

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)
IPR2024-01165 (Patent 10,958,840 B2)
IPR2024-01186 (Patent 10,574,894 B2)

Record of Oral Hearing
Held: October 23, 2025

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

IPR2024-01164 (Patent 10,958,840 B2)
IPR2024-01165 (Patent 10,958,840 B2)
IPR2024-01186 (Patent 10,574,894 B2)

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P R O C E E D I N G S

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MR. SCHMIDT: Thank you, Your Honor. I'm Patrick Schmidt on behalf of GoPro, and I'm joined by my colleague, Joseph Milowic.

MR. MILOWIC: Hi, Your Honor.

JUDGE SAINDON: Good afternoon. Thank you. Petitioner?

MS. LI: Good afternoon, Your Honors. My name is Lily Yue Li, counsel For Petitioner Arashi d/b/a Insta360. Joining me here today in person are my colleagues Alex Yap and Mehran Arjomand. My colleague Stella Mao may also be joining remotely. And also joining us is our client representative.

JUDGE SAINDON: Okay. Thank you. Good afternoon. Okay. Petitioner, you may approach the podium and begin. If you'd like me to keep track of rebuttal time, let me know. Otherwise, you have your 90 minutes.

MS. LI: Thank you, Your Honors. Would you like to have a hard copy of our slide deck?

JUDGE SAINDON: No, thank you.

MS. LI: May I approach and pass to the court reporter?

JUDGE SAINDON: Sure.

MS. LI: Thank you.

COURT REPORTER: Thank you.

MS. LI: Your Honors, for Petitioner, may we reserve 40 minutes for rebuttal and 10 minutes for the confidential session?

JUDGE SAINDON: Okay. You may begin.

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1 MS. LI: Thank you, Your Honors. May it please the Board.

2 Today we are representing Insta360, and we'll explain why the '840, '894
3 patents are unpatentable in those three proceedings 1164, 1165, and 1186.

4 So Your Honors, I'm going to just have a brief intro of the patents,
5 go through the claim construction, and then the instituted grounds for all
6 three proceedings. And in the end, we'll go through the secondary
7 considerations in the confidential session.

8 Before we delve into the details, I just wanted to give a quick
9 overview of what those patents are about. They are about video
10 stabilization. And there are three steps for video stabilization: the first step
11 is motion estimation; the second step is motion smoothing; and the third step
12 is the rendering process, it's how you generate the stabilized video, which is
13 called image warping.

14 Now, if we take the '840 patent, Claim 1, as example, the first step
15 really is to estimate the camera's original trajectory, which may have some
16 shakiness or jittering as you're taking the video. And for example, Claim 1
17 of '840 recites determining a trajectory of the housing during the capture
18 duration based on the position information.

19 Slide 7, the second step, motion smoothing, is to determine a
20 smoothed trajectory that removes the shakiness or jittering. So here, '840
21 patent, Claim 1 recites, for example, using any of the three parameters like
22 weight balance, low-light high-pass, or stickiness parameter to determine a
23 smooth path. It also recites using a look-ahead, so you're looking into the
24 future to determine the smoothed trajectory so it can approximate the user's
25 intentional motion.

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1 Slide 8, the third step, is to generate the stabilized video based on
2 the smoothed trajectory, and that is the rendering process I just mentioned.
3 So here in the '840 patent, Claim 1 recites determining a view window to
4 basically crop out a stabilized video content.

5 Similarly, '894 is also about video stabilization. I just wanted to
6 draw the Board attention to Claim 1. Then in the smoothing step, Slide 11,
7 the '894 patent in Claim 1 recites a path that minimizes a combination of
8 rotational velocity and rotational acceleration. So this is similar to the
9 weight-balance parameter in the '840 patent we're going to discuss today.

10 Going to the claim construction, Slide 13 and 14 shows that there's
11 a term low-light high-pass parameter in the '840 patent that the Board issued
12 a preliminary construction in the decision on institution. Now, we're on
13 Slide 15, so during the institution, the Board construed this parameter to
14 mean a parameter that controls the amount or strength of smoothing using
15 motion blur compensation. There's no dispute that this at least should be
16 part of the construction.

17 Now, GoPro's construction has an additional limitation, which
18 requires -- by allowing more high frequencies to pass through based on low-
19 light conditions. This is not in the Board's preliminary construction. This is
20 also not how GoPro itself interpreted this limitation in the ITC investigation.
21 And I'll explain why GoPro's construction is wrong.

22 But at the threshold, I want to draw the Board's attention to
23 dependent Claim 14 which recites the low-light high-pass parameter controls
24 the amount or strength of smoothing performed in smoothed trajectory
25 generation in extent of motion blur compensation applied in determination

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1 of the smoothed trajectory. So this is Claim, it's a dependent claim, which
2 gives more details about what this parameter is about. This claim depends
3 from Claim 1. And GoPro's claim construction makes no sense because it is
4 narrower than the dependent claim and validates claim differentiation.

5 Slide 16, the case law is clear that we need to look at the
6 specification for claim construction. And what I'll explain is GoPro
7 improperly trying to parse out the words in the term in isolation and consider
8 them in a vacuum without looking at the specification.

9 Slide 17, so what does the specification say? It describes how the
10 low-light high-pass parameter controls the amount or strength of smoothing
11 using motion blur compensation. So as shown on Slide 17, this parameter
12 can be arranged, as example, between 0 and 1. So 0 corresponds to no
13 motion blur compensation at all. And on the other hand, 1 corresponds to
14 full motion blur compensation, meaning that the smoothed camera trajectory
15 completely follows the original trajectory.

16 Slide 18, again, the specification describes that this parameter is
17 determined based on motion blur. And motion blur, as described in the spec,
18 is also referred to as the intra-frame motion, meaning that the motion
19 happens within a single frame during the exposure time. And this is
20 different from the inter-motion, which is between the frames. So we're
21 talking about this intra-frame motion that's happening within the single
22 frame and basically is -- you know, your object or camera moves during this
23 exposure time. So the motion may get blurred inside this one frame.

24 Slide 19, as the specification makes clear, motion blur can be
25 caused by different conditions, and it's not limited to low-light conditions.

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1 Take an example, in Figure 7, it shows that the low-light high-pass
2 parameter can change based on the camera motion. So you can see Figure 7,
3 the X axis is exposure time, the Y axis is how the motion changes. You see
4 the highlighted arrows where you can have the same light condition, but
5 based on how the motion changes, the low-light high-pass parameter can
6 change from S1 to S3 or vice versa. And GoPro's own experts also concedes
7 that this Figure 7 shows adjusting smoothing, amount of smoothing, based
8 on factors such as exposure time, motion of the image capture device, and
9 other conditions.

10 Slide 20, so if we think about it, this low-light high-pass parameter
11 compensates for motion blur. It compensates for motion blur after motion
12 blur has already occurred. So it is agnostic as to what condition causes the
13 blur.

14 JUDGE SAINDON: Counsel, before we move to the high-pass
15 part, I have a question for you. So low-light, there's a few ways in my mind
16 to think about this. As you mentioned, this is intra-frame capture. So you
17 could have low-light, for example, if it's dim or dark outside, right,
18 insufficient environmental light. You could also have low-light if your
19 exposure time is very short, irrespective of the environmental conditions.
20 Am I understanding that correct, low-light doesn't mean it's dark outside, it
21 just means you didn't get enough light to the sensor?

22 MS. LI: Yeah. I believe that's right.

23 JUDGE SAINDON: Okay.

24 MS. LI: And moving on to Slide 21, GoPro's construction requires
25 this additional limitation of requiring more high frequencies to pass through.

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1 This again lacks support because the spec makes clear that this parameter
2 causes the smoothed trajectory to follow the actual trajectory because this is
3 how you compensate for motion blur. You don't want to do too much
4 smoothing if there's this motion blur. You want to follow just the motion
5 during the intra-frame time.

6 Slide 22, there's no requirement for more high frequencies to pass.
7 If you look at the snippets on this Slide 22, the spec users may contain high
8 frequencies; that is not a requirement. And for example, when this
9 parameter is 1, which means the smoothed trajectory is the same as the
10 original trajectory, both low and high frequencies of the motion will be
11 retained, will pass through. Again, the purpose of this parameter is to follow
12 the intra-frame motion.

13 JUDGE SAINDON: So Counsel, I'm trying to understand your
14 position here. It says "may." It's a spec. These use wishy-washy language
15 all the time. Is there some other way that the parameter affects its filter
16 other than by attenuating lower frequencies?

17 MS. LI: So as an example, Your Honors, I just mentioned the
18 parameter could be 0 or it could be 1. And in the example of 1, this
19 smoothed trajectory basically follows the original trajectory. So everything
20 pass through, including both high, low frequencies.

21 JUDGE SAINDON: So it's off?

22 MS. LI: Yes, correct.

23 JUDGE SAINDON: Okay. But assume in the not off position in
24 both of these examples you've pointed to here on Slide 22, it seems like the
25 way in which it affects the filtering is by allowing more high frequencies

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1 versus lower frequencies.

2 MS. LI: Your Honors, I would say that based on the specification,
3 it's how much the smoothed trajectory follows the original trajectory. You
4 know, in some cases, yes, maybe high frequencies get more passed through.
5 But there are other times where you have different bands of frequencies get
6 passed through. The really essence of this parameter is determining how
7 much this smoothed trajectory should follow the original trajectory.

8 JUDGE SAINDON: Okay. And then as far as whether there is
9 some other way to effectuate it besides a high-pass -- besides letting high
10 frequencies through, the spec doesn't have any other examples?

11 MS. LI: Your Honors, we can double check and get back to you
12 during the rebuttal, if that's okay.

13 All right. We're moving on to the instituted grounds. Slide 27, 28,
14 29 has a summary of the instituted grounds for all three IPR proceedings.
15 And because some of them address similar limitations, which for the sake of
16 efficiency we may combine, like, limitations and go through the different
17 grounds.

18 Slide 30 shows the grounds in the parallel ITC proceedings. And I
19 just wanted to bring your Board's attention is that the grounds in the 1165
20 IPR, which is Zhou plus Cai were not before the ITC. And we'll spend more
21 time to discuss later. But even for the overlapping grounds between IPR and
22 ITC is the evidentiary record before these IPR proceedings is different from
23 the record before the ITC, which I'll explain later, and they also involve
24 different experts.

25 All right. We'll continue with the low-light high-pass parameter,

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1 starting with the IPR proceedings 1164, prior art Shi. Here's Slide 33. One
2 thing we wanted to again highlight for the Board is in making its argument,
3 GoPro attempts to, again, improperly narrow the scope of the claims by
4 arguing that the claims require the low-light high-pass parameter and the
5 smoothing step to be in a single transformation. And that is wrong, not
6 supported by the specification and also rejected by the ITC. There's no basis
7 for limiting the scope, as GoPro asserts. The claim simply recite that
8 smoothed trajectory is based on a low-light high-pass parameter.

9 So moving on to the Shi reference, Slide 34, GoPro does not
10 dispute that Shi discloses using a coefficient to generate the virtual position
11 V2 to compensate for motion blur. Its only argument is saying that, oh,
12 because V2 is not part of the smoothing step. But again, as we mentioned,
13 there's no requirement that this low-light high-pass parameter have to be in
14 the single transformation of the smoothing step.

15 But regardless, the reference, Shi, makes clear that the generation
16 of the virtual camera positions all constitute -- it's all part of the motion
17 smoothing process, including V2. So on the Slide 34, I want to draw the
18 Board attention to Shi's disclosure that, quote, "using any of the filtered
19 camera position V0(T), V1(T), and V2(T) to generate a stabilizing
20 transformation may still improve stability of video."

21 I want to quickly address the Zhou reference in the 1165
22 proceeding. This is the Slide 38. Slide 39, going back to the construction,
23 GoPro does not contend that Zhou fails to disclose the low-light high-pass
24 parameter under the Board's preliminary construction and Insta360's
25 construction; instead, it hinges on its narrow construction. But regardless,

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1 I'll explain how Zhou discloses under -- even under GoPro's narrow
2 construction.

3 So starting with Slide 40, look at Zhou's title, it's low-light video
4 image stabilization strength modulation. It talks about low-light. GoPro is
5 wrong that Zhou does not compensate for motion blur based on low-light
6 conditions. And if I may also share a snippet of Zhou, which is in the IPR
7 proceeding 1165, Exhibit 1017, at column 6, line 40 to line 54 -- going to try
8 to share -- okay, here. So we can see that here, in this highlighted passages,
9 Zhou teaches adjusting strength of stabilization based on the amount of blur,
10 which in turn depends on the light conditions, quote, "if the amount of blur
11 in the image is larger (typically found in darker images with longer
12 integration times), smaller stabilization strengths may be employed."

13 "On the other hand, if the amount of blur in the image is smaller
14 and typically found in brighter images with shorter integration times, larger
15 stabilization strings may be employed." Again, this shows that Zhou teaches
16 the low-light condition even under GoPro's narrow construction.

17 JUDGE SAINDON: All right. Counsel, just to press you on that
18 point a little bit, does it have the high-pass aspect of it?

19 MS. LI: Yes, Your Honors. I'm going to address on Slide 41. So
20 if we look at this slide -- the snippet, Zhou discloses letting the jittering pass
21 in darker environment. So darker environment is the low-light conditions.
22 And jittering, Zhou describes jittering means high frequency motions, as
23 shown on this Slide 41. So again, this means GoPro is wrong that Zhou
24 does not let more high frequencies to pass under low-light conditions.

25 JUDGE SAINDON: Counsel, sorry, could you run that by me

1 again? How is that a high-pass?

2 MS. LI: Yeah. So if you look at Zhou, on the right-hand side of
3 Slide 41, there's a citation to Zhou, Exhibit 1006, column 6, you see that it
4 says, "if the amount of blur in the image is larger (typically found in darker
5 images)," so darker images correspond to the low-light conditions. And
6 under that condition, Zhou goes on to say, "by letting the image sequence
7 jitter slightly," basically letting the jitter pass. And the jitter, as Zhou
8 described -- sorry, the jitter '840 patent described means the high frequency.
9 So in this passage, this shows -- a skilled in the art reading this would
10 understand that Zhou is letting the jittering pass, meaning letting the high
11 frequencies to pass under the darker conditions, which is the low-light
12 condition.

13 JUDGE SAINDON: I see. So high-pass means allow the high
14 frequencies to pass. It doesn't mean allow the high frequencies to pass and
15 do not allow some amount of the low frequencies to pass? Usually I think of
16 those as paired, you have one or the other.

17 MS. LI: Yes, Your Honor. We do not think the claims should be
18 construed to mean just letting the high frequencies to pass and not letting the
19 low frequencies to pass. Again, we're thinking that this is really agnostic in
20 terms of what are the frequencies that pass, but it's really like how much
21 your smoothed trajectory is following the original trajectory.

22 And I want to kind of circle back to Your Honor's earlier question
23 about this high -- you know, high frequencies. The specification of '840
24 only mentions high frequency three instances. And in every single instance,
25 it used the word "may." And again, the specification is about tracking the

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1 original trajectory. It's possible that the original trajectory may have some
2 high frequencies, but it also has the medium frequencies and low
3 frequencies. And there is no restriction from the specification saying that it
4 allowed -- it requires the high frequencies to pass.

5 Okay. We'll move on to the temporal horizon limitation, unless
6 Your Honors have any other questions about the low-light high-pass. Okay.
7 So Slide 44, the '840 patent recites the temporal horizon, enabling
8 approximation of intentional motion of the image capture device. This is
9 showing Claim 1, primarily, and also Claim 5 and Claim 16. So let's talk
10 about the IPR proceedings 1164, Ground 1, Bell plus Shi, Slide 47 -- oh,
11 sorry, in the interest of time, I'm going to skip Bell's discussion about
12 temporal horizon. I'll move on to the Shi disclosure about temporal horizon.

13 So let's move on to Slide 52. So at the threshold matter, GoPro
14 does not dispute that Shi discloses a temporal horizon of motion because Shi
15 discloses a look-ahead. If we look at the Slide 52, we saw from Shi's
16 disclosure that it uses look-ahead frames that is looking into this future
17 frames, and that is the temporal horizon of motion. Now, Slide 53, what
18 GoPro argues is that Shi's look-ahead does not approximate intentional
19 motion. But, Your Honors, that is wrong because Shi discloses evaluating
20 and determining intentional motion. For example, on -- as shown on this
21 Slide 53, Shi discloses distinguishing between intentional versus
22 unintentional motions.

23 Shi discloses examples of intentional motions, such as panning by
24 the user. And Shi specifically, if we look at the right-hand side of the Slide
25 53, there's a snippet that Shi discloses using look-ahead frames to evaluate

1 consistent movement such as panning, which is intentional motion, is
2 occurring and adjusting the video frames to reflect the consistent movement.
3 There's also an example of Shi's disclosure, for example, column 18, line 53
4 to 58. This is where Shi also explicitly discusses closes using future frames
5 to determine if an intentional motion, such as panning, has occurred.

6 And moving on to, again, proceedings 1165, Ground 1, Zhou plus
7 Cai, this Cai reference, Slide 56, Cai also discloses detecting intentional
8 motion. And in fact, GoPro concedes that Cai detects intentional motion
9 such as zero motion. But instead, GoPro argues that Cai's zero motion
10 detection is based on past and current frames only, not about future frames.
11 But again, that is incorrect. For example, as we show here on Slide 58, if
12 you look at this annotated Figure 2 which is in our paper, in our petition Cai
13 explicitly discloses comparing, quote, "a mean or variance of a window of
14 frames, such as five frames, to each of the frames in that window."

15 So what does that mean? So we take an example of Figure 2. We
16 have five frames, right, one , two, three, four, five. So what Cai teaches is
17 that, look, the means of variance of the frames at point 1 through 5 are
18 compared with point 1. So in other words, to determine -- take the frame at
19 point 1, as example, to determine whether the frame at point 1 includes
20 intentional motion. Future frames corresponding to points two and five are
21 used to make that determination because it is using this window of frames to
22 determine, okay, whether the frame 1 has intentional motion and whether the
23 frame 2 has intentional motion. So when you're doing that window frames
24 to compare against, determine whether frame 1 is intentional or not. The 2
25 to 5 frames are considered future frames with respect to frame 1.

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1 And we can go back. I can address more details later in rebuttal
2 that GoPro basically attempts to limit Cai's disclosure to specific
3 embodiments but ignores the embodiment that we just talked about. And as
4 time makes very clear, there are a variety of different ways to perform
5 smoothing. And the embodiment that Petitioner relies on discloses using
6 future frames to approximate intentional motion. And again, this is on Slide
7 59.

8 So moving on to the limitation stickiness parameter in the '840
9 patent on Slide 61, I want to quickly address that Slide 63, both parties
10 actually apply the same interpretation of the stickiness parameters, meaning
11 that a parameter that controls the extent by which preceding portions of the
12 observed trajectory, meaning the actual trajectory, impacts the determination
13 of the smoothed trajectory. So we talk about, Your Honors, like they're
14 using the future frames in the look-ahead limitation. But here in the
15 stickiness, it's basically how you stick to the past frames. That's how they
16 use the term stickiness.

17 One argument I want to quickly just address and happy to
18 elaborate later, is that GoPro attempts to argue that Zhou stickiness
19 parameter is not adjustable, which is incorrect as Petitioner's expert has
20 shown the weighting function that we're relying on as disclosing the
21 stickiness parameter is basically a Gaussian curve. And by just changing the
22 standard deviation of the Gaussian curve, meaning, like, how narrow or how
23 tall the Gaussian curve is or how wide the Gaussian curve is, you can have
24 different weighting functions which will affect the weight -- impact, you
25 know, how much you consider to follow the past frames.

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1 So here, for Slide 64, we can see that the weight for the frame 5
2 -- minus 5 actually -- in the past can be 0 or can be some more significant
3 value -- just depend on how the weighting functions is based on the standard
4 deviation.

5 JUDGE SAINDON: Counsel, I have a question for you on the
6 stickiness parameter. So I understand your point that looking at this
7 Gaussian function in Slide 64 that there is a preceding portion of the
8 trajectory which impacts determination of the smoothed trajectory. But what
9 I'm having a little difficulty with is just the fact that it's called a stickiness
10 parameter. It seems like it's intended to only be that half and not have this
11 -- the other half of the of the Gaussian, which is in the future.

12 And Patent Owner has an argument somewhat like this that they'll
13 discuss later, I'm sure. But I was hoping to get a little bit more insight into
14 why does the claim term only care about what happens in the past and
15 doesn't care about what happens in the future, as opposed to only cares about
16 what happens in the past and we can't look to the future.

17 MS. LI: Yeah. So Your Honors, that's a really good question. I
18 think if I -- we understand Patent Owner's argument, as you're saying, is
19 Zhou's weighting function have no mechanism for expressing, like, a
20 preference for past frames because it, you know, may also consider some
21 future frames. But again, if we look at what -- how the parties apply the
22 construction and how the specification describes the stickiness parameters,
23 all that requires is that this parameter controls extent by which one or more
24 past frames impact the determination of the smoothed trajectory. It is really
25 agnostic as to what happens to the future frames.

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1 And for the future frames, obviously there are other limitations
2 about, you know, this look-ahead that considers the future. But this
3 stickiness parameter is just not like precluded from considering, you know,
4 current or future frame. It's just there is no requirement or restriction that
5 the Patent Owner can point to from the specification that limits the claim
6 term in that way.

7 And I wanted to mention that the specification, for example in
8 column 22, line 22 to line 41, describes that the impact of the preceding
9 motion, which is in the past is, you know -- can be maximized or not to be
10 taken into account in the determination of the smoothed trajectory at all.
11 Again, there's no preference about whether it cannot consider the future.

12 Again, both sides agree, apply -- basically apply the similar
13 constructions as I flagged earlier on the slide for this stickiness parameters.
14 And the construction itself is agnostic as to the future frames.

15 In the interest of the time, I'm going to go straight to this weight-
16 balance parameter/minimization, kind of both '840, '894 patents have similar
17 limitations. So let's start with the weight-balance parameter in the '840
18 patent on Slide 75. Here, for example, Claim 13, which is a dependent
19 claim, recites that the weight-balance parameter controls types of motion
20 that are minimized in smoothed trajectory generation, the types of motion
21 including rotational velocity and rotational acceleration. And similarly, '894
22 patent has the minimization limitation in Claims 1 and 11, as shown on Slide
23 76.

24 Now, let's talk about the ground for Zhou plus Cai plus Bell Paper
25 in IPR proceeding 1165, starting on Slide 78. So here in this ground,

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1 Petitioners rely on the Bell Paper to disclose this weight/balance parameter,
2 the minimization limitation. So as Your Honor just saw, this claim
3 limitation requires consideration of minimizing of the rotational velocity and
4 also the rotational acceleration. So these are the two things we're going to
5 be focused on.

6 So starting with rotational velocity, GoPro does not dispute that the
7 Bell Paper discloses rotational velocity. It argues that Bell Paper does not
8 disclose minimizing rotational velocity. But that is wrong because, as
9 shown on the Slide 78, Bell discloses that, quote, "When the camera is
10 nearly still, its virtual camera is fixed, removing all jitter." Removing all
11 jitter means minimizing motion in the smoothed trajectory generation. And
12 if you look at the second snippet in Bell on this slide, Bell is explaining
13 removing jitter in angular velocity. Angular velocity is -- which is the same
14 as rotational velocity. So Bell discloses minimizing angular or rotational
15 velocity.

16 Now moving on to rotational acceleration, GoPro is wrong that
17 Bell does not mention rotational acceleration. I mean, look at this snippet on
18 Slide 78. Bell explicitly states that its method removes most of the angular
19 acceleration, producing an output video which is pleasing to view. Here
20 again, angular acceleration means rotational acceleration. It is removing
21 most of the rotational acceleration, meaning that it is minimizing rotational
22 acceleration. And I also wanted to mention here that GoPro does not dispute
23 that it would have been obvious to combine Zhou's stabilization strength
24 parameter with the Bell Paper.

25 Petitioner is arguing that because Zhou discloses its minimization

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1 step. And Zhou, on the other hand, discloses a video stabilization strength
2 parameter. So a skilled in the art would understand that Zhou stabilization
3 strength parameter, in view of Bell Paper's disclosure of this minimizing
4 limitation, discloses the limitation of weight-balance parameter that controls
5 the types of motion that are minimized in smoothed trajectory generation
6 and the types of motion, including rotational velocity and rotational
7 acceleration.

8 Moving on to the IPR proceeding 1164, Ground 5, involving Bell
9 plus Shi plus Kwatra, Petitioners rely on Kwatra, this reference for the
10 similar weight-balance parameter/minimization limitations. So starting with
11 Slide 82, we really want to draw the Board's attention to this equation 7 in
12 Kwatra. If we compare this equation in Kwatra with the equation in the
13 '840, '894 patents, they are very, very -- nearly identical. So in the '840, '894
14 patents, when the spec describes how it performs minimization, it uses an
15 example of a cost function that performs the minimization. On the left-hand
16 side, that is the cost function in the patents which we can see that it's
17 minimizing the first derivative, which is the velocity, and the second
18 derivative, which is the acceleration. On the right-hand side, that is the
19 equation in Kwatra.

20 Similarly, it also is minimizing -- it uses the term minimizing in
21 Kwatra. It shows the equation. We can see that DP -- that is the first
22 derivative, that is velocity, and then the second derivative which is the
23 acceleration. So I want to make it really clear on the record that there is no
24 dispute, absolutely no dispute, that Kwatra discloses a cost function which
25 minimizes a combination of velocity and acceleration. There's no dispute

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1 about that.

2 Now the issue is whether -- you see the Kwatra equation -- the
3 camera pass P in Kwatra's equation involves rotational movement. That is
4 all the dispute that Patent Owner is raising, and we'll explain. Yes, the
5 answer is, yes, Kwatra's camera pass does in fact include rotational motion
6 -- it's not limited to linear or translational motion. Slide 83, from our
7 expert's declaration, it says because the motion models that Kwatra uses to
8 present -- represent the original camera motion pass can and do encompass
9 rotational movement, the original camera motion pass must also include
10 rotational movement. And the path in equation 7 that is being minimized
11 must also encompass rotational movement.

12 And I'll show you the evidence in Kwatra, here on Slide 84, that it
13 is undisputed. Look at all these quotes from Kwatra. It talks about angular
14 movement of the camera, talks about rotation of the camera, right? Like, all
15 of these shows -- and this is again also undisputed -- that Kwatra's original
16 camera path encompasses rotational movement. Slide 85 -- oh, let me
17 actually skip that in the interest of time.

18 Another argument that Patent Owner's making is saying, oh,
19 Kwatra is only two dimensional. But here in the past --

20 JUDGE RANGE: This is Judge Range. Before you move on to
21 next issue, so I understand that Kwatra is a cost function, as you say. I also
22 understand that Kwatra is interested in smoothing out rotation. But I'm a
23 little bit less clear on how we know that Kwatra is applying that cost
24 function to rotation.

25 MS. LI: Yes. So Your Honors, if I can go back to Slide 82, we

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1 see the minimization equation, the cost function in Kwatra, right? You see
2 -- let's just focus on the first derivative, which is the velocity, because -- how
3 fast object moves, that's the first derivative, which is velocity. And second
4 component is the second derivative, acceleration, meaning how fast the
5 velocity changes, right? So what Kwatra does is saying that, okay, I want a
6 very smooth path, how do I do that? It's I want a path that is constant, I want
7 the velocity to be constant, I want acceleration to be constant.

8 So what Kwatra does is, okay, let's just go through this and make
9 the velocity, the first derivative, to be 0, so that I will have this constant
10 path. And then I'll also make the second derivative, the acceleration, to be 0,
11 which means I have a path, the object moves at a constant speed, the
12 velocity. So there's again -- based on this equation, there's no dispute that
13 Kwatra is about minimizing a combination of both velocity and acceleration.

14 JUDGE RANGE: So --

15 MS. LI: Now, going back to your others --

16 JUDGE RANGE: Yeah. So I follow all that. I guess the question
17 is whether or not the P here could be rotational.

18 MS. LI: Could be rotational, yes. Exactly. So Kwatra describes
19 -- this P is the camera pass, right? It's how camera moves. So then we need
20 to look at, okay, how Kwatra is describing the camera pass moves, does
21 Kwatra say it can only be translational or linear, or does Kwatra also say,
22 yes, it can be rotational?

23 So here, Slide 40 -- sorry, 84, if you look at the snippets, the first
24 snippet saying that, you know, the camera can have angular movement. And
25 the second snippet, on the left, it shows in the similarity transformation, a

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1 combination of scale, rotation and translation can be used. So again, Kwatra
2 talks about camera rotation. And the third example on the right, it shows,
3 you know, if a highest dimension motion model is deemed unreliable -- too
4 much rotation. Again, it mentions rotation, right? It contemplates rotation.
5 In the fourth example, on the same slide, saying that as still another example
6 for camera rotation. So it actually talks about camera rotation again, again,
7 and again. And at no point did Kwatra say, well, actually in our case, the
8 camera can only move in a linear or translational fashion.

9 So this is a whole dispute. And the Patent Owner is going to point
10 Your Honors to embodiments -- non-limiting embodiments -- talk about
11 linear transformation -- sorry, talk about linear movements. But again, they
12 ignore elsewhere in Kwatra, where they state repeatedly that Kwatra's
13 camera path involves angular and rotation movement.

14 JUDGE RANGE: Okay. Thank you.

15 MS. LI: Your Honors, in the interest of time, I think I will address
16 any other issues on rebuttal, unless Your Honors have any questions for me
17 now.

18 JUDGE SAINDON: No. Thank you.

19 MS. LI: Thank you, Your Honors.

20 MR. SCHMIDT: Your Honor, we have a hard copy of the slides.
21 May we hand it up to the court reporter?

22 JUDGE SAINDON: Yes, sir.

23 MR. SCHMIDT: And I assume Your Honor doesn't want a copy.

24 JUDGE SAINDON: No, thank you.

25 MR. SCHMIDT: Your Honor, may I proceed?

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1 JUDGE SAINDON: Yes.

2 MR. SCHMIDT: Thank you, Your Honors. May it please the
3 Board, my name is Patrick Schmidt. And I'll be presenting the argument for
4 the Patent Owner. I want to turn right to where Petitioner left off, and that's
5 the minimization issues relating to the Kwatra reference. And by the way,
6 this Kwatra reference is dispositive to the 1186 matter. We believe it's also
7 dispositive to Claim 13 of the 1164 matter.

8 Here are the claim limitations that the issue relates to. It relates to
9 the minimization requirement in 1[g][v] of the '894 patent and then the
10 weight balance parameter in 1[g][i] in the '840 patent; and obviously,
11 dependent Claim 13. And the issues relating to those claims rise and fall
12 together as it relates to Kwatra. I think there's no dispute between the parties
13 about that.

14 I'm turning to Slide 16 of my presentation and what I want to do --

15 JUDGE RANGE: Counsel, this is Judge Range. It seems like -- I
16 think they said that they're relying on Bell for Claim 13. So it seems like
17 that could be a distinction, potentially.

18 MR. SCHMIDT: Yes, Your Honor, they're relying on Bell for
19 Claim 13 for the 1165 matter --

20 JUDGE RANGE: Right,

21 MR. SCHMIDT: -- and they're relying on Kwatra in the 1164
22 matter. And I'll address the Bell Paper at the very end of this but, you know,
23 Kwatra is where I'm going to focus most of my time.

24 JUDGE RANGE: Okay. Fair enough.

25 MR. SCHMIDT: Okay. I want to walk through Kwatra in a little

1 bit of detail so that the Board understands exactly what's going on here
2 -- because I think it's important to understand the math. If we want to
3 understand if that smooth path $P(t)$ is actually minimizing a rotational
4 quantity, then we have to look at the mathematics. We have to look beyond
5 these generalized statements about camera rotation in column 1. So that's
6 what I want to do now.

7 So Kwatra's motion estimation process starts with this process of
8 extracting trackable features. Kwatra doesn't have any onboard motion
9 sensor where it could actually directly detect the rotation of the camera and
10 record it. So what we're talking about is trying to figure out how much
11 features within the image move within a certain frame. And Kwatra
12 discusses producing 2D linear motion models based on that rotation.

13 Now, in the institution decision, the Board noticed that in one
14 statement of Kwatra, it mentions that that these two-dimensional models
15 may include a rotational degree of freedom; and that's true. We
16 acknowledge that in the Patent Owner response, that's in column 11 of
17 Kwatra.

18 But what's important is if we look at the specific linear
19 transformations that Kwatra uses as part of the optimization process, it
20 absolutely does not include that rotational parameter. In fact, Kwatra goes
21 out of its way to avoid optimizing that rotational parameter for the reasons
22 that I'm going to discuss. What I'm showing the Board now is Slide 17 of
23 our demonstratives. And I want to make the point first of all that the
24 original camera path in Kwatra is something called C -- it's the C function.
25 And in Equation 1 at column 9, line 62 through 67 at Kwatra, it tells us how

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1 the original camera path C evolves over time. It evolves according to this
2 function $F(t)$. And $F(t)$ is the function that models how the motion within a
3 frame increment from frame to frame. So the key here is $F(t)$.

4 And in the second block I have on Slide 17, column 10, lines 48
5 through 53 of Kwatra, it tells us as clear as day that these models for $F(t)$,
6 the frame pair transformations, are not just linear but translational. And
7 that's true for even the higher order transformations like affine or similarity
8 or homographic transformations. And it's depicted right there in column 12.
9 This is the $F(t)$ function that increments the original camera path. It's a
10 linear parametric equation. It's based on four constants -- because this is a
11 similarity transform.

12 If it was -- I'm sorry, it's an affine transformation. If it's a
13 similarity transform, there's only two; there would only be the A and B . And
14 this function is expressed entirely in terms of translation in the horizontal
15 and vertical directions -- you see the dx and dy . There's no rotational
16 parameter in this equation. And this is what increments the original camera
17 path. So what Kwatra is doing is it's removing the rotational degree of
18 freedom and it's simplifying by modeling the camera trajectory in terms of
19 only two-dimensional motion expressed by dx and dt .

20 I'm turning to Slide 18, What Kwatra does then is it attempts to
21 solve for the smooth camera path, which it calls $P(t)$. And it does that by
22 multiplying that original trajectory, which I just talked about, by this other
23 transformation, matrix B . And the goal of Kwatra is to solve for B that
24 results in the desired P . And Counsel pointed you to the objective function,
25 equation 7, in Kwatra, and it's right here at column 13, line 62 through

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1 column 14, line 13.

2 The first thing to notice about the objective function in Kwatra is
3 it's not the same as the objective function in the challenged patents. The
4 objective function on the right is expressed in terms of an angular parameter
5 -- derivatives of the angular parameter directly. In Kwatra, it is derivatives
6 -- first and second derivatives -- of this motion path P, okay? Just at a basic
7 level, the equations are different.

8 So the question then becomes, does that path P include a rotational
9 parameter that's minimized? I'm turning to Slide 20. And the question is
10 clearly no. On Slide 20, what I've done is I've extracted the key equations
11 from columns 14 and 15 of Kwatra. And what Kwatra does in these
12 columns is it derives the mathematics for the minimization of each one of
13 those derivatives.

14 And I'm not going to go through all the detailed math, but if you
15 look at the bottom-line equations -- it's Equation 9 for the first derivative, it's
16 Equation 10 for the second derivative, and Equation 11 for the third
17 derivative -- each one of those derivations results in a minimization function
18 that's expressed in terms of that $F(t)$ function. That's the simplified function
19 that's a purely linear translational model. There's absolutely no
20 minimization of a rotational parameter.

21 And I'm turning to Slide 21. This explains why figures 8A and 8B
22 look the way they do in Kwatra. So when Kwatra actually plots out the
23 camera trajectory and the smoothed trajectory, they're expressed entirely in
24 terms of motion in X and motion in Y. There is no similar plot plotting a
25 smoothed trajectory as a function of an angle θ or some angular

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1 parameter because Kwatra is simply incapable of doing it. And in the ITC,
2 Judge Johnson Hines found this evidence particular persuasive.

3 Turning now to Slide 22, the reason why Kwatra does this
4 simplification is explained in the provisional application. It's actually not in
5 Kwatra itself. And what the provisional application of Kwatra, this is
6 Exhibit 2019, I'm on Slide 22, at page 3, the provisional application writes,
7 "The optimal algorithm could estimate all parameters for all frames jointly,
8 similar to the Bundle Adjustment. However, the concatenation of
9 parameters is not linear anymore, requiring a more complex non-linear
10 optimization method which is not fast enough for real-time performance."

11 So the Kwatra Provisional tells us exactly why it makes this
12 simplification. At page 5, it goes on to say, "Our model imposes smoothness
13 on the parameters of $P(t)$, which are a , b , t ." "Constraining smoothness on a ,
14 b may not always guarantee that rotation and scale are smooth especially if
15 we want them to be highly smooth."

16 JUDGE RANGE: Counsel, this is Judge Range. I have a high-
17 level question just to help understand. So the word linear is used a lot in the
18 briefing. I think I have a sense of what that means in this context. But could
19 you help explain what linear versus non-linear means here?

20 MR. SCHMIDT: Yes, Your Honor. I think linear is used in two
21 different senses in Kwatra, which leads to some of the confusion. So Kwatra
22 refers to a linear two-dimensional motion model that might include a
23 rotational degree of freedom. That's true. So in that case, a linear motion
24 model that operates in two dimensions may include this rotational parameter.
25 When Kwatra discusses its simplified function $F(t)$, which is a translational

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1 model, it also uses the term linear. So it's sort of using the same term for
2 two different things. The clearest example I could give you where this is
3 cleared up in Kwatra -- I'm turning back to slide --

4 JUDGE RANGE: This is Judge Range. I guess I'm looking for a
5 more, like, high-level answer, like just what the word linear means. Like, I
6 -- like when Kwatra says it's using a linear model, I'm unclear what that
7 means.

8 MR. SCHMIDT: In the simplified equation of --

9 JUDGE RANGE: Like, I could see it mathematically. Maybe it
10 would mean that it's not, you know, using squares or it's not a derivative or I
11 could see it also talking about the motion. And so that's confusing.

12 MR. SCHMIDT: Yeah. Yes, Your Honor. I would say that linear
13 would mean that it's a product of a model expressed only in terms of
14 translation. So it's not using a complex equation like a variable to a power
15 of some order or some kind of trigonometric relationship.

16 JUDGE RANGE: Okay. That makes sense. Thank you.

17 MR. SCHMIDT: And what I wanted to point you to here on Slide
18 17 was just that when Kwatra is referring to equation 12, that F function, it
19 refers to it as a linear -- many linear motion models may be used, such as a
20 translation model. And I think that eliminates the ambiguity. Equation 12 is
21 a translation model. It has no rotation.

22 Turning to Slide 23 -- I walked you through the provisional before,
23 and I think there's something really interesting to consider here. When I
24 took Dr. Katsaggelos' deposition, Petitioner's expert, asked him if he had
25 reviewed the Provisional application, and he told me that he did not. He did

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1 not consider those statements that I showed you before. And this is a very
2 important point in our minds because the Provisional application, as I'm
3 showing on this slide, is incorporated by reference into Kwatra itself so this
4 is part of the prior art reference.

5 So what Petitioner's expert has done here is he's admitted that he
6 didn't even review the entire reference that he's claiming renders the claim
7 obvious. And I would submit to the Board that the passage that I showed
8 you in the Kwatra Provisional is the key to understanding Kwatra. It tells us
9 exactly why it's making this simplification -- because the complex angular
10 parameters are not fast -- minimizing those are not fast enough for real time
11 performance. So this really does speak volumes to the credibility of this
12 expert on this issue, I would say.

13 Turning to Kwatra itself, Kwatra, I'm on Slide 24, Kwatra
14 describes at column 17 that constraining smoothness on A and B -- those are
15 the points parameters of that Equation 12 -- rotation and scale may not
16 remain smooth. And what Kwatra teaches to do instead is to apply bounding
17 constraints to those variables, scale and rotation, basically like hard
18 thresholds on how much that they could deviate.

19 But what our expert has opined -- this is Dr. Foroosh's declaration,
20 Exhibit 2018, at paragraph 69 in the 1186 case, our expert has opined in no
21 uncertain terms that simply placing a bounding constraint on these
22 parameters does not result in them being minimized. So you could constrain
23 angular displacement by some amount, but going through Kwatra's math is
24 not going to result in that parameter then being minimized. And this
25 testimony is unrebutted, and I'm showing that here on the next slide. I'm on

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1 Slide 25, this is unrebutted testimony from Dr. Foroosh, that placing a
2 bounding constraint on a parameter like rotation is not the same as
3 minimizing that parameter.

4 Turning to Slide 26, I told you that this was undisputed -- and
5 here's Petitioner's expert -- the key excerpts from Petitioner's expert that
6 proves it. So when Petitioners saw our argument, they put in a reply
7 declaration from Dr. Katsaggelos. So this is in response to everything that
8 I've already told you. And what Dr. Katsaggelos says -- at paragraph 36 of
9 his declaration, he acknowledges our point. Kwatra teaches that instead of
10 solving a nonlinear optimization problem to smooth scale in rotation
11 directly, it uses the estimated camera path represented by a linear motion
12 model to constrain how much scale and rotation vary indirectly. So that
13 point is undisputed. Kwatra doesn't minimize them directly. It places a
14 bounding constraint on it.

15 In the third box, in paragraph 39, Dr. Katsaggelos acknowledges
16 Dr. Foroosh's opinion that bounding constraints is not the same as
17 minimization. But he doesn't rebut the argument. And he never says in his
18 declaration that these bounding constraints minimize rotation, or scale for
19 that matter, in his reply declaration. He saw our argument, he considered it,
20 he had the opportunity to respond. He had nothing to say. There's no
21 opinion in his reply declaration that this mathematics that I just walked you
22 through could any -- could have any possibility of minimizing a rotational
23 parameter.

24 The most Dr. Katsaggelos says is in the second box of paragraph
25 37. He says Kwatra teaches smoothing scale and rotation. That's the most

1 he says. Now, I don't know what he means by smoothing there. But I
2 showed you the passage from Kwatra before where Kwatra says it doesn't
3 smooth scale and rotation, or scale and rotation may not remain smooth. So
4 I don't necessarily know what Dr. Katsaggelos is saying here, but the key is
5 that he doesn't say that it minimizes.

6 So whatever he means by smoothing, he has it established that it
7 minimizes. And if we turn to the claim language, we can see that smoothing
8 scalar rotation, even if it happens, even if you accept that that's true, is not
9 enough, because smoothing is separately recited in the claim for
10 minimization. The claim requires both. Minimization is something in
11 addition.

12 So Petitioners simply have not shown, through the mathematics of
13 Kwatra, that rotation would be minimized. In fact, the opposite is true. And
14 if we turn to -- I'm sorry, Your Honors, if we turn to Slide 35, I just want to
15 make one last point. The ITC considered all these arguments and sided with
16 us on this issue, full stop. The ITC found that Claim 1 of the '894 patent was
17 not obvious over the combinations involving Kwatra. The judge found that
18 a minimization of a combination of rotational velocity and rotational
19 acceleration would not result even if the combination was considered, and
20 then also found that Claim 13 was not valid over the same combination.

21 I have additional arguments on motivation to combine, but unless
22 Your Honors have any questions on the Kwatra grounds, I'll move on. Let
23 me just say a few words about the Bell Paper. The Bell Paper, which they
24 rely on for the 1165 case, that paper has no disclosure of minimization. That
25 paper has no sort of mathematical consideration of rotational acceleration at

1 all; mentions it in passing as part of a generalized observation. And it
2 certainly doesn't have any parameter that balances rotational velocity and
3 rotational acceleration considerations against one another. So the Bell Paper
4 doesn't even come close to satisfying these limitations. There's a lot of hard
5 issues across these cases. But, you know, I would submit to Your Honors
6 that the Bell Paper's failure to disclose Claim 13 is not one of them.

7 I'm going to turn now to Slide 47, and this is our claim
8 construction argument on the low-light high-pass parameter. The
9 construction that we're urging is on Slide 48, "a parameter that controls the
10 amount or strength of smoothing used in motion blur compensation by
11 allowing more high frequencies to pass through based on low-light
12 conditions." And we believe that this construction is necessary in order to
13 give meaning to the plain and ordinary terms that appear in the claim, which
14 is low-light high-pass.

15 We're in a Phillips claim construction paradigm here, and Phillips
16 sets forth hierarchies of evidence that we're supposed to consider. And the
17 claim language is paramount. It's the primary source of evidence that we
18 need to look to, to construe the claim, not the specification. And if you
19 reduce the low-light high-pass parameter to just a generalized blur
20 parameter, then you're reading those limitations out of the claim.

21 Now, the Petitioner has argued that we took an inconsistent
22 position in the ITC, that we accepted a broader construction. But Your
23 Honors, the reason for that is because, as Petitioners mentioned in their
24 argument, the issues before the ITC were very different. It was different art
25 and different theories. And the issues that our construction are intended to

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1 address here were not raised by the theories that Petitioner advanced in the
2 ITC. In fact, the only overlapping art, or the key overlapping art, which was
3 Zhou and the Shi reference. By the time we got to trial in the ITC, the
4 Petitioners had abandoned the theory that they're arguing now, that Zhou and
5 Shi disclose a low-light high-pass parameter. They didn't make that
6 argument in the ITC.

7 The argument they made in the ITC was that it would be obvious
8 to modify Bell's mixing weight, the existing parameter in Bell, based on the
9 general blur concerns that are expressed in Shi and Zhou. So they never
10 even argued that Shi and Zhou disclose a low-light high-pass parameter. So
11 to the extent that there's a difference between the claim construction
12 positions in the two proceedings, that's because Petitioners actually
13 abandoned the very theory that they're advancing now, not because Patent
14 Owner has taken an inconsistent position.

15 JUDGE SAINDON: Counsel, to ask the same question that I
16 asked Petitioner's Counsel earlier. I'm looking at Slide 48 of your slides
17 here. And by allowing more high frequencies to pass -- we talked about that
18 quite a bit with Petitioner's Counsel. But based on low-light conditions
19 -- again, my understanding was low-light conditions is based on insufficient
20 light received by the camera. Do you agree with that?

21 MR. SCHMIDT: Yes, Your Honor, I do.

22 JUDGE SAINDON: Okay.

23 MR. SCHMIDT: I do. The specification draws a direct
24 connection between the low-light condition and the exposure time, so I do
25 agree with that.

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1 JUDGE SAINDON: Okay.

2 MR. SCHMIDT: One last thing I want to address from Petitioner's
3 argument, they argued that our claim construction rendered Claim 14
4 superfluous. That's not true. Claim 14 is more narrow than Claim 1, even
5 under our construction. Claim 14 recites that the low-light high-pass
6 parameter controls amount or strength of smoothing performed in smoothed
7 trajectory generation and in extent of motion blur compensation applied in
8 determination of the smoothed trajectory. So Claim 14 is adding the
9 additional limitation that the way that the low-light high-pass parameter is
10 used is to control the strength of smoothing and thereby affect the motion
11 blur compensation. And that's a requirement that's not recited in Claim 1.

12 On Slide 49, I've reproduced just some of the key case law. I'm
13 not going to belabor this other than to say that all claim terms have to be
14 given meaning. I did want to say a few words about the Malvern case
15 because I think it's highly instructive in this case. In the Malvern case, the
16 District Court found that claim term reciting a pipette guiding mechanism
17 was a coined term and because of that, resorted to the specification.

18 The Federal Circuit reversed, and the Federal Circuit said it was
19 error to jump to the coined term doctrine just because this pipette guiding
20 mechanism wasn't necessarily a term that was used in the art. And the
21 Federal Circuit said that you're supposed to look at each one of these
22 adjectives individually to understand their plain and ordinary meaning and
23 give effect to those claim terms.

24 We believe that Petitioners violate all of the principles on this slide
25 because if you read their reply brief carefully, they never come to grips with

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1 the plain claim language. They never explain why this claim term is reciting
2 low-light and high-pass other than just reciting a generalized blur parameter.

3 I'm turning to Slide 50. The argument I just made, that the claims
4 have a plain and ordinary meaning, is something that the Petitioners actually
5 agreed to in their original petition. In the original petition -- I'm showing Dr.
6 Katsaggelos declaration Exhibit 1003 in both cases, paragraph 35 in both
7 cases -- Dr. Katsaggelos writes, "I agree with Petitioner and apply the
8 ordinary and customary meaning of the terms in my analysis below." So
9 both Petitioner and their expert took the position that these claim terms had a
10 plain and ordinary meaning.

11 It was not until we raised the deficiencies in the prior art that they
12 pivoted in the reply, and they made a different argument that the low-light
13 high-pass parameter had no accepted meaning in the art. And then they
14 invoked this coined term doctrine. And what's going on here, Your Honors
15 -- we didn't hear this argument today, by the way, so I don't know if they've
16 abandoned it or what.

17 But the subtext of this coined term argument is that the Board
18 should ignore the plain meaning of low-light and high-pass and give the
19 term a broader construction based on the full scope of embodiments in the
20 specification. They want you to adopt a scope that embodies everything that
21 the specification says. But that's inconsistent with what they said in the
22 original petition. It's inconsistent with their expert who consistently said that
23 these terms have a plain and ordinary meaning. And it's inconsistent with
24 the specification if you read it as a whole.

25 I'm turning to Slide 51, the specification. This gets to your point,

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1 Judge Saindon, the specification ties the low-light condition specifically to
2 exposure time and then ties exposure time -- actually ties blur specifically to
3 the exposure time. So all three of these concepts are tied together in
4 specification -- the low-light condition, the exposure time, and the motion
5 blur that the claim term is intended to address.

6 Returning to Slide 52, the position that we're taking is fully
7 consistent with Figure 7 in the specification. Figure 7 teaches various ways
8 that smoothing strength can be attenuated based on a blur condition. Now,
9 Petitioner's Counsel argued that these S parameters in Figure 7 are low-light
10 high-pass parameters. That's incorrect. If you read the description in
11 column 7, these values S are smoothing strength values. And actually, if
12 you look at how the smoothing strength values change based on the low-
13 light condition in Figure 7, it's opposite of what the low-light parameter
14 teaches.

15 So in other words, the smoothing strength goes from 1 to 0 as the
16 device transitions from S3 to S4. So this absolutely is not defining the scope
17 of the low-light high-pass parameter. This is a more general statement about
18 how motion blur could be addressed through attenuation and smoothing
19 strength. That said, all of this is fully consistent with our theory. So these
20 transitions between S3 and S4 and S1 and S2, as the specification teaches,
21 result in a linear change to smoothing strength between 0 and 1. And one
22 way to implement that is through a low-light high-pass parameter.

23 And the Petitioners argue that these other transitions between S1
24 and S3 justify a broader construction. But they haven't pointed you to
25 anything that links those transitions to the claim term. Those are transitions

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1 that are possible. The specification teaches that they're possible; we
2 acknowledge that. But the claim term is narrower. And the case law is very
3 clear that a patent claim need not claim every single embodiment in the
4 specification. So when the inventors in this case make a decision to recite
5 low-light high-pass parameter in the claim term, they have clearly evinced
6 an intent to narrow the claim only to those specific situations involving low-
7 light, not every single cause of blur.

8 Turning to page 53, I just want to make the quick point -- this is
9 Slide 53, I should say. At column 17, line 61 through column 18, lines 9,
10 the '840 patent talks about the high-pass nature of the parameter. It allows
11 certain portion of high frequencies ,and the input may be kept based on the
12 image capture configuration, such as exposure time and exposure duration
13 time.

14 And just in case there's any confusion about our argument, Your
15 Honors, we're not arguing that the high-pass nature of the parameter requires
16 only high-pass frequencies to pass. The claim doesn't preclude low-pass
17 frequencies passing as part of the blur compensation process, but it has to
18 operate as a high-pass system. And what that means is that there's a bias or
19 preference for high frequencies. There must be some preference for high
20 frequencies so that more pass as compared to the low frequency motion.

21 Turning to Slide 54, this is column 22 where the patent actually
22 describes the low-light high-pass parameter. And one point I just wanted to
23 make about this is this portion of the specification is completely different
24 and distinct from the Figure 7 discussion. And I've mentioned before how
25 the values actually are inverted in terms of how they change. I think that's

1 really important because what that means is that the low-light high-pass
2 parameter is directed to something different -- not something different, but
3 something more narrow than what's described in Figure 7. So Figure 7 is
4 not a definition of the full scope of the claim. The claim is directed to the
5 low-light high-pass parameter. And that is described only here in column
6 22.

7 Now, Counsel argued or made an argument about how when the
8 low-light high-pass parameter has a value of 1. This is the third sentence,
9 "The low-light high-pass parameter 1 may result in the smoothed trajectory
10 being the same as the (observed) trajectory during the exposure periods."
11 And Counsel made the point that what this is saying is that it's really just the
12 same as the observed trajectory when the parameter is 1. What she left out
13 was the last clause here during the exposure periods. So the way that this
14 parameter works is when the low-light high-pass parameter is 1, it results in
15 the smoothed trajectory being the same as the observed trajectory during the
16 exposure periods.

17 In other words, the camera will continue to track the expected
18 motion of the camera between frames when there is no trajectory data at all,
19 okay? So that's the key nature of this claim. That's the high-pass nature of
20 the system. Because the only way you could address motion blur that occurs
21 in those intra-frame periods that's become encrusted in the frame. The only
22 way to address that is to get a sense of what the high frequency motion is
23 immediately before that inter-frame portion and try to do your best to
24 preserve it during that period. That's why it's a high-pass filter. So it's not
25 that a value of 1 is going to simply adopt the observed trajectory. A high-

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1 pass filter of 1 is going to attempt to preserve the high frequencies so that
2 motion is preserved during the intra-frame periods where there is no
3 trajectory data at all. That's an important part of the claim.

4 Very quickly, Dr. Katsaggelos in Slide 55, Dr. Katsaggelos, in his
5 opening declaration, fully understood the meaning of low-light. This is his
6 testimony in paragraph 111. There was no confusion about what this claim
7 term meant. Turning to Slide 59, Dr. Katsaggelos also understood what high
8 frequencies meant. Again, there's no confusion about what this claim term
9 meant. Oh, and now I'm on Slide 59. When we took Dr. Katsaggelos
10 deposition, we asked him about a high-pass system, how a high-pass system
11 works. He gave testimony that was completely consistent with our
12 construction. This is at Exhibit 2020, page 95 for lines 6 through 15.

13 JUDGE SAINDON: That was Slide 57.

14 MR. SCHMIDT: I'm sorry, this is Slide 57, and the previous one
15 was 56. Apologies, Your Honors. What I want to turn to now -- and
16 everything I've just told you is supportive of the plain and ordinary meaning
17 for the claim term. What I want to turn to now is the provisional application
18 which Petitioner raises in the reply brief for the first time. And frankly, I'm
19 glad they did because this provisional application fully supports our
20 construction of the term. And I want to walk you through that and take
21 some time doing it.

22 The provisional application is Exhibit 1021 in both the 1164 and
23 1165 cases. So this is part of the prosecution history. And what the
24 provisional application says in the very first clause is "taking into account
25 the exposure time of every frame." So what the patent does in order to

1 address these types of inter-frame and intra-frame motion blur is to first take
2 account of the exposure time in every frame. In the middle sentence that
3 I've highlighted, the provisional makes clear, "there is a positive scalar
4 parameter controlling the gain of the corresponding high-pass filter." It fully
5 supports our construction that this is a high-pass system.

6 What Petitioner relied on in their reply brief is the very last
7 paragraph, reading, "This parameter does not need to evolve in function of
8 the exposure time." And the argument they made in the reply brief was that
9 the meaning of this sentence was that the low-light high-pass parameter
10 doesn't change as exposure time changes throughout the duration. And that's
11 just a nonsensical interpretation because it's -- first of all, it's completely
12 inconsistent with the first sentence of this document which says that the
13 exposure time is considered for every frame.

14 So in the next slide, what I've done -- this is Slide 60 -- I've created
15 a demonstrative to try to illustrate what that sentence means. And before I
16 describe the demonstrative, I want to point one thing out. I made an error in
17 my slides, which I found just this morning. The low-light high-pass
18 parameter for these various frames is supposed to increase across the frames.
19 And I had it reversed. So what I've done on the slides that I'm showing in
20 the courtroom is I've struck out the parameters. And I've reversed them in
21 red text, just to be clear. That's my mistake, and I apologize for that. But
22 the point I want to illustrate remains the same.

23 So what the provisional application is describing -- you could think
24 of each one of these three frames of the video as being created based on
25 some exposure time. So these are the product of an exposure time. And the

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1 exposure time is the period in the red arrows, and that may be longer or
2 shorter based on the light condition, based on how much light is available.
3 For every frame, the low-light high-pass parameter will be assigned a value
4 based on that exposure time and then that's going to control the smoothing
5 strength.

6 What the sentence that Petitioners pointed you to means is that
7 there's no evolution, no further evolution of the low-light high-pass
8 parameter during the red arrow periods. In other words, the exposure time
9 of every frame itself is enough to resolve the value of the low-light high-pass
10 parameter, and we don't have to further consider the degree to which the
11 motion is translating within those exposure periods. This actually supports
12 our construction because it shows that the low-light high-pass parameter is
13 based only on the exposure time. There's no need to consider the motion
14 intra-frame. And that's why the low-light high-pass parameter doesn't have
15 to evolve over time.

16 And turning back to Slide 59, that understanding is confirmed by
17 these two sub-bullets in the provisional application right at the bottom. The
18 first sub-bullet reads, "When a highly illuminated scene is being shot, the
19 exposure time is short enough to render the intra-frame displacement
20 negligible." What that's saying is you don't have to worry about
21 undercompensating with the value of the low-light high-pass parameter,
22 even if there ends up being a lot of motion in that intra-frame period because
23 the period is already so short.

24 The second sentence is addressed to the flipside of that, "When the
25 camera does not move much, the intra-frame displacement is limited

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1 regardless of the exposure time." What that's saying is you don't have to
2 worry about overcompensating in a low-light scene where the camera
3 doesn't move a lot, because whatever correction or whatever attenuation of
4 smoothing strength is going to be done is going to be minimal anyways
5 because the scene's not moving.

6 So what this sentence and these bullets are telling us, all read
7 together, is that the low-light high-pass parameter is determined strictly
8 based on the exposure time. And that is enough information in order to
9 figure out how much blur compensation to apply. And that is a very
10 important insight of the GoPro inventors because if you contrast that with
11 the prior art of record, like Shi and Zhou, where they're trying to measure the
12 blur directly based on pixel streaking or image translation within the image
13 frame, that was the conventional approach.

14 These complicated approaches of trying to address how much the
15 camera frame actually displaces in the motion, GoPro realized that that was
16 not necessary, that this could adequately be done based on the low-light
17 condition itself, and they built that into the claim limitation and the
18 specification. Again, if the inventors wanted a generic blur compensation,
19 then they would have said blur compensation parameter. They wouldn't
20 have called this a low-light high-pass parameter.

21 That addresses the claim construction arguments. Happy to answer
22 any questions, but otherwise I'm just going to very quickly discuss why Shi
23 and Zhou don't disclose this parameter. I'm on Slide 69, and this is Shi
24 Exhibit 1007 at column 18, line 7 through 26. I believe this is undisputed,
25 but the point I just want to make is that the way that Shi calculates motion

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1 blur is based on these projection matrices that are determined at different
2 points within the exposure period. And Shi applies a transformation in order
3 to move the projected point to an offset from the actual origin in the
4 projected space. And that's how Shi calculates blur. So this is not a method
5 of calculating blur based on a low-light condition.

6 Turning to Slide 72 -- and Dr. Katsaggelos confirmed this at the
7 deposition -- I asked him about this method of calculating blur in Shi. And I
8 asked him, "This example is not tied specifically to the nature of the lighting
9 conditions; isn't that right, Doctor?" And then in the second sentence he
10 answered, "It can be applied to low-lighting conditions, normal lighting
11 conditions. It's not tied to any of these situations. As long as blur, due to
12 whatever it is, is one way to estimate the magnitude of this blur."

13 Turning to Slide 100, the approach in Zhou is very similar. I'm
14 showing -- this is Slide 100, Exhibit 1006, at column 5, lines 30 through
15 column 6, line 11. And on the left I have Figure 1D of Zhou, which walks
16 through how blur is calculated. And the first step is shown right here. I've
17 highlighted it in the pink color. The blur vector matrix is calculated based
18 on the square root of the translation of the image in the X and the Y
19 direction. So this is not a calculation of blur based on the lighting
20 conditions, but rather a calculation of blur based on the motion in the frame.

21 And just to complete this, what Zhou does is it then takes this blur
22 vector metric -- and on Slide 100 -- it averages it across the various image
23 rows and then averages it across frames. And then on Slide 102, it takes the
24 blur metric value that it calculates and it maps that against what it calls a
25 stabilization strength parameter, which is shown in this equation at column

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1 6, lines 38 through 68. And it's also visually illustrated in Figure 5C. So the
2 stabilization strength metric value in Zhou, the S parameter, is tied
3 specifically to the translation of the image within the frame.

4 Now, the Petitioner has pointed to various statements in Zhou
5 about low-light conditions and how Zhou's approach can be helpful in low-
6 light conditions. But the claim requires more than that. So the claim
7 requires more than just a correlation between blur correction and usefulness
8 in low-light conditions. The claim requires that the amount of blur
9 compensation depend on the low-light conditions and not some other factor.
10 And that's why Zhou is deficient, despite reciting that low-light is one of the
11 problems that can be addressed in certain circumstances.

12 Let me just give you a hypothetical, though. In the approach of
13 Zhou and Shi, you could have a very well-lit scene with a high degree of
14 motion in the frame and register a very high value of blur; and therefore
15 attenuate smoothing strength accordingly under the approach of Zhou and
16 Shi. Correspondingly, you could have a very dim scene in Zhou and Shi
17 with very little motion -- perhaps the camera is on a tripod -- and Zhou and
18 Shi will record a very low value of the low-light high-pass parameter in
19 those circumstances. And those two situations, I believe, illustrate exactly
20 why their approach is so different from the GoPro approach.

21 And the one last point I want to make, you have to remember that
22 the way that the smoothing and the blur work is that there's a trade-off
23 between them. So blur compensation comes at the expense of smoothing
24 strength. And different patents and different inventions and different
25 companies can make that trade-off differently. And what GoPro has claimed

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1 in the '840 patent is the trade-off based on the insight that it made in the
2 provisional application, that smoothing strength should be maintained unless
3 the exposure time indicates otherwise. And that's a very different approach
4 from what's being taught in the prior art, I submit to the Board.

5 Petitioner argued that Zhou discloses a high-pass filter. It's simply
6 not true. The way that Zhou works is when the stabilization strength metric
7 is changed, it changes the standard deviation of the Gaussian weighting
8 functions. So it blends in more frames around the central point with a higher
9 stabilization strength metric and narrows the Gaussian weighting function
10 when the stabilization strength metric is low.

11 A Gaussian weighting function is a low-pass filter. I don't think
12 there's any dispute about that. When you average motion across frames, that
13 is a low-pass approach. So what Zhou is actually teaching by modulating
14 the stabilization strength parameter is that it's changing the degree to which
15 the trajectory is low-pass filtered. There is no high-pass filter taught in
16 Zhou. And on Slide 104, I'm just showing Dr. Katsaggelos deposition
17 testimony confirming that Zhou is calculating blur based on the translation
18 of the image rather than specifically on the lighting conditions.

19 Before I turn away from Zhou and Shi, let me just say a few words
20 about the stickiness parameter since Petitioner addressed it. There's no
21 dispute between the parties that a stickiness parameter is supposed to control
22 the extent to which proceeding frames affect the smoothed trajectory. The
23 only thing they point to in Zhou is the Gaussian weighting functions
24 themselves. Now, what Zhou teaches is that those Gaussian weighting
25 functions are a function of the stabilization strength parameter that I just

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1 walked you through. So in other words, they're always centered on the mean
2 and the width.

3 The standard deviation of that Gaussian weighting function is
4 purely a result of the amount of blur that Zhou calculates as part of the
5 process I walked you through. So the shape of the Gaussian weighting
6 functions, which they're relying on for the stickiness parameter, it's not a
7 stickiness parameter at all. It's the implementation of how Zhou addresses
8 motion blur, the very thing that they rely on for the low-light, high-pass
9 parameter. And the stickiness parameter is supposed to allow for
10 independent control of the degree to which proceeding frames affect the
11 smoothed trajectory. That is not what the weighting functions do. It's an
12 implementation of the stabilization strength metric based on blur.

13 Unless Your Honors have any questions, I'll move on to the next
14 argument.

15 JUDGE SAINDON: Yes. Counsel, I think I may have missed the
16 point you're trying to make there with the stickiness. So in some sense, if
17 you're looking ahead and back using the Gaussian, you are controlling based
18 on past. But you're trying to distinguish it not that we're only looking at the
19 past. I think you're trying to distinguish it with smoothing versus -- can you
20 finish that thought?

21 MR. SCHMIDT: That's a separate argument. I'm happy to address
22 that. But let me just clear up what my argument was.

23 JUDGE SAINDON: Yeah.

24 MR. SCHMIDT: My argument is that the shape of the Gaussian
25 weighting function is based on the stabilization strength parameter, which in

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1 turn is calculated based on blur. So when you change the shape of the
2 Gaussian weighting function, you're controlling blur, you're not controlling
3 stickiness. The past frames are only being considered as a mechanism for
4 addressing blur. So it's inconsistent with the notion of a parameter that's
5 there in order to control stickiness. The shape of that function is not there to
6 control stickiness. It's there to implement the parameter blur mitigation
7 technique.

8 Now to your point, Judge Saindon, we have an additional argument
9 that it's not really a stickiness parameter at all, because the plain and
10 ordinary meaning of stickiness is supposed to express some preference for
11 the past. And the only way that Zhou even considers past frames is
12 symmetrically around the mean with future frames. We're not saying that a
13 stickiness parameter precludes consideration of the future, but we're saying
14 that the stickiness parameter is supposed to control the degree to which you
15 prefer the past. And if the only way you consider the past is by considering
16 past and future equally, then you're not controlling the extent to which you
17 prefer the past.

18 JUDGE SAINDON: So to prefer the past means you need to not
19 prefer the future? Those are two sides of the scales.

20 MR. SCHMIDT: Or put slightly differently, you need to have a
21 mechanism for including more past frames without being offset by
22 corresponding future frames.

23 JUDGE SAINDON: Okay.

24 MR. SCHMIDT: Did I answer your question, Your Honor?

25 JUDGE SAINDON: Yes.

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1 MR. SCHMIDT: I want to turn now to Cai and the temporal
2 horizon issues. Oh, actually, I have another argument. Before I move on to
3 Cai, I want to discuss the motivation to combine Shi with Bell. This is in the
4 1164 petition. So Petitioner's combination is the Bell reference combined
5 with Shi to add the low-light high-pass parameter. And in order to
6 understand this argument, you have to understand Bell.

7 So the way that Bell operates and the way that Bell achieves
8 smoothing is that it conceptualizes two things. So, number one, it
9 conceptualizes this crop polygon 340. And then it conceptualizes this inner
10 region 310, which is in Figure 3 -- and I'm on Slide 90. And the way that
11 Bell operates is that it will move the crop polygon around in order to achieve
12 stabilization.

13 And so long as the crop polygon falls within that inner padding
14 space, Bell will try to slow down the crop polygon in order to keep it in the
15 center. To the extent the crop polygon falls outside that padding space, Bell
16 will speed it up in order to follow the camera more closely so that there's no
17 risk that it's going to run into the frame and create a collision.

18 So Bell's stabilization approach -- and I'm going to show you the
19 mathematics of this, but Bell's stabilization approach is fundamentally based
20 on this balance between accelerating and decelerating the crop polygon
21 based on where it's located relative to the motion of the camera. And this
22 inner padding space is really intrinsically intertwined with Bell's approach.
23 That's actually reflected in Claim 1 of Bell, if you look at the claims.

24 Turning to Slide 92, this is the mathematics that I was talking
25 about. On the upper right-hand side of my slide, I'm extracting Bell Exhibit

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1 1006 at column 9, lines 30 through 37. This is the equation for the
2 calculation of the orientation of the crop polygon. And you can see that in
3 cases where the crop polygon is within the inner region, Bell's applying a
4 decay factor d as part of this interpolation process. That's the deceleration
5 process. And in the lower right-hand corner, I'm showing relation 7 from
6 Bell at columns nine, lines 43 through 47. It's the same equation, except
7 now -- or substantially similar equation, except now Bell is applying this
8 alpha parameter which is called a mixing weight. And that's the acceleration
9 parameter.

10 And the reason why this is important, the reason I'm walking you
11 through this, is because Petitioner's combination is that you can take Shi's
12 blur parameter, the blur coefficient in Shi, and implement it into Bell. And
13 Shi's blur parameter increases the motion of the virtual camera based on
14 blur. And the point I want to make is that if Bell already has this balance
15 between accelerating and decelerating the camera, there's no telling how
16 that's going to be disrupted based on this additional parameter from Shi.

17 There's no -- Petitioner's expert didn't account for this. Petitioner's
18 expert didn't consider the extent to which adding an additional parameter is
19 going to disrupt Bell's balance. Petitioner's expert didn't consider whether
20 adding this additional parameter is going to frustrate Bell's purposes of
21 stabilization.

22 And if we turn to Slide 93 -- I've mentioned this before -- in the
23 ITC, they made a slight variation of the this argument because they
24 abandoned the notion that Shi even disclosed a low-light high-pass
25 parameter. But they were still arguing to the ALJ in the ITC that you could

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1 modify Bell in order to incorporate a low-light high-pass parameter. And we
2 made substantially the same argument I just made to you, which is based on
3 the way that Bell works, there's no indication that you could add another
4 parameter for speeding up or slowing down the camera without screwing up
5 the entire point of Bell in the first place.

6 And the ITC judge there agreed with us wholeheartedly. In the
7 initial determination, Exhibit 2052 at pages 109 through 110, the ALJ found
8 that Bell already uses alpha, the mixing weight, for a different purpose. And
9 then at page 110, in the last sentence I've highlighted, the ALJ found that
10 trying to add a low-light high-pass parameter into the way that Bell works
11 would frustrate the purpose of Bell systems, not improve it.

12 And this motivation to combine argument, which we think should
13 fully apply in this proceeding, would be dispositive on the entire 1164 case.
14 There's no motivation to incorporate a low-light high-pass parameter into
15 Bell. There's been no showing that there would be a reasonable expectation
16 of success.

17 And one more point. We raised this argument in technical detail in
18 our POR -- and the Petitioner did not address it, Petitioner and their expert
19 -- other than to say that both Shi and Bell are concerned with the frame
20 boundaries, therefore it would be obvious to combine. They did not respond
21 to the specific technical challenge that us and Dr. Foroosh raised in the
22 Patent Owner response. So there's no showing that you could change that
23 balance between acceleration and deceleration factors in Bell and still
24 achieve its purposes with this combination. And that should resolve the
25 1164 matter, we submit.

1 Turning to Slide 93, I did want to discuss the Cai issues. In the
2 1165 case, the Petitioner relies on a combination of Zhou and Cai, and the
3 assertion is that Cai disclosing closes the temporal horizon, enabling
4 approximation of intentional motion. Oh, I'm sorry, I'm on Slide 119. And
5 now I'm going to skip ahead to Slide 124.

6 The first point I want to make is that the petition for the temporal
7 horizon limitation is relying on Cai's disclosure of this zero motion detection
8 logic. And the zero motion detection logic is shown in Figure 5. And I
9 think Petitioner said Figure 5 is just an embodiment. Figure 5 is actually the
10 overview of the entire algorithm of how Cai performs trajectory
11 modification. It includes the, what Cai calls the -- sorry, I'm squinting
12 -- trajectory smoothing and trajectory planing stages. So this is the entire
13 front-to-back algorithm of Cai.

14 And in block 522, you see the zero motion detection block. The
15 input to that block is only previous frames and current frame. In fact, Cai
16 only considers the raw trajectory of future frames 524 after the zero motion
17 detection block is completed. And this alone shows that the zero motion
18 detection logic in Cai is not reliant on any sort of future frames, any look-
19 ahead, or any temporal horizon of motion. The future frames that Cai is
20 talking about are only considered in Cai as part of a different process, which
21 Cai describes as a clamping and anchoring process. That's not part of
22 Petitioner's theory for the temporal horizon but Petitioner repeatedly
23 conflates the disclosures about the clamping and anchoring process with the
24 zero motion detection logic.

25 Turning to Slide 125, I just want to walk through the way that the

1 zero-detection logic works in Cai. So I'm showing Figure 2 on Slide 125.
2 And what Cai does is it conceptualizes two different trajectories. One
3 trajectory, which I've annotated in pink, is what it calls the Predicted
4 Trajectory. It's the product of a low-pass filtering process. And then there's
5 another trajectory which Cai calls the Planned Trajectory or Zero Motion
6 Trajectory in some cases.

7 And this is the trajectory that Cai would experience or Cai would
8 output if the camera had zero motion across. And the purpose of Cai, for
9 every individual frame, is to figure out whether or not that frame is a zero
10 motion frame, in which case the planned trajectory is adopted, or whether
11 the frame is not a zero motion frame, in which case the predicted low-pass
12 filter trajectory is adopted.

13 And if we look at the embodiments of Cai, this analysis is done
14 entirely on present and past frames. It's an entire backward-looking
15 analysis. I'm on Slide 126. In one embodiment, Cai describes comparing
16 the gap between the last low-pass filter coordinate and the current low-pass
17 filter coordinate. So you take your current low-pass filter coordinate and
18 compare it to the past. And if the gap exceeds a threshold, then you consider
19 that a non-zero motion case. And if it is less than the threshold, then you
20 consider that a zero motion case. It's entirely backward-looking process.

21 And in an alternative embodiment, Cai discloses an approach at
22 column four, lines 45 through 56, where the two lines are compared to each
23 other. So you would compare the low-pass filter coordinate with the
24 corresponding coordinate of the zero motion trajectory. And if that
25 displacement in that case exceeded a gap, then you would consider it a frame

1 in motion rather than a zero motion frame. So again, that analysis is based
2 only on present frames, no look ahead and no temporal horizon.

3 I want to address -- and I'm going to have to go to the external
4 documents, so give me a moment here. I want to address the Petitioner's
5 argument with this annotated Figure 2, which they spent some time on. And
6 this is in their reply brief. This is in their expert declaration which was
7 submitted for the first time on reply. They didn't make this argument in the
8 petition, but Petitioner and their expert are relying on this mean or variance
9 embodiment in Cai and they're annotating Figure 2 in order to report reflect
10 what they read that embodiment to me.

11 And with respect, Your Honors, they are reading in the claim
12 limitation. They are using hindsight to read something into Cai that's not
13 there. And I want to show you why that's the case. If we turn to Cai itself
14 -- this is the portion -- you have to dig for this, but this is the portion of the
15 specification for Cai that they rely on for this embodiment. It's column 5,
16 line 16 through lines 23, and this is the mean or variance embodiment that
17 their expert cites in support of this annotation of Figure 2. And what's
18 important to note about this embodiment is what's being processed in this
19 embodiment is the sequence of frames that are averaged.

20 So let me back up and just read what's being described here as a
21 further alternative, "a mean or variance or both of the coordinate values for a
22 short set of frames, e.g. five or ten of the low-pass filtered predicted
23 trajectory frames may be compared to each of the frames in the short set of
24 frames. If the difference between the mean and any one particular frame is
25 less than a threshold, then the sequence may be determined to be a zero-

1 motion sequence for that frame." So what Cai is talking about is once a
2 short sequence of frames are incurred, five frames. It will take an average of
3 those five frames, then go back and compare the values in each one of those
4 frames to the average that was computed. It's a completely backward-
5 looking analysis.

6 Now, what Petitioner is reading this to mean is that at frame 1,
7 frame 1 is going to be compared to an average that can't yet be calculated
8 because the fifth frame hasn't been incurred. But there's absolutely nothing
9 here in the disclosure of Cai that indicates that that's the case. This is
10 completely a backward-looking analysis because what's being processed is
11 the entire sequence. This isn't a frame-by-frame processing. That's what
12 this embodiment of Cai is describing. So Petitioner has not met their burden
13 that Cai does any sort of forward-looking analysis as part of the zero motion
14 detection logic. They certainly haven't met their burden to overcome what
15 Figure 5 implies in the other evidence that I'm going to show you about Cai.

16 Turning to Slide 129 -- let me just minimize this. I'm on Slide 129
17 of my deck, here we go. We make this argument in the POR. Figure 4 of
18 Cai actually confirms that there's no temporal horizon that's enabling
19 approximation of intentional motion. What Figure 4 and its disclosure relate
20 to is what Cai calls a false alarm process. So what happens, you see the
21 cross-hatched trajectory, which is the zero motion trajectory, which remains
22 flat for the first six frames or so, and the low pass filter trajectory is slowly
23 deviating from that zero motion condition.

24 And what Cai teaches is that when you use its approach, if that
25 initial motion in those low-pass filtered frames is small, it's going to be

1 registered by Cai as a zero-motion frame, even if it wasn't a zero-motion
2 frame, even if the user fully intended that motion. And it's only when that
3 motion accumulates over four or five frames does Cai realize that its zero-
4 motion detection was a false alarm. That's what Cai calls it, a false alarm.

5 And when Cai recognizes that this false alarm condition is there,
6 then it starts smoothly following the intended trajectory. But this proves that
7 Cai doesn't have a temporal horizon and doesn't enable approximation of
8 intentional motion because it's unable to tell that the user has intended the
9 motion at the moment the motion began.

10 And just to make this really clear, if we compare Figure 4, the false
11 alarm embodiment of Cai, to Figure 5C of the '840 patent, I think it makes
12 this really clear. In Cai, in Figure 4, the intended motion begins at the very
13 beginning of that trajectory. And notice that the zero-motion trajectory, the
14 trajectory from the proposed method -- that's what Cai says, the crosshatch
15 trajectory -- fails to follow the curve until some number of frames into the
16 future. That's what the false alarm is about.

17 Compare that to Figure 5, where as soon as the intended motion
18 begins at the end of duration c, the patented approach is able to immediately
19 begin following that intended trajectory in a smooth manner. Even though
20 the initial displacement after duration c is very, very small. It's smaller than
21 the motion that's ignored in durations a and b. And the reason why the
22 patented method is able to determine that that's intentional motion, even
23 though it's a very small displacement, is because it's looking ahead a
24 temporal horizon. It's looking ahead a sufficiently long temporal horizon to
25 recognize and know that this motion is going to persist in the future and that

1 it should begin following that trajectory. And that's a feature that's entirely
2 missing from Cai, and Figure 4 proves it.

3 The last argument I want to make on Cai is there's a second reason
4 why Cai doesn't disclose the temporal horizon, and that is the nature of the
5 zero motion detection is that Cai can infer that a frame, according to its
6 logic, may have been intended to be zero motion, although there are
7 limitations with that, and then enforce a zero motion constraint. But if Cai
8 determines that it's not a zero motion frame, then Cai simply adopts the low-
9 pass filter trajectory that would otherwise occur. So once Cai determines
10 that the frame is in motion, it has no further ability to determine intentional
11 motion after that point.

12 And that's distinguishable from the claimed approach in Figure 5C,
13 which I just showed you, because the patent is able to, while the camera's
14 motion continue, distinguish between intentional and unintentional motion
15 and smooth along that intended trajectory. So Petitioners make the
16 argument in their reply that Cai does have the ability to approximate
17 intentional motion while the camera's in motion, but they don't point to
18 anything. And in fact their expert contradicts this because at paragraph 88
19 of his reply declaration, this is Exhibit 1017, Dr. Katsaggelos admits in his
20 reply declaration that the filtered motion, the low pass filter trajectory of
21 Cai, does not in all cases reflect the intended motion, as it still contains jitter.

22 So just to back up and make sure that this is clear, once Cai
23 determines that the frame is in motion, it adopts the low-pass filter
24 trajectory. Dr. Katsaggelos admits that the low-pass filter trajectory may
25 include jitter, it may include unintended motion. So by definition, Cai

1 cannot be distinguishing between intentional and unintentional motion when
2 the camera's in motion, because it's just following the low-pass filter
3 trajectory, which may or may not reflect the user's intent.

4 Turning to Slide 133, in the institution decision, the Board cited to
5 this passage column 9, lines 8 through 18 of Cai and that corresponds to
6 Figure 7. With respect, this mention about the smoothed trajectory from the
7 zero motion stabilization being projected into future frames, that is not
8 disclosing a temporal horizon of motion. What's being described here is
9 whenever a frame is determined to be zero motion, that zero motion
10 constraint is enforced for that frame. And then what happens is there needs
11 to be a comparison point for the future filtered frames to be compared
12 against.

13 So what Cai does is once the zero motion constraint is enforced, it
14 will project that position as the planned trajectory for the next five frames,
15 so that there's a baseline comparison point for the low-pass filter Gaussian
16 frames to be compared to in the upcoming frames. And that's reflected in
17 the next sentence. This, meaning the projected frames, is compared to the
18 Gaussian-filtered next five frames to characterize the video as zero motion
19 or not. So this is not teaching comparing future low-pass filtered frames to
20 past zero-motion frames. It's discussing projecting the zero motion frames
21 in order to serve as a comparison point for further analysis.

22 The last point I want to make is -- I've mentioned this before, but
23 there's an additional step after Cai, a clamping check and a trajectory
24 planning step. These steps do include forward-looking motion. Looking
25 ahead, I saw -- I showed you in Figure 5 how the raw trajectory of future

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1 frames are considered. So there are -- there is mention in Cai of considering
2 future frames. And I don't have time to get into all the details, but all of
3 those disclosures relate to this clamping and anchoring check. There's not
4 any disclosures in Cai that discuss those future frames being used as part of
5 the zero motion detection process.

6 So with that, Your Honors, I will rest on the briefs for the
7 remaining arguments and reserve the balance of my time, unless you have
8 any questions.

9 JUDGE SAINDON: No, thank you.

10 MR. SCHMIDT: Thank you.

11 JUDGE SAINDON: Okay. Let's take a recess here before we start
12 with the rebuttal periods. Let's see, I have 2:55 on my clock here. How
13 about we start back up -- just take 15 minutes -- at 3:10?

14 (Whereupon, the above-entitled matter went off the record at 2:56
15 p.m. and resumed at 3:12 p.m.)

16 JUDGE SAINDON: Okay. Petitioner, I have 45 minutes. Okay.
17 We begin when ready.

18 MS. LI: Thank you, Your Honors. I'd like to start with
19 proceedings 1186, the Kwatra reference. GoPro, the Patent Owner, is trying
20 to complicate the Kwatra reference. Again going back to this equation 7, the
21 cost function, there's no dispute that this minimizes a combination of
22 velocity and acceleration. The only issue is whether the camera path P in
23 this cost function involves rotational movement. Now we've shown that the
24 closures from the patent stating repeatedly that the cameras in Kwatra
25 involves rotational movement.

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1 GoPro is trying to rest its argument on a conflation between the
2 term linear model with linear motion. Now let me explain. These are two
3 different things. Linear model is simply a mathematical computation where
4 the operations involve linear relationships. That doesn't mean they don't
5 represent rotation motion, okay?

6 And let me quickly address Patent Owner's Slide 17, when they
7 refer to Equation 12 in Kwatra. Now Patent Owner would have made the
8 argument that this dxt, dyt in equation 12 and Kwatra somehow means
9 rotational motions only. First, I like to make clear to the Board, this is a
10 pure attorney argument. Their expert never addressed equation 12
11 whatsoever in his declaration so this pure attorney argument should be
12 disregarded.

13 Regardless, this is wrong because Petitioner's expert has explained
14 at length -- which I can point to where in his declarations that look at the
15 equation 12. There's also a matrix that involving A, B, C and D and
16 Petitioner's expert explained at length why this matrix does in fact represent
17 rotation movement. And GoPro ignored this matrix entirely focusing on the
18 other part based on their attorney argument. Their expert never addressed it.

19 Specifically, I would like to turn the Board's attention to
20 proceeding 1186 Exhibit 1017, Dr. Katsaggelos' declaration, at paragraphs
21 19 to 32, where Dr. Katsaggelos explains at length why the linear models,
22 including similarity model, affine model and homography model, they all
23 can represent rotation movement. And, you know what, this is again
24 -- GoPro concedes that. They in fact, in their POR at page 19, concedes that
25 Kwatra's linear model represents rotation.

1 And specifically -- I'm going to quote this; this is what they said
2 -- they say Kwatra does teach that the two-dimensional linear model may be
3 represented as a similarity or a fine transformation with degrees of freedom
4 for scale and rotation. Again, I want to direct the Board's attention to
5 Kwatra at column 11, line 3 to 21, and column 17 line 5 to 6. They all talk
6 about how the two -- how the linear models, similarity or affine, they do
7 represent rotation movement.

8 Patent Owner also relied on some non-limiting examples in
9 Kwatra, specifically Figure 8A and 8B to show that these are about
10 translational motions. But they completely ignored Figure 5D, which is
11 shown here on Slide 87 of Petitioner's deck. Figure 5D is an example
12 showing minimization of rotational velocity and rotational acceleration and
13 based on Equation 7. And this is described in Kwatra Exhibit 1005, column
14 14 line 39 through line 60.

15 I also wanted to briefly address GoPro's argument that somehow
16 Kwatra avoids optimization or smoothness on rotation. Again that is
17 inconsistent with Kwatra's disclosure. Going to Slide 86, here we can see
18 that yes, Kwatra imposes smoothness constraints on the two parameters A
19 and B. But it is also undisputed that rotation theta relates to only the
20 parameters A and B.

21 So in other words, imposing smoothness constraints on A and B
22 results in rotation theta also being smoothed. And there's -- Kwatra need not
23 directly bound or smooth theta to control rotation. It constrains A and B in a
24 way such that it is mathematically and functional equivalent to bounding the
25 rotation theta. And Kwatra goes on to disclose, like, Equation 23, 24 about

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1 imposing smoothness constraints on rotation.

2 I also wanted to address Patent Owner's argument about this 2D
3 versus 3D, which is a red herring.

4 JUDGE SAINDON: Counsel, before we go to that, I'm looking at
5 column 17 of Kwatra. This is where Equation 17 and 18 that you had just
6 had up in your slides is shown. And I'm reading here about smoothness or
7 -- no, additional constraints constraining smoothness on AB rotation and
8 scale. And Patent Owner's Counsel had made an argument similar to this
9 about -- is this constraint different than the minimization function?

10 MS. LI: Yes, Your Honors, I can answer this question. So Kwatra
11 discloses this Equation 7 first, right? We already know it is minimizing.
12 And this is the additional stuff that Kwatra is doing to further smoothing. So
13 whether it's doing some additional thing, we already know based on the
14 Equation 7 it is minimizing the velocity and acceleration of the camera pass,
15 which includes rotation. But this is the Equation 17 through, like, 24, all the
16 additional steps that Kwatra does.

17 JUDGE SAINDON: With these 17 through 24 equations, these are
18 post the equation 7?

19 MS. LI: Yes, Your Honors, we believe that's the case.

20 JUDGE SAINDON: Okay.

21 MS. LI: Going to Slide 90, addressing GoPro's 2D versus 3D
22 argument. Again, first of all, the patents are not limited to 3D motion. The
23 spec does not mention 2D or 3D, nor do the claims reference any 3D motion.
24 And the claims recite rotational motion of a camera housing does not mean
25 that it is limited to rotational motion in 3D space.

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1 But regardless, as Petitioner's expert has explained, Kwatra in fact
2 does disclose 3D motions. For example, Kwatra, in its column 11, line 58 to
3 61, discloses lower to higher dimension motion models. So Kwatra is
4 intending to capture more complicated camera motions from similarity,
5 which is more basic 2D, to homography. And homography, as our expert
6 has explained, this is the model that can simulate full 3D rotation in the
7 three-dimensional space that involves more complicated motion.

8 Patent Owner also made the argument that said somehow Kwatra
9 is about image-based, it does not model motion of camera housing. That is
10 also incorrect. Looking at our slide number 92, Kwatra in fact explicitly
11 discloses estimating the motion of a camera. Look at the highlighted
12 portions "estimate a motion of the camera," "estimate an original motion
13 path of a camera." So in addition, it is also well known. First of all, I want
14 to clarify that Kwatra is not limited to 2D image-based, you know, trajectory
15 estimation. It used the word, like, may -- you may use the image based, but
16 it never limits that.

17 And regardless, it is well known that 3D information, including the
18 depth, can be reconstructed from a 2D video. In fact, GoPro's own expert
19 -- and this is Slide 91 -- his own research used 2D video to calculate the
20 depth. This is also reflected in his depo testimony, Exhibit 1018, column 24,
21 line 16 to column 25, line 5. Petitioner also mentioned about Kwatra
22 -- there's a provisional application of Kwatra. Yes, Petitioners -- sorry,
23 Patent Owner mentioned the provisional application and kind of faults
24 Petitioner's expert of not referencing that in his opening declaration.

25 But here on Slide 89, we can show that Kwatra's provisional

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1 application is entirely consistent with the Kwatra disclosure -- that its motion
2 includes rotation. So here, for example, page 5 of the Provisional
3 application Exhibit 2019, that shows, states, when the camera motion model
4 is pure translation, minimizing derivatives of PT is straightforward. It is
5 talking about translation. Then it goes on to say when it is a similarity
6 transform, however -- so now it's talking about something that's not
7 translation, right? It goes on to say it is a combination of scale, rotation, and
8 translation. Again, this confirms consistent is consistent with the Kwatra
9 distribution, that the camera has the rotational movement.

10 Let me briefly address the parallel ITC investigation. As I stated
11 earlier, that ITC had a different evidentiary record. And there, the ITC did
12 not have the evidence that what we are explaining here, why linear model
13 can actually represent rotational motions. This is in Dr. Katsaggelos'
14 declaration. This is in fact conceded by GoPro's own papers. So the fact
15 that in a different proceeding that the ALJ reached a different conclusion
16 doesn't mean it applies here because we have a different record here, Your
17 Honors.

18 If no other questions, I'm happy to move on a different issue
19 involving low-light high-pass. Okay. So addressing the claim construction
20 first. GoPro here kept saying why their narrow construction involving -- you
21 know, letting the higher frequencies to pass based on low-light conditions, it
22 is warranted. They never ever argue this construction in the ITC for
23 infringement. And they -- even Counsel just now even made an even more
24 narrow argument by saying this low-light high-pass parameter somehow has
25 to be calculated that depend on the low-light conditions.

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1 And that is not even in their proposed construction. Their
2 proposed construction is saying based on low-light conditions. It doesn't say
3 when you calculate this parameter, it has to be actually depending on. You
4 have to show calculations that it, you know, depend on how the low-light
5 changes. That's not what they're even advancing in their claim construction.

6 I also wanted to address their argument that somehow Petitioner
7 made an inconsistent claim construction argument. That is not true. At the
8 petition stage, Petitioner and its experts state that no construction is needed;
9 should just apply the plain ordinary meaning. And then only after the Patent
10 Owner improperly attempted to narrow the scope of low-light high-pass
11 parameter, Petitioner then responded in a reply that a skill in the art will
12 have to look at the specification to understand the plain meaning of this
13 term. You cannot look at the words in isolation in a vacuum. That's exactly
14 what Patent Owner is doing.

15 I also wanted to address briefly the Malvern case that Patent
16 Owner is arguing. So going to our Slide 23, this Malvern case that Patent
17 Owner relies on actually supports Petitioner's position because it says, "the
18 claim language and the specification both support the conclusion." Here,
19 unlike this Malvern case, the Patent Owner attempts to disregard the broader
20 disclosure in the specification and their construction is not consistent with
21 the what the specification says. And they're trying to impose a narrow scope
22 of low-light high-pass.

23 He made new attorney argument for the first time that the inventor
24 somehow decided to disclaim some scope of the low-light high-pass. And
25 then the Figure 7, like, the parameter -- only the S1 to S2 and S3 to S4 in

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1 Figure 7 shows low-light high-pass. There's no basis for them to exclude the
2 other variants as shown in Figure 7. When the light condition is the same,
3 the intra-camera motion changes and then you can still change that
4 parameter.

5 They also mentioned about provisional application. Again, that
6 supports Petitioner. The provisional application of I think the '840 patent
7 wanted to draw the board's attention. It discloses that when the low-light
8 high-pass parameter is 1, the entire camera displacement during the exposure
9 period is preserved. So again, this means that all frequencies are preserved,
10 whether that's high frequencies or low frequencies. There's no limitation
11 saying that the high -- require the high frequencies to be preserved.

12 And Patent Owner's Slide 57 also says that Petitioner's experts
13 somehow testify high-pass. But again, I wanted to put this into the context.
14 When the Petitioner's expert was testifying, the question addressed to him
15 was what is a high-pass in a vacuum that is not in the context of the
16 specification. Again, how we understand the plain ordinary meaning, we
17 cannot tear apart, parsing out the words in the vacuum. We have to look at
18 what the specification states. The specification uses the whole term
19 together. Low-light high-pass. It does say -- it does not use the high-pass in
20 like any separate instances. So we have to consider the term in its entirety
21 and how that is used in the specification.

22 Now I want to briefly cover the Shi reference in terms of the
23 disclosure relating to low-light high-pass. GoPro argues that Shi's
24 coefficient is calculated based on the amount of motion incurred in a given
25 frame, not based on the low-light conditions. But a skill in the art would

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1 have understood that the blurs can be caused by low-light conditions. And
2 again, this goes back to their improper claim construction.

3 I want to point the Board to the disclosure of the patent wherein,
4 for example, column 18, line 10 through 24, where the patent specifically
5 talks about this blur compensation technique, takes into account the motion
6 blur and attempts to match the smoothed trajectory with that motion blur.
7 That is a goal of the low-light high-pass.

8 Now moving on to addressing the motivation to combine Bell and
9 Shi. Before I delve into the details, I wanted to give a little bit kind of
10 fundamental principle behind stabilization. This goes -- you know, we talk
11 about the three steps in stabilization. There is the motion estimation, there's
12 motion smoothing, there's this rendering process. So during this rendering
13 process, what happened is the system received input video that is shaky.
14 And in the rendering process, it basically will determine a viewing window.
15 It crops out, right? There's a shaky video and then you do a cropping out
16 and you crop out a stabilized video. And that crop out is referred to in the
17 '840, '894 pattern as a viewing window. It is referred to in Bell as the crop
18 polygon.

19 So the same thing, it's about the cropping. And what Bell talks
20 about, you know, how it's adjusting the velocity of the virtual camera
21 position really is to ensure that this cropped view window stays within the
22 input image. Because if it goes out of boundary, then you don't have any
23 input pixels into that crop out. So the whole point is, you need to adjust the
24 speed just to make sure that the cropped out window stays within input
25 image.

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1 And that is the same thing. That is the standard, that is the same
2 thing disclosed in Shi, as well. So for example, Shi system also involves a
3 similar -- this is Slide 67 -- step of making sure that the projection that is
4 correspond to this profile window, relating to the virtual camera motion
5 matches the output frame. And here we cited Dr. Katsaggelos' declarations,
6 Exhibit 1017, paragraph 100 and paragraph 101. It's all talking about -- he's
7 applying that, look, this is a standard procedure for video stabilization. This
8 happens in Bell, this happened in Shi, this also happens in '840 because they
9 all need to make sure this idea that the viewing window does not exceed the
10 field of view of the digital content.

11 So a skilled in the art will be motivated to combine these
12 references because they're not contradicting each other. They're all having
13 the same goal, that is to making sure this crop view window stays within the
14 field of view of the input image. Again, kind of mentioned how in the ITC,
15 the ALJ found lack of motivation to combine. But again, here on this record
16 in these proceedings, we have expert testimony showing that why Shi is also
17 achieving a similar purpose as Bell and hence a skill in the art looking at
18 them will be able to combine them.

19 In addition to the same point that Bell somehow uses this different
20 parameter to adjust the stabilization strength, the fact that Bell has this
21 parameter to adjust the stabilization strength does not mean it cannot be used
22 for both motion blur compensation and also making sure this crop region
23 stays within the range. So yeah, again, this respond to the motion to
24 combine arguments.

25 Next, I wanted to briefly talk about the Zhou reference regarding

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1 the low-light high-pass that is in the IPR procedure. Petitioner's -- Patent
2 Owner's argument again hinges on this narrow construction and saying that
3 Zhou doesn't show that its parameter -- its motion blur parameter is actually
4 calculated based on the low-light condition. But again, even their own
5 construction does not require this parameter has to be calculated -- that
6 depends on this low-light condition it's only based on. And as we explained,
7 Zhou teaches adjusting the strength of stabilization based on the motion blur,
8 which in turn is -- depends on the low-light condition. Because Zhou -- to
9 reiterate, Zhou discloses that if the amount of blur in the image is larger,
10 which is in a darker image, i.e., low-light condition, smaller stabilization
11 strands may be employed. So it ties to the adjustment of the smoothing to
12 the low-light condition.

13 And regarding the high-pass limitation that GoPro is proposing,
14 they argue that somehow Zhou does not allow the high-pass frequency to
15 pass. Remember, they point to this Gaussian -- the spread of the Gaussian
16 curve over time to show oh, how they're treating all the frequencies equal.
17 But wait a second, this Gaussian curve determines, you know, how much
18 smoothing is performed. This is not about motion frequency. This is about,
19 you know, how you change the weight over time. Nothing in the Gaussian
20 curve is talking about the frequencies. If the curve in the Gaussian curve is
21 tall and not wide, then you basically only consider, you know, the current
22 frame and not the other frames. But if the Gaussian curve is very flat, is
23 very wide, then that's where you consider, you know, you have a lot of
24 smoothing because you consider both future and past frames.

25 And so, in other words, if we consider those camera trajectories in

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1 the frequency domain, say that in Zhou, you know, for example, they only
2 -- when the stabilization strength is small, meaning that they don't filter that
3 much, it's almost like an all-pass filter, meaning that you let all the
4 frequencies of the motion to pass through, including both high frequencies
5 and low frequencies.

6 JUDGE SAINDON: Counsel, could I jump in here for a second?
7 So let's talk about the stickiness parameter again. So we've talked on both
8 times about whether this precludes looking ahead or -- perhaps not
9 precluding looking ahead, but favors looking behind versus looking ahead.
10 And if you have a Gaussian centered on present, then you're giving equal
11 weight to the past and the future. And that could be a reason why it is not
12 stickiness, because it's not favoring the past over the present. Or at least
13 that's what I understood from an earlier conversation. So I was wondering if
14 you could respond to that.

15 MS. LI: Right. But if we look at both sides, kind of how they
16 apply the construction, the -- let me try to go back to the claim construction.
17 I want to point out is that whatever the construction the parties are applying,
18 there's no requirement to favor more past frames than the future frames.

19 JUDGE SAINDON: Well, I guess the specification, column 22,
20 lines 22 through 36, I'm looking at Slide 63 -- I believe this is of your slides
21 -- and it says the stickiness parameter may refer to a parameter that, blah-
22 blah-blah, by which the preceding portions of the observed trajectory
23 impacts determination of the smoothed trajectory. So the preceding portions
24 impacts.

25 MS. LI: Right.

1 JUDGE SAINDON: So that to me again is looking at the past or
2 favoring the past to some extent. And again, the Gaussian that you were
3 showing -- I forget the reference off the top of my head, but it had the
4 balance on both sides.

5 MS. LI: Right. Your Honors, with respect to this sentence, it still
6 does not reference the future frame. And the claims has a separate limitation
7 about looking ahead -- that talks about the future frames. But when it talks
8 about the stickiness, all that requires is that parameter control the extent by
9 which one or more past frames impact the determination of the smoothed
10 trajectory. So yes, this Gaussian, you know, it may consider some futures, it
11 may offset some effect of the past frames, but it doesn't negate the fact that it
12 does consider the impact of the past frames. There's no requirement in here
13 that shows you can only consider the past frames, but not the future frames.

14 Also I want to point out, like, you know, we're talking about
15 Gaussian, right? This curve and there are weight. But also, like, in the
16 claim or in the specification, you know, there's no requirement that a
17 different weight to be applied to a future frame versus, you know, if you can
18 have just the same way applies to both past and future frames. The point is,
19 you consider the weight for the past frames.

20 Your Honors, are there any further questions or am I -- can I move
21 on to additional issues?

22 JUDGE SAINDON: You may proceed.

23 MS. LI: Thank you. So lastly, I want to address the Cai reference
24 in the 1165 proceedings regarding temporal horizons. GoPro attempts to
25 limit Cai's disclosure to very specific embodiments -- non-limiting examples

1 but ignores the embodiment that actually uses the feature frames. Again,
2 going back to our Figure 2, which is Slide number 58, GoPro effectively
3 conceded that the frame 1, whether that's intentional or not intentional, it
4 actually depends on the frames at points 2 to 5 which, relative to frame 1, are
5 the future frames. And there's no -- I know they mentioned about, like,
6 clamping. But this embodiment, when we talk about this Figure 2 and the
7 corresponding disclosure on Slide 58, there's nothing restricting this
8 embodiment to clamping.

9 Also, GoPro attempts to argue that somehow because Cai detects
10 intentional motion, there's a little bit lagging, that it does not meet the
11 limitation. So first of all, there's no requirement that approximating
12 intentional motion cannot have any lagging. And GoPro Counsel just made
13 the argument that in order to meet this limitation, you have to approximate
14 or detect intentional motion at the motion, when the motion begins. There's
15 no such requirement. The claim limitation is plain -- just approximate
16 intentional motion.

17 And their Slide 131, where they annotate the slide, they actually
18 concede that Cai detects intentional motion -- and nor do the claim require
19 approximation of intentional motion at all times. I know they made the
20 argument that, oh, once Cai determines that the motion is not 0, then they
21 use a low-pass filter. But the claims in no way require that approximation of
22 intentional motion have to be done like that at all times. And Cai clearly
23 discloses detecting intentional motion in its example is a non-zero motion
24 detection. And even after the non-zero motion detection, it still detects if it's
25 not a non-zero motion, that it will still track the motion by doing the low-

1 pass filter.

2 Your Honors, before I rest, I wanted to address and also emphasize
3 two points. First, there's nothing in the claim language to reiterate regarding
4 stickiness parameter that requires favoring the past frames. There's no such
5 thing. There's no favoring the past versus the future frames. And back to
6 Kwatra and your question, Your Honors, Figure 7 -- I want to again bring
7 the Board's attention to Figure 7, which is a cost function that minimizes the
8 rotational acceleration, rotational velocity, and the other equations we talk
9 about 19 through 24 further smooths this by making sure that the scale and
10 rotation don't deviate too much. And with that, I will save the rest of my
11 time for the confidential session.

12 JUDGE SAINDON: Okay. Thank you.

13 MS. LI: Thank you very much.

14 MR. SCHMIDT: Your Honor, may I proceed?

15 JUDGE SAINDON: Yes.

16 MR. SCHMIDT: I want to start with Kwatra and I'm showing
17 Slide 17 from my deck. And I just want to make a few points. First,
18 Petitioner accused me of conflating linear motion models. We've been very
19 upfront about this. We said in our POR that a linear, a two-dimensional
20 linear motion model, can have a rotational degree of freedom. That's taught
21 at column level 11 of Kwatra. Our point is that the linear motion model
22 that's actually minimized in Kwatra doesn't have a rotational parameter.
23 And that's shown on my Slide 17 right here.

24 In fact, at Kwatra columns 10, lines 48 through 53, it expressly
25 says that this function $F(t)$, which is used to control the frame pair transition,

1 is not just linear, but a translational model. The Petitioner said I'm ignoring
2 the A, B, C and D coefficients. I'm not ignoring those -- those are just
3 coefficients. Those don't capture any rotational degree of freedom. There's
4 four parameters here because it's a similarity -- I'm sorry, it's an affine
5 transform. But what Kwatra teaches is when it's a similarity transform,
6 those four parameters become two. So it's just A and B. So later on in
7 column 17, where Kwatra talks about imposing smoothness on only A and
8 B, those are the constraints that smoothness is imposed on.

9 And it goes on to say that imposing smoothness constraints on
10 these coefficients does not smooth rotation. So Kwatra can't -- couldn't be
11 more clear that these coefficients have nothing to do with rotation.
12 Petitioner argued that this is all attorney argument. Not true. Exhibit 2018
13 of Dr. Foroosh's declaration paragraph 66, Dr. Foroosh considers Equation
14 12 and steps through the analysis that I did.

15 Petitioner pointed to Figure 5D of Kwatra. Figure 5D has nothing
16 to do with rotation. Figure 5D is one of a series of figures that relate to the
17 objective function of Kwatra. And what Kwatra teaches is that that
18 objective function with the three derivatives, each one of those derivatives
19 can be minimized while one at a time. And it provides different examples of
20 that in 5A through 5C. And then all 5D is an example where Kwatra says all
21 the derivatives are minimized simultaneously. That's it. It doesn't change
22 what's being minimized at all. There's nothing in the discussion of that
23 equation in Figure 5D that indicates there's rotation.

24 And if you go to Petitioner's Slide 87, it's a little bit of a misleading
25 slide, because Petitioner has a picture of 5D, and they have citations to

1 Kwatra that mention rotation that are completely disconnected from Figure
2 5D. I wrote it down. I think they cited to column 1 and they cited to column
3 18, which has to do with recasting of the image. The discussion of column
4 5D is in column 14, and there's no indication that 5D has anything to do with
5 rotation. And that's why they have to cite in that manner.

6 Petitioner raised the issue of the constraints on the rotation that we
7 talked about. So because Kwatra can't smooth the rotation directly, it places
8 these bounding constraints on. And what was really striking about the
9 argument is even now on the rebuttal argument, Petitioner is not claiming
10 that those constraints minimize a combination of rotation and velocity.
11 Petitioner hasn't argued that at all. They didn't argue that initially. They
12 didn't argue that on rebuttal. Their expert hasn't said it. Nobody is saying
13 that placing bounding constraints on theta and scale minimize those
14 parameters. And Dr. Foroosh's testimony is completely un rebutted.

15 Petitioner raised the issue of the camera housing. This is an
16 argument I didn't get into. But we have this additional argument that even if
17 you believe Kwatra is minimizing, it's a minimization of some composite set
18 of images in the screen. It's not an actual minimization of the housing. And
19 just to give you a brief thumbnail of the argument, images at different depths
20 within a camera are going to move by different amounts based on the
21 rotation of the camera. So when Kwatra minimizes some composite set of
22 images, there's no guarantee or even any indication that that's going to
23 correspond to a minimization of rotation of the housing of the camera, which
24 is what the claim ultimately requires.

25 And they pointed to our expert's declaration that in the computer

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1 vision space, you know, some experts can go off and figure out techniques
2 for figuring out how much the camera moved based on image depth in the
3 image plane. That's all fine and good, but none of that's disclosed in Kwatra.
4 So just because our expert recognizes that as a theoretical possibility doesn't
5 mean that Kwatra is minimizing rotation of the housing, even if you accept
6 the they minimize rotation.

7 I only have a few things on the low-light high-pass parameter. In
8 my mind, there's no difference between depends on and based on in the
9 claim construction. I didn't view my argument as changing our claim
10 construction in any way. I think we were very clear in the Patent Owner
11 response that we think that in order to meet the claim limitation, a piece of
12 prior art needs to be triggering blur compensation based on the low-light
13 condition and not on something else. So in other words, it must depend on
14 the low-light condition. If the correction to blur were made for any reason at
15 all, then the inventors would have just called it a blur parameter.

16 And if correlation -- if just a correlation to low-light was enough,
17 the inventors would have called it a blur parameter because low-light is
18 always correlated to blur. So the only way to not render this claim term
19 superfluous is to find that the limitation requires that the parameter be based
20 on or depend on, take your pick, but it has to be triggered by the low-light
21 condition and not based on image motion in frame.

22 Just in case I messed up my hypothetical before, let me just state it
23 again. In Zhou and Shi, if you have a well-lit scene with a low exposure
24 time and high motion, the parameters in Zhou and Shi are going to register a
25 high value. Even in the high-lit scene with a low exposure time, the low-

1 light high-pass parameter would be a low value. In a poorly-lit scene with a
2 high exposure time and low or no motion, the parameters in Zhou and Shi
3 are going to register a low value for the low-light high-pass parameter,
4 whereas the claimed approach would register a high value. So that just
5 proves that Zhou and Shi are not based on or depending on low-light high-
6 pass parameter.

7 On the stickiness parameter, I hope I was clear. We're not taking
8 the position that the claim requirement precludes a look-ahead of frames, but
9 it certainly expresses a preference for past frames. And the parties agreed-
10 upon construction is that the stickiness perhaps must control the extent to
11 which the past frames impact the smoothing and control indicates that some
12 symmetrical balancing of past and future frames would not satisfy the
13 stickiness parameter. In case there's any doubt about whether or not Zhou is
14 able to express a preference for the past, I questioned Dr. Katsaggelos about
15 this in his reply declaration. It's cited in our sur-reply. His testimony is
16 Exhibit 2049 at page 32 lines 4 through 8.

17 I just confirmed that there's only two parameters that could be
18 changed in Zhou. I'm sorry, let me back up. There's only two parameters
19 that can even theoretically be changed in a Gaussian distribution or a
20 Gaussian function. One is the mean, and one is the standard deviation. And
21 Zhou does not disclose any mechanism for changing the mean.

22 Last issue, turning to Cai on this mean or variance embodiment
23 that they're pointing to in Figure 5, I think it's important to keep in mind that
24 when we're considering whether or not there's a temporal horizon or a look-
25 ahead to future frames, that inquiry has to be from the perspective of what's

1 being processed, okay? So when we consider whether or not there is a look-
2 ahead across the temporal horizon, we need to consider what's being
3 processed as part of that look-ahead, if there is one.

4 And the embodiment that they pointed you to in Figure 5 makes
5 very clear that what's being processed there is the sequence of frames itself.
6 So if there's a five sequence -- if there's a five-frame sequence of frames and
7 the average of that five-frame sequence is compared to each individual
8 frame, that is for the purposes of determining whether the sequence was zero
9 motion, not the individual frames within. So we believe that the perspective
10 is from -- from the perspective of processing the sequence, it's an entirely
11 backward-looking process. You can't process the sequence until the
12 sequence is received.

13 And that's the best reading of Cai. And at a minimum, it doesn't
14 overcome all the other evidence in Cai indicating that it's based purely on
15 current and past frames, Figure 5, the false alarm embodiment in Figure 4,
16 and the absence of any clear teaching that this threshold and gap analysis is
17 done based on any sort of future consideration. It's always done based on a
18 current frame to another current frame we're looking into the past.

19 One last point on the whether or not Cai can determine intentional
20 motion once it's in motion, I believe Petitioner made an argument -- I'm
21 paraphrasing here, but it was something to the effect that the claims don't
22 require that there be an approximation of intentional motion in all
23 circumstances. Well, the claims require that the smoothing -- well first of
24 all, the claims require a process configured to do this technique and they
25 require the processors to be configured to do smoothing that takes into

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1 account the temporal horizon that enables approximation of intentional
2 motion, okay?

3 So the mere fact that Cai's adoption of a low-pass filter trajectory
4 when zero motion is rejected, the mere fact that that low-pass filter trajectory
5 may, by virtue of happenstance, reflect the user's intent, doesn't satisfy a
6 claim. The claim requires that the use of the temporal horizon enable
7 approximation of intentional motion, and that's a requirement of the
8 configuration of the device. And Dr. Katsaggelos admitted that the low-pass
9 frequency trajectory will not reflect the user's intent because it still includes
10 jitter. So the mere fact that it may overlap with user intent by happenstance
11 is not enough. That's an independent reason to find that Cai doesn't disclose
12 the temporal horizon.

13 And for everything else, I would rest on the argument and the
14 briefs unless the Court has any questions.

15 JUDGE SAINDON: Okey doke. Thank you. Okay. We can go
16 off the record for a little bit. I think we are ready to start --

17 (Whereupon, the above-entitled matter went off the record at 3:59
18 p.m.)

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