the evidence that any claim of the '840 patent would have been obvious in view of the prior art cited.

The following table summarizes the outcome of this proceeding:

Claim(s)	35 U.S.C. §	Reference(s)/Basis	Claim(s) Shown Unpatentable	Claim(s) Not Shown Unpatentable
1–3, 5, 8–11, 14, 16, 18, 19	103	Bell, Shi		1–3, 5, 8–11, 14, 16, 18, 19
4, 20	103	Bell, Shi, Karpenko		4, 20
6, 7, 21	103	Bell, Shi, Bell Paper		6, 7, 21
12	103	Bell, Shi, Sokeila		12
13	103	Bell, Shi, Kwatra		13
15	103	Bell, Shi, Corey		15
17	103	Bell, Shi, Kwatra, Corey		17
Overall Outcome				1–21

IV. ORDER

In consideration of the foregoing, it is hereby

ORDERED that the record show that Petitioner has not established that any of claims 1–21 of the ’840 patent are unpatentable;

FURTHER ORDERED that, because this is a Final Written Decision, parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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