

1 UNITED STATES PATENT AND TRADEMARK OFFICE

2
3 BEFORE THE PATENT TRIAL AND APPEAL BOARD

4
5 ARASHI VISION (US) LLC (D/B/A INSTA360)

6 Petitioner,

7 v.

8 GOPRO, INC.

9 Patent Owner.

10
11 CASE NO. IPR2024-01164

IPR2024-01165

12 IPR2024-01186

13 US PATENT NO. 10,958,840

10,958,840

14 10,574,894

15
16 DEPOSITION OF

17 DR. AGGELOS KATSAGGELOS

18 August 28, 2025

19 10:00 a.m CST

20
21
22 Taken via Zoom by agreement

23
24 Diana G. Rodriguez, RPR, Certified Shorthand Reporter

25
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I N D E X
WITNESSES

ALL WITNESSES: PAGE:
DR. AGGELOS KATSAGGELOS
Examination by Mr. Schmidt 4:6

EXHIBITS

NO.: DESCRIPTION: PAGE:

For Katsaggelos:

Exhibit 1
Katsaggelos Supplemental Declaration
for the '894 patent in proceeding
1186:
For Identification 6:3
Exhibit 2
Katsaggelos Supplemental Declaration
in the 1164 case regarding the '840
patent:
For Identification 6:10
Exhibit 3
Katsaggelos Supplemental Declaration
in the 1165 case regarding the '840
patent:
For Identification 7:3
Exhibit 4
'894 patent:
For Identification 7:22
Exhibit 5
'840 patent:
For Identification 54:20
Exhibit 6
Katsaggelos original declaration
regarding '840 patent:
For Identification 21:18

1 (Witness sworn)

2 DR. AGGELOS KATSAGGELOS,
3 called as a witness herein, having been first duly
4 sworn, was examined and testified as follows:

5 EXAMINATION

6 BY MR. SCHMIDT:

7 Q Welcome back, Doctor.

8 A Thank you.

9 Q Is there anybody else present in the room
10 from which you're testifying today?

11 A No.

12 Q And can you identify any hard copy
13 documents that you have available to you during this
14 deposition?

15 A Yes. I brought with me clean copies of my
16 six declarations.

17 Q Okay. Anything else?

18 A No. I also had PDFs of the six
19 declarations on my desktop because I was not sure as to
20 whether I would be able to download them or not so I
21 can keep them and make use of them or I can delete
22 them.

23 Q It's not necessary. Let me just ask a few
24 more questions.

25 So the six hard copy declarations that

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1 you have in front of you are comprised of your original
2 and supplemental declarations in the three proceedings
3 that we're discussing here today, correct?

4 A That's correct, the original and the
5 supplemental declarations, yes.

6 Q And I understood from your prior testimony
7 that those hard copy declarations are unannotated,
8 correct?

9 A That's correct.

10 Q And you also have PDF electronic copies on
11 your desktop available to you?

12 A That's correct.

13 Q Are those also unannotated?

14 A Yes. They are not annotated, yes.
15 They're clean.

16 Q All right. I have no problem with you
17 referring to the PDFs on your desktop or the hard
18 copies that you have in front of you with the
19 understanding that the exhibits that I've marked in the
20 Exhibit Share will be the controlling versions for this
21 deposition. Is that fair?

22 A Certainly, yeah.

23 Q And why don't we just identify those.
24 I've marked them for identification if you refresh your
25 Exhibit Share window, I've marked as Exhibit 1 your

1 Supplemental Declaration for the '894 patent in
2 proceeding 1186.

3 (Exhibit 1 marked for identification)

4 BY MR. SCHMIDT:

5 Q Can you verify that is a true and accurate
6 copy?

7 A Yes, it certainly looks that way I see my
8 signature also at the last page.

9 Q Thank you.

10 (Exhibit 2 marked for identification)

11 BY MR. SCHMIDT:

12 Q And Exhibit 2 is the Supplemental
13 Declaration that you've provided in the 1164 case
14 regarding the '840 patent. Can you please confirm that
15 for me.

16 A Wait. Did I close the window here? I'm
17 sorry. I might have goofed here. Sorry about that.
18 It seems like I logged out from the Exhibit Share. So
19 I need to get back into that. Okay. How did I get
20 there? I forget how I got there.

21 I'm sorry. I'm back in there. So you
22 asked me to verify Exhibit 2, right?

23 Q Yes. Would you verify that Exhibit 2 is
24 the Supplemental Declaration that you've submitted in
25 the 1146 case regarding the '840 patent.

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1 A Yes. This seems to be the case. I also
2 see my signature at the last page.

3 (Exhibit 3 marked for identification)

4 BY MR. SCHMIDT:

5 Q Exhibit 3 is the Supplemental Declaration
6 that you have submitted in the 1165 case regarding the
7 '840 patent. Would you please verify that, please.

8 A Yeah, that's seems to be the one.

9 Q For purposes of this deposition, the same
10 ground rules we've discussed before are going to apply.
11 So, for example, if anyone tries to contact or message
12 you during the deposition I would ask that you identify
13 that for me. Is that fair?

14 A Certainly, yeah. I turned off my cell.
15 Okay.

16 Q And if any of my questions are unclear or
17 ambiguous or you need clarification, I invite you to
18 ask me for clarification at any time, otherwise, I'll
19 assume you understood the question as posed. Is that a
20 fair rule?

21 A That's a fair rule, yes.

22 (Exhibit 4 marked for identification)

23 BY MR. SCHMIDT:

24 Q I want to start by asking you about the
25 '894 patent and, for the record, I've marked that as

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1 Exhibit 4 to the deposition in the Exhibit Share so you
2 could refer to it there and I want to direct you to
3 claim 1.

4 A Exhibit 4, right?

5 Q Yes.

6 A Okay.

7 Q Do you have claim 1 in front of you?

8 A Yes, I do.

9 Q Claim 1 is a claim that you analyzed in
10 forming your expert opinions in this proceeding,
11 correct?

12 A That's correct.

13 Q Do you see the limitation in column 18
14 reading determine a capture trajectory of the housing?

15 A Yes, yes, I see it. I see the beginning
16 of the limitation.

17 Q Okay. I want to direct you down to line
18 27 to the phrase that reads (reading):

19 "A capture trajectory having
20 smoother changes than the observed
21 trajectory."

22 Do you see that?

23 A Yes, I do.

24 Q Do you have an understanding of what it
25 means for the capture trajectory to have smoother

1 changes than the observed trajectory?

2 MS. MAO: Objection, form.

3 BY THE WITNESS:

4 A I applied the plain and ordinary meaning
5 to this term.

6 BY MR. SCHMIDT:

7 Q What is the plain and ordinary meaning of
8 the capture trajectory having smoother changes than the
9 observed trajectory?

10 MS. MAO: Objection, form.

11 BY MR. SCHMIDT:

12 Q Doctor, you understand there's a question
13 pending?

14 A Yes.

15 Q Okay.

16 A One possible meaning of that following the
17 '894 specification is that the capture trajectory has
18 less jitter or less abrupt changes, let's discontinuous
19 changes than the observed trajectory. That could be
20 one possible way to interpret this.

21 Q And then immediately following that phrase
22 the claim goes on to read (reading):

23 "Wherein the capture trajectory is
24 determined to include a path that
25 minimizes a combination of rotational

1 velocity and rotational acceleration to
2 the housing."

3 Do you see that?

4 A Yes, I do.

5 Q Can you explain to me the plain and
6 ordinary meaning of that phrase that you applied in
7 your expert analysis.

8 MS. MAO: Objection, form.

9 BY THE WITNESS:

10 A The plain and ordinary meaning of this is
11 to minimize combination of rotational velocity and
12 rotational acceleration of the housing where
13 minimization may mean reduction in the values of the
14 rotational velocity and rotational acceleration.

15 BY MR. SCHMIDT:

16 Q Did you just testify that minimization may
17 mean reduction in the values of rotational velocity and
18 rotational acceleration?

19 MS. MAO: Objection, form.

20 BY THE WITNESS:

21 A That would be one way to apply the plain
22 and ordinary meaning of the term.

23 BY MR. SCHMIDT:

24 Q So just so I understand your testimony, if
25 there's any reduction in a combination of rotational

1 velocity and rotational acceleration, it's your opinion
2 that this minimization term would be satisfied?

3 MS. MAO: Objection, form, mischaracterizes
4 testimony.

5 MR. SCHMIDT: Objection to form only, please,
6 counsel.

7 BY MR. SCHMIDT:

8 Q Do you need the question read back to you,
9 Doctor?

10 A Yes, please.

11 Q Is it your testimony that if there's any
12 reduction in a combination of rotational velocity and
13 rotational acceleration, then the minimization term of
14 the '894 patent would be satisfied?

15 A I said that one example of minimization
16 can be reducing to a point the values of the
17 quantities. Another interpretation would be forming a
18 cost function and trying to minimize it.

19 Q In the first part of your answer you said
20 one example of minimization can be reducing to a point
21 the values of the quantities. What point would the
22 reduction have to reach in order to constitute
23 minimization in your opinion?

24 MS. MAO: Objection, form.

25 BY THE WITNESS:

1 A The point depends on the application,
2 depends on the quantities that are minimized.

3 BY MR. SCHMIDT:

4 Q Can we agree, Doctor, that not all
5 trajectories that have smoother changes than the
6 observed trajectory minimize rotational velocity and
7 rotational acceleration of the housing?

8 A Can you repeat the question.

9 Q Can we agree that not all trajectories
10 that have smoother changes than the observed trajectory
11 will necessarily minimize rotational velocity and
12 rotational acceleration of the housing?

13 A I'm sorry. Can you repeat your question.

14 Q Can we agree that not all trajectories
15 that have smoother changes than the observed trajectory
16 will necessarily minimize rotational velocity and
17 rotational acceleration of the housing?

18 A So what the limitation is all about is to
19 have to determine the capture trajectory to include the
20 part that minimizes the combination of rotational
21 velocity and rotational acceleration of the housing so
22 a trajectory that is determined to have a minimized
23 version of this combination of rotational velocity and
24 rotational acceleration would satisfy the claim.

25 Q My question was different. My question is

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1 if you have a capture trajectory that results in
2 smoother changes than the observed trajectory, is it
3 your opinion that the minimization term is necessarily
4 met?

5 A To meet the limitation we have to consider
6 a combination of rotational velocity and rotational
7 acceleration. As long as these two quantities are
8 considered and minimized then based on that we have the
9 capture trajectory, the limitation is met.

10 Q So if I understand your testimony you
11 agree that this claim requires more than simply the
12 capture trajectory having smoother changes than the
13 observed trajectory, correct?

14 A Again, by reading the limitation, the
15 rotational velocity and the rotational acceleration
16 need to be considered.

17 Q And minimized, correct?

18 A And minimized, yes.

19 Q A few questions back we were talking about
20 how your opinion is that the minimization can be
21 satisfied by a reduction of the rotational velocity and
22 rotational acceleration to a point. Do you remember
23 that?

24 A Yes.

25 Q When you were analyzing the Kwatra

1 reference in forming your expert opinions, what point
2 did you determine that the reduction of rotational
3 velocity and rotational acceleration met?

4 MS. MAO: Objection, form.

5 BY THE WITNESS:

6 A In Kwatra we have an example of this
7 minimization through the determination of a cost
8 function that is minimized and that point is the
9 smallest value the objective function can attain.

10 BY MR. SCHMIDT:

11 Q So in rendering your opinions about
12 minimization in Kwatra you relied on minimization of
13 the cost function, is that correct?

14 A Kwatra discloses the combination of the
15 rotational velocity and the rotational acceleration of
16 the housing and he discloses determining a stable
17 camera path by minimizing a cost function that he has
18 in the paper weighted some of the first, second, third
19 order derivatives of the path.

20 Q And the minimization of the cost function
21 in Kwatra is what you believe represents minimization
22 of rotational velocity and rotational acceleration in
23 the reference, is that true?

24 A Well, this is one example of a
25 minimization just forming a cost function like Kwatra

1 does and minimizing this cost function.

2 Q I understand. But are you relying on
3 anything else in Kwatra besides minimization of the
4 cost function to show that rotational velocity and
5 rotational acceleration in that reference are
6 minimized?

7 MS. MAO: Same objection.

8 BY THE WITNESS:

9 A Again, as I mentioned, minimization of the
10 derivatives of the original camera path, the first,
11 second, third order derivatives is what is disclosed in
12 Kwatra in satisfying this limitation.

13 BY MR. SCHMIDT:

14 Q In the Bell paper which you rely on for
15 claim 13 of the '840 patent, what point did you
16 determine that rotational velocity and rotational
17 acceleration had been reduced to in forming your
18 opinions that the Bell paper disclosed the necessary
19 minimization?

20 MS. MAO: Objection, form.

21 BY THE WITNESS:

22 A The Bell paper discloses that when the
23 camera is nearly still its virtual camera is fixed
24 removing all jitter so the POSITA would have understood
25 that removing all jitter when the camera is still means

1 that the rotational velocity is minimized which results
2 in the camera being still and it further discloses that
3 it removes most of the angular acceleration producing
4 an output video which is pleasing to view and it
5 discloses that a method for video stabilization
6 dramatically reduces the jitter in angular velocity and
7 even removes it when possible thus producing smoother
8 results and the POSITA would understand that the jitter
9 in angular velocity is the rotational acceleration
10 which is minimized.

11 BY MR. SCHMIDT:

12 Q You said that the Bell paper discloses it
13 removes most of the angular acceleration and produces a
14 video that's pleasing to view, correct?

15 A That's what I read from the paper.

16 Q And the Bell paper will only remove most
17 of the angular acceleration in the circumstances where
18 the camera is nearly still, correct?

19 MS. MAO: Objection to form.

20 BY THE WITNESS:

21 A Well, the paper discloses a method that
22 dramatically reduces the jitter in angular velocity and
23 even removes it where possible, that's producing
24 smoother results, so that's the disclosure that
25 addresses rotational acceleration.

1 BY MR. SCHMIDT:

2 Q So the disclosures that the Bell paper can
3 remove most of the angular acceleration and that Bell
4 dramatically reduces jitter in angular velocity are the
5 disclosures that allowed you to opine that the
6 combination of rotational velocity and rotational
7 acceleration were minimized?

8 MS. MAO: Objection, form.

9 BY THE WITNESS:

10 A In the supplemental declaration I have
11 quite a number of paragraphs there addressing this
12 issue that the Bell paper minimizes rotational velocity
13 and acceleration like paragraphs 149 all the way to 164
14 and what I mentioned are some of the references in the
15 Bell paper that address the minimization of the
16 rotational velocity and the rotational acceleration.

17 BY MR. SCHMIDT:

18 Q Wouldn't you agree, Doctor, that when the
19 Bell paper discloses that most of the angular
20 acceleration is removed that disclosure implies that
21 there would still be more angular acceleration to
22 potentially remove?

23 MS. MAO: Objection form.

24 BY THE WITNESS:

25 A Well, in one place the Bell paper

1 discloses a method for video stabilization that
2 dramatically reduces the jitter in angular velocity and
3 even removes it when possible thus producing smoother
4 results so it can be dramatically reduced or even
5 removed completely when possible.

6 BY MR. SCHMIDT:

7 Q In some circumstances, correct?

8 A Yeah, it discloses that it's dramatically
9 reduced all the way to being completely removed.

10 Q And your opinion is that jitter in angular
11 velocity is referring to angular acceleration?

12 A Angular acceleration is the rate of change
13 of the angular velocity, the derivative of the angular
14 velocity. If the angular velocity has a lot of noise
15 that is jitter this means that the angular velocity is
16 changing quickly back and forth and this means there is
17 a lot of angular acceleration.

18 Q Just so I understand your testimony, you
19 interpret Bell's description of jitter in angular
20 velocity to be referring to angular acceleration?

21 A This is what I describe in paragraph 159
22 of my declaration that as well known acceleration is
23 the derivative of velocity and as I explain that if the
24 angular velocity has a lot of noise, i.e, jitter, this
25 means that it's changing quickly and this means there's

1 a lot of angular acceleration.

2 Q Do you agree that one way of -- strike
3 that.

4 Do you agree that removing jitter in
5 angular velocity is not necessarily going to remove
6 angular velocity itself?

7 MS. MAO: Objection form.

8 BY THE WITNESS:

9 A As I already mentioned and explain in
10 paragraph 159 that when the jitter in angular velocity
11 is removed this means that there is a slow, gentle in
12 some cases no changes in angular velocity.

13 BY MR. SCHMIDT:

14 Q My question is it's possible to remove
15 jitter in angular velocity and still have a relatively
16 high consistent angular velocity in the trajectory.
17 Wouldn't you agree?

18 MS. MAO: Same objection.

19 BY THE WITNESS:

20 A As I mentioned, this jitter, removing the
21 jitter in angular velocity means that there are slow,
22 gentle and in some cases no changes in the angular
23 velocity.

24 BY MR. SCHMIDT:

25 Q I understand that but my question now is

1 simply removing changes in angular velocity doesn't say
2 anything about what the angular velocity value
3 ultimately is, correct?

4 MS. MAO: Same objection.

5 BY THE WITNESS:

6 A Yeah, this discussion addresses the
7 rotational acceleration where rotational or angular
8 velocity is addressed in a different part of the Bell
9 paper as I already mentioned.

10 BY MR. SCHMIDT:

11 Q And you agree just as a matter of
12 mathematics and physics that angular velocity and
13 angular acceleration can be minimized or reduced
14 independently of one another, correct?

15 MS. MAO: Objection, form.

16 BY THE WITNESS:

17 A Mathematically the velocity is the first
18 derivative of the path, of a path. Acceleration is the
19 second derivative. They can be addressed together or
20 they can be addressed separately.

21 BY MR. SCHMIDT:

22 Q I want to ask you about your opinions
23 regarding the low-light high-pass parameter.

24 A Okay.

25 Q And actually you said you had your

1 original declaration from the 1164 case in front of
2 you, is that right?

3 A Yeah, I have all six of them so.

4 Q Can you turn to paragraph 35 of your
5 original declaration in the 1164 case.

6 MS. MAO: Objection, outside scope. He's here to
7 talk about his supplemental declaration. He just has
8 that on his desktop, he didn't say he had it open.
9 It's not even an exhibit.

10 MR. SCHMIDT: I'll mark it as an exhibit. That's
11 fine.

12 MS. MAO: It's outside scope.

13 MR. SCHMIDT: Are you going to instruct him not
14 to answer?

15 MS. MAO: I'm just saying it's outside scope.

16 MR. SCHMIDT: One moment so I can mark it as an
17 exhibit.

18 (Exhibit 6 marked for identification)

19 BY MR. SCHMIDT:

20 Q To address the objection, Doctor, I've
21 marked in the Exhibit Share Exhibit 6 to the
22 deposition. Do you see Exhibit 6 is the original
23 declaration you submitted in the 1164 case regarding
24 the '840 patent?

25 A Yes. My signature is on page 197.

1 Q And I understood from your testimony at
2 the beginning of the deposition that you brought a hard
3 copy version of this document to today's deposition to
4 consult in the event you needed to, correct?

5 A Yeah, I brought a hard copy as well.

6 Q So I want to ask you about paragraph 35 in
7 that original declaration.

8 A So 1164, right, we're talking about?

9 Q Yes, correct.

10 MS. MAO: Let me just put in an objection, this
11 is outside the scope.

12 BY THE WITNESS:

13 A I'm sorry. What page shall I go to?

14 BY MR. SCHMIDT:

15 Q Page 21 of the declaration paragraph 35
16 and it carries over to page 22.

17 A Okay. I'm there.

18 Q You write in the last sentence of
19 paragraph 21 (reading):

20 "Instead, Petitioner believes each
21 of the terms of the '840 patent carries
22 its ordinary and customary meaning
23 which is the meaning that the term
24 would have to a POSITA. I agree
25 with"--

1 A Sorry, Counsel. Are you reading paragraph
2 35?

3 Q Yes.

4 A So page 21 paragraph 35. Okay. Thank
5 you.

6 Q It's the second sentence of the paragraph
7 35 which carries over from page 21 to page 22. Are you
8 with me?

9 A Yes.

10 Q You write (reading):

11 "Instead, Petitioner believes each
12 of the terms of the '840 patent carries
13 its ordinary and customary meaning,
14 which is the meaning that the term
15 would have to a POSITA. I agree with
16 Petitioner and apply the ordinary and
17 customary meaning of the terms in my
18 analysis below."

19 Do you see that?

20 A Yes, I do.

21 Q And that's the analysis that you carried
22 out throughout this proceeding for the terms of the
23 '840 patent?

24 MS. MAO: Objection, form, outside scope.

25 BY THE WITNESS:

1 A What you read is what is in paragraph 35,
2 there is one additional sentence at the end of 35 which
3 you did not read but, yeah, that's what I state in the
4 original declaration.

5 BY MR. SCHMIDT:

6 Q You agree, Doctor, that all of the terms
7 of the '840 patent that you applied in your analysis
8 have an ordinary and customary meaning to a person of
9 ordinary skill in the art?

10 MS. MAO: Objection, form.

11 BY THE WITNESS:

12 A Well, some of the terms as I describe in
13 the supplemental declaration, the 1146, they have been
14 construed by GoPro and Dr. Foroosh and one of these
15 terms is the low-light high-pass parameter.

16 BY MR. SCHMIDT:

17 Q Let's focus on the low-light high-pass
18 parameter. Doctor, do you believe the low-light
19 high-pass parameter has an ordinary and customary
20 meaning to a person of ordinary skill in the art?

21 MS. MAO: Objection, form.

22 BY THE WITNESS:

23 A Well, I provide lengthy analysis regarding
24 this term in my supplemental declaration and since it
25 was construed by GoPro and Dr. Foroosh, the Board

1 construed it as well, and I agree with the board's
2 proposed construction.

3 BY MR. SCHMIDT:

4 Q What I need to understand is in your
5 opinions about the term in the supplemental
6 declaration, are you now taking the position that the
7 term does not have an ordinary and customary meaning to
8 a person of ordinary skill in the art or do you stand
9 by your opinions in paragraph 35 of your original
10 declaration?

11 MS. MAO: Objection, form, outside scope.

12 BY THE WITNESS:

13 A Well, when I wrote the initial declaration
14 there was no construction of the term by any of the
15 parties involved. The construction that the Board gave
16 is one I agree with.

17 BY MR. SCHMIDT:

18 Q Is the construction that you agree with
19 the plain and customary meaning of the term as would be
20 understood by a POSITA in your opinion?

21 MS. MAO: Same objection.

22 BY THE WITNESS:

23 A The plain language shows that the
24 low-light high-pass parameter is used as part of the
25 determination of the smooth trajectory and this is what

1 the patent teaches and this is, yeah, the Board's
2 construction is a low-light high-pass parameter is a
3 parameter that controls the amount of strength of
4 smoothing using motion blur compensation around the
5 lines to a large extent of the patent.

6 BY MR. SCHMIDT:

7 Q Do I understand your testimony to be that
8 you applied the plain and ordinary meaning of the term
9 low-light high-pass parameter in forming those
10 opinions. Is that true?

11 A As we went through, there was no claim
12 construction when the original declaration was written.
13 The claim construction was triggered by GoPro,
14 Dr. Foroosh, the Board, and that's why in my
15 supplemental declaration I state that I disagree with
16 GoPro's proposed construction and agree with the
17 Board's proposed construction.

18 Q That's fine but none of that was my
19 question.

20 My question is in forming your
21 opinions about the meaning of the low-light high-pass
22 parameter, you determined that that term has a plain
23 and ordinary meaning to a person of ordinary skill in
24 the art, correct?

25 MS. MAO: Objection, form.

1 BY THE WITNESS:

2 A And as I explained when the original
3 declaration was written, that was the operational mode
4 of everybody involved to apply the plain and ordinary
5 meaning to this term and it's at a later point in time
6 that the term is construed.

7 BY MR. SCHMIDT:

8 Q So in your supplemental declaration are
9 you not applying the plain and ordinary meaning of the
10 term?

11 MS. MAO: Objection, form.

12 BY THE WITNESS:

13 A The supplemental declaration is to rebut
14 the positions taken primarily by GoPro and Dr. Foroosh
15 and that's what in many paragraphs there I address that
16 the use of this term and the disagreement with GoPro's
17 proposed construction and the agreement with the
18 Board's proposed construction.

19 BY MR. SCHMIDT:

20 Q In the analysis in your supplemental
21 declaration did you apply the plain and ordinary
22 meaning of the term low-light high-pass parameter? Yes
23 or no or you cannot say?

24 A Yeah, the focus again was to address the
25 proposed construction.

1 MS. MAO: Counsel, we are at an hour. When is a
2 good point to break?

3 MR. SCHMIDT: Let me finish this pending line of
4 questioning.

5 BY MR. SCHMIDT:

6 Q Doctor, in your supplemental declaration
7 in analyzing the term low-light high-pass parameter did
8 you apply the plain and ordinary meaning of that term
9 as it would be understood by a POSITA? Yes or no or do
10 you not know?

11 MS. MAO: Same objection.

12 BY THE WITNESS:

13 A The analysis in my supplemental
14 declaration is to address the two different
15 constructions by GoPro and Dr. Foroosh and the Board.

16 BY MR. SCHMIDT:

17 Q But you render opinions in your
18 supplemental declaration that the prior art disclosed a
19 low-light high-pass parameter. When you rendered those
20 opinions were you applying the plain and ordinary
21 meaning of low-light high-pass parameter, yes or no?

22 A Yeah, the supplemental declaration again
23 was to address the two different constructions of this
24 term, as I mentioned, and explaining the reasons why I
25 agree with the Board's construction.

1 Q One more time, very simple question, so
2 there's no confusion, when you rendered the opinions in
3 your supplemental declaration that the prior art
4 disclosed a low-light high-pass parameter did you apply
5 the plain and ordinary meaning of that term, yes or no?

6 MS. MAO: Same objection.

7 BY THE WITNESS:

8 A The supplemental declaration is not to
9 introduce new positions or new grounds but just to
10 respond to Dr. Foroosh's declaration.

11 BY MR. SCHMIDT:

12 Q When you rendered your opinions in the
13 original declaration that the prior art disclosed
14 low-light high-pass parameter did you apply the plain
15 and ordinary meaning of that term?

16 A At that point no construction had been
17 proposed and the operating mode was to apply the plain
18 and ordinary meaning of the term.

19 MR. SCHMIDT: Okay. We can take a break now.

20 Thank you.

21 MS. MAO: Ten minutes?

22 MR. SCHMIDT: Sure.

23 (Brief recess taken)

24 BY MR. SCHMIDT:

25 Q Doctor, during the break did you speak

1 with anyone?

2 A No.

3 Q Turn to paragraph 71 of Exhibit 3 which is
4 your supplemental declaration in the 1165 case.

5 A Which page? I'm sorry. Okay. I'm on
6 page 29.

7 Q In paragraph 71 you provide a plot with a
8 yellow and an orange line. Do you see that?

9 A Yes, I do.

10 Q How was that plot created?

11 A Using one of the different software
12 packages for plotting functions.

13 Q What software package did you use?

14 A This was created in collaboration with the
15 counsel. It's just a simple Gaussian with different
16 standard deviation, values for standard deviation.

17 Q So you did not create this plot, is that
18 right?

19 MS. MAO: Objection, form.

20 BY THE WITNESS:

21 A Yeah, the plot was discussed, the
22 generational plot, with the counsel and they generated
23 the particular plot.

24 BY MR. SCHMIDT:

25 Q Do you know what function was used to

1 generate the curves shown in the plot on paragraph 71?

2 A Yeah, these are Gaussian curves using
3 different standard deviations for the curve.

4 Q So both the yellow curve and the orange
5 curve that are shown in paragraph 71 were generated
6 using a standard Gaussian function probability
7 distribution, correct?

8 A Yeah, using a program that plots a
9 Gaussian function for, again, different values.
10 They're both zero mean clearly, both functions, and the
11 difference is the standard deviation.

12 Q And that was my next question. The only
13 difference between the yellow curve and the orange
14 curve in your plot in paragraph 71 is that a different
15 standard deviation was applied?

16 A These are normalized Gaussians so the area
17 under the curve is one to depict as if these were a
18 probability density function, so the formula, the
19 Gaussian actually is mentioned somewhere. And the
20 Gaussian in principle has infinite extent, extends from
21 minus infinity to infinity, so here we show the value
22 of these two Gaussians between -10 and 10.

23 Q My question was that the only thing that
24 is accounting for the differences in the yellow curve
25 and the orange curve is a difference in standard

1 deviation, is that true?

2 A This is what we -- that's the intention of
3 this drawing to demonstrate how the Gaussian changes by
4 changing the standard deviation.

5 Q And I take it that it's your opinion that
6 the curves shown in the plot provided in paragraph 71
7 are representative of how the Zhou prior art reference
8 operates?

9 MS. MAO: Objection, form.

10 BY THE WITNESS:

11 A Counsel, can you repeat your question,
12 please.

13 BY MR. SCHMIDT:

14 Q I understand the reason why you're
15 providing these plots is to provide an illustration of
16 how the probability density functions in Zhou are
17 adjusted. Is that true?

18 MS. MAO: Objection, form.

19 BY THE WITNESS:

20 A Zhou as an example uses the Gaussian
21 function to determine a weighting function that he's
22 using and, again, this is just one possible example.
23 So we want to demonstrate here that, as we know, the
24 Gaussian, the one dimension of Gaussian has two
25 independent parameters, the mean and the variance of

1 standard deviation, the same thing, and here we keep
2 them in the same, which is zero, and by changing the
3 standard deviation it's clear to everybody that the
4 curve -- you know, increasing the standard deviation,
5 the height of the Gaussian goes down and the extent
6 increases, and with a small standard deviation we have
7 a more pointy, you might say, Gaussian.

8 So that's to demonstrate how this
9 weighting function, here we are addressing one of
10 Dr. Foroosh's arguments regarding a dependent parameter
11 or not but to demonstrate how the parameter in Zhou,
12 the stabilization strength parameter controls the shape
13 of the Gaussian and all of the implications of this
14 relationship.

15 BY MR. SCHMIDT:

16 Q You agree that in Zhou the way the
17 probability density function is adjusted is through a
18 change to the standard deviation. Correct?

19 MS. MAO: Objection, form.

20 BY THE WITNESS:

21 A I'm sorry. Can you please repeat your
22 question.

23 BY MR. SCHMIDT:

24 Q In the Zhou reference which you analyze in
25 forming your opinions the probability distribution

1 functions are adjusted based on changing the standard
2 deviation, correct?

3 MS. MAO: Objection, form.

4 BY THE WITNESS:

5 A Zhou, again, uses the Gaussian as one
6 example of this weighting function that it would be
7 used to adjust the correction in the virtual camera
8 position and this weighting function in this example is
9 a Gaussian, it's not a probability density function,
10 there is nothing probabilistic here, it's a normalized
11 Gaussian, Gaussian function, and as everybody knows the
12 Gaussian function has two parameters, mean and
13 variance, and I changed those, the shape, location of
14 the Gaussian changes, so that's the main reason for
15 showing this. And the variance for standard deviation,
16 the variance is the square root of the standard
17 deviation or the variance is the square of the standard
18 deviation, it's the same thing, is this parameter in
19 Zhou, this S parameter.

20 BY MR. SCHMIDT:

21 Q In the disclosures of Zhou where the
22 weighting functions are Gaussian distributions, the
23 adjustment to the weighting functions is done through
24 changes to the standard deviation, is that fair?

25 A Yes. Zhou as one example defines

1 weighting functions in the particular example of mega x
2 or mega y that are functions of -- that are Gaussian
3 and they're functions of the value S.

4 Q You didn't see any disclosure in Zhou of
5 adjusting the weighting function by changing the mean,
6 correct?

7 MS. MAO: Objection, form.

8 BY THE WITNESS:

9 A Again, this is just one example in Zhou
10 and in that particular example that he drew them in
11 zero, which is meaningful, the zero position is the
12 current frame and the positive in time values of the
13 Gaussian with other future times, future frames, while
14 the negative in time values of the Gaussian compared to
15 past frames.

16 BY MR. SCHMIDT:

17 Q And in Zhou the weighting functions are
18 centered on the current frame, correct?

19 A In this example that Zhou shows in Figure
20 4 this seems to be the case but it's just an example.

21 Q You mentioned the parameter S in Zhou.
22 That's the stabilization strength metric, correct?

23 A That's what, right, I was referring to.

24 Q And you understand that the stabilization
25 strength metric in Zhou is calculated based on the

1 detected amount of motion blur?

2 MS. MAO: Objection, form.

3 BY THE WITNESS:

4 A Zhou discloses performing stabilization
5 techniques in ways to more effectively stabilize by
6 using techniques for estimating the amount of motion
7 blur in the current frame to adjust or modulate the
8 strength of a video stabilization metric value.

9 BY MR. SCHMIDT:

10 Q Let me ask you this. In paragraph 71 in
11 the plots you provided there's a yellow curve and an
12 orange curve, right?

13 A Yes.

14 Q Which one represents stronger smoothing?

15 A If the motion blur amount is smaller then
16 the stabilization strength is adjusted to be larger and
17 vice versa, so the smaller the motion blur, the larger
18 the value of the stabilization strength, and the larger
19 the motion the smaller the strength.

20 Q Which curve, yellow or orange, represents
21 a larger stabilization strength metric?

22 MS. MAO: Objection, form.

23 BY THE WITNESS:

24 A The stabilization strength S is the
25 variance of the Gaussian so the red curve has a larger

1 variance than the yellow-orange curve.

2 BY MR. SCHMIDT:

3 Q So your testimony is that the orange curve
4 represents stronger smoothing than the yellow curve?

5 MS. MAO: Objection, form.

6 BY THE WITNESS:

7 A So from looking at the two Gaussians,
8 again, the red one has a larger variance than the
9 yellow one and larger variance, larger stabilization
10 strength, and we want to stabilize more when the amount
11 of motion blur is smaller.

12 BY MR. SCHMIDT:

13 Q And that's what the orange or red curve is
14 representing?

15 MS. MAO: Objection, form.

16 BY THE WITNESS:

17 A Yeah, the red curve has larger
18 stabilization strength value, larger variance. The
19 yellow one has smaller variance, smaller stabilization
20 strength value.

21 BY MR. SCHMIDT:

22 Q And that's because the yellow curve has
23 less motion blur than what is associated with the
24 orange or the red curve?

25 MS. MAO: Objection, form.

1 BY THE WITNESS:

2 A So larger strength for smaller motion and
3 smaller stabilization strength for larger motion.

4 BY MR. SCHMIDT:

5 Q Larger stabilization strength for smaller
6 blur and smaller stabilization strength for -- wait.
7 Strike that.

8 It's larger stabilization strength for
9 smaller blur and smaller stabilization strength for
10 larger blur, correct?

11 MS. MAO: Objection, form.

12 BY THE WITNESS:

13 A Yeah, that's what I mentioned that S is
14 larger for small amounts of motion blur and S
15 stabilization is smaller for larger amounts of motion
16 blur.

17 BY MR. SCHMIDT:

18 Q Thank you. I want to turn to Exhibit 2
19 which is your supplemental declaration in the 1146
20 case. Can you turn to paragraph 40, please.

21 A Page 14, right?

22 Q Yeah, page 14 carrying over to page 15.

23 A Okay, I'm there.

24 Q And in this paragraph you are opining on
25 the provisional patent application that's part of the

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1 prosecution history for the '840 patent, correct?

2 A Right. This section refers to the
3 prosecution history and then the provisional patent
4 application.

5 Q I want to direct you to a sentence in
6 paragraph 40, it appears on page 15. It's about four
7 lines down. It begins with, "In other words." Do you
8 see that?

9 A I'm sorry. So "Critically," that
10 sentence?

11 Q No. It begins with, "In other words."

12 A "In other words," okay.

13 Q Fourth line down on page 15. Are you with
14 me?

15 A Yes, I'm reading that sentence.

16 Q Okay. You write (reading):

17 "In other words, no matter the
18 exposure time - and thus regardless of
19 the lighting condition - the parameter
20 stays the same and performs blur
21 compensation."

22 Do you see that?

23 A Yes, I do.

24 Q Is it your opinion that in the GoPro
25 implementation the low-light high-pass parameter stays

1 the same regardless of the exposure time?

2 MS. MAO: Objection, form.

3 BY THE WITNESS:

4 A So in my analysis here what I mention in
5 paragraph 39 is that the provisional application
6 mentions low-light high-pass only in what is shown
7 there under 2 and in there there's a mention that this
8 parameter does not need to evolve in function of the
9 exposure time and the example that if there's a lot of
10 light it might not be much blur and so on. So based on
11 the disclosure of the provisional patent application,
12 in my analysis I conclude that this parameter is not a
13 function of the exposure time and, therefore,
14 regardless of the lighting conditions the parameter
15 stays the same and performs blur compensation.

16 BY MR. SCHMIDT:

17 Q So your opinion based on the sentence that
18 you've identified in the provisional application is
19 that GoPro's low-light high-pass parameter is a
20 constant with respect to the exposure time, correct?

21 MS. MAO: Objection, form.

22 BY THE WITNESS:

23 A Well, the analysis of this paragraph is
24 not, in this Section 2 anyway, there is no reasoning
25 that this parameter depends on the low lighting

1 conditions. If we read the whole thing it talks about
2 intra-frame and intra-frame motion and we want to just
3 address the intra-frame motion and so on and so forth,
4 I don't want to read the whole thing. So it does not
5 make this determination that this parameter is to
6 address low lighting conditions but to address motion
7 blur that is encrusted in the data.

8 BY MR. SCHMIDT:

9 Q What about the very first phrase of the
10 first sentence in the part that you excerpted that says
11 taking into account the exposure time of every frame.
12 Do you see that?

13 A Yes.

14 Q How do you explain that and harmonize it
15 with your opinion that exposure time is not considered
16 as part of the low-light high-pass parameter value?

17 A Well, the taking into account the exposure
18 time ties to the intra-frame motion, let's say it's the
19 motion underwent by the camera during the exposure
20 period of every frame, so this is to recognize that the
21 frame is not captured instantaneously but there is an
22 exposure time like I need to take whatever the exposure
23 time is to form a frame, to form the data frame, and
24 during that exposure time, which is not again
25 instantaneous, things happen and what happens is that

1 the camera moves and there's motion blur and that's the
2 visual impression and that's what this parameter tries
3 to address.

4 Q But you agree, Doctor, that the
5 description that you excerpted here in paragraph 39
6 describes taking into account the exposure time and
7 therefore the lighting conditions at the beginning of
8 every frame, correct?

9 MS. MAO: Objection, form.

10 BY THE WITNESS:

11 A Yeah, the way I read this is the
12 recognition of the fact that the frames are not
13 acquired instantaneously but it takes some time to
14 acquire a frame, so taking into account the exposure
15 time of every frame, I have to address then the
16 intra-frame motion. During that exposure time things
17 move, the camera moves, they have motion blur, and so
18 on. That's what this tells us. It doesn't tell us
19 that considering low lighting conditions and high
20 lighting conditions or this or that, it's just to state
21 the known fact that there is a period during which the
22 aperture is open and the CCD array or the film in the
23 good old days is exposed to light and that's what
24 causes the motion blur.

25 BY MR. SCHMIDT:

1 Q But you agree, Doctor, that as part of
2 determining the intra-frame motion this document is
3 describing a consideration of the exposure time for
4 every frame, correct?

5 MS. MAO: Same objection.

6 BY THE WITNESS:

7 A This is almost, you know, it's a well
8 known fact there's a standard statement there that
9 during the exposure period of every frame that's all
10 the report is saying that there's a different exposure
11 period of every frame and during that period the camera
12 moves. That's all it says which is well known to a
13 POSITA.

14 BY MR. SCHMIDT:

15 Q But my question is in determining the
16 intra-frame motion, this document is telling us that
17 the approach takes into account the exposure time of
18 every frame in which that intra-frame motion occurs.
19 Fair?

20 MS. MAO: Same objection.

21 BY THE WITNESS:

22 A That's not how I read this. It doesn't
23 tell us anything about how, you know, it's a statement
24 realizing the fact that the frame is not taken
25 instantaneously but there is an exposure time, that's

1 all this statement says. There's no, nothing specific
2 coming out of this to tie it to low lighting conditions
3 or tie it to anything else.

4 BY MR. SCHMIDT:

5 Q (Reading):

6 "Taking into account the exposure
7 time of every frame, HyperSmooth
8 decomposes the observable camera motion
9 in two categories."

10 Do you see that?

11 A Yes, I do.

12 Q So in decomposing observable camera motion
13 into two categories, HyperSmooth takes into account the
14 exposure time of every frame, isn't that right?

15 MS. MAO: Same objection.

16 BY THE WITNESS:

17 A And this statement means to me and to a
18 POSITA that there is an exposure time, an exposure
19 period as it's mentioned later that is associated for
20 each frame, which is a well known fact, but it's just
21 kind of underlying here that that's the fact that,
22 again, that the frame is not applied instantaneously
23 that gives rise to the motion blur and if it was
24 something different there would be specificity as to
25 how this might tie to low lighting conditions or

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1 anything of that sort. This is really a very simple,
2 generic I would say, statement that don't forget there
3 is an exposure time and an exposure period associated
4 with each frame which is, of course, correct.

5 BY MR. SCHMIDT:

6 Q You agree as a POSITA that the exposure
7 time for different frames can be different, correct?

8 A Yeah, the exposure time does not have to
9 be fixed or the same.

10 Q And you agree that in GoPro's
11 implementation of HyperSmooth the low-light high-pass
12 parameter can change for different frames, correct?

13 MS. MAO: Objection, form.

14 BY THE WITNESS:

15 A I'm analyzing what's in the provisional
16 patent here, not analyzing what is necessarily
17 implemented in the GoPro products.

18 BY MR. SCHMIDT:

19 Q Fair point. Let me reask the question.

20 In the implementation described in
21 this provisional application, you agree that the
22 low-light high-pass parameter can change for different
23 frames, correct?

24 MS. MAO: Objection, form.

25 BY THE WITNESS:

1 A Yeah, what is described here is that with
2 this parameter that gives two values here set to zero
3 and set to 1, and this has to do with whether motion
4 compensation takes place or not, zero no motion
5 compensation, 1 the original, the entire camera
6 displacement during the exposure period is preserved,
7 so that's what is described, and then this parameter
8 does not need to evolve in function of the exposure
9 time is the other statement.

10 BY MR. SCHMIDT:

11 Q Do you understand the low-light high-pass
12 parameter to be a parameter that can change from
13 frame-to-frame in the implementation described in this
14 document?

15 MS. MAO: Objection, form.

16 BY THE WITNESS:

17 A Well, this document here describes, again,
18 that there is this parameter gives us two values, it's
19 not clear if it assumes additional values than these
20 two, based on this it assumes zero and 1 value. It's
21 tied to the motion blur, there's no disclosure here of
22 how this parameter will be set, and then there's the
23 last part there that this parameter does not need to
24 evolve in function of the exposure time which suggests
25 that it's set as a default value 1.0 for MP updated to

1 .8 for launch, so there are different pieces of
2 information here that don't tell us either how exactly
3 to set this parameter or how often it will change, how
4 it changes or if it doesn't change at all based on the
5 last sentence there.

6 BY MR. SCHMIDT:

7 Q Let me ask one more time so that I have
8 your testimony clear. Do you understand this document
9 to be describing a parameter that can change from
10 frame-to-frame? Yes, no, or is there not enough
11 information in the document to say?

12 MS. MAO: Same objection.

13 BY THE WITNESS:

14 A This document I assume we're referring to
15 this Section 2 here that we're analyzing, right?

16 BY MR. SCHMIDT:

17 Q Yes. Let me clarify, the excerpt from the
18 provisional application that you provided in paragraph
19 39, based on that excerpt do you understand that the
20 low-light high-pass parameter can change from
21 frame-to-frame? Yes, no, or is there not enough
22 information provided for you to say?

23 MS. MAO: Same objection.

24 BY THE WITNESS:

25 A This document talks about two values for

1 this positive scalar parameter and explains the role of
2 when it's equal to zero, when it's equal to 1. It also
3 mentions that this parameter there is no need to evolve
4 in function of the exposure time so overall there is no
5 strong disclosure of how to determine this parameter,
6 how often to change it or not to change it. There's
7 also the statement that it does not need to evolve in
8 function of the exposure time so it's not, in
9 addressing your question, crystal clear again how
10 exactly this parameter is determined, how often it
11 changes if it changes.

12 BY MR. SCHMIDT:

13 Q I'm going back to the sentence I pointed
14 you to in paragraph 40 where you write (reading):

15 "In other words, no matter the
16 exposure time - and thus regardless of
17 the lighting condition - the parameter
18 stays the same and performs blur
19 compensation."

20 Do you see that?

21 A Yes, I see that.

22 Q In that sentence you are acknowledging
23 that there's a connection between the exposure time and
24 the lighting condition, correct?

25 A This sentence addresses the previous

1 sentence in the provisional, the sentence that this
2 parameter does not need to evolve in function of the
3 exposure time, and it's just stating in different
4 words, if you wish, that no matter the exposure time,
5 this parameter stays the same and therefore blur
6 compensation so the "in other words sentence" is an
7 explanation of the previous statement in the
8 provisional.

9 Q Your opinion is that because the parameter
10 does not evolve in function of the exposure time, it
11 doesn't evolve as a function of lighting condition,
12 correct?

13 A Just looking at this sentence again, the
14 exposure time is a function of the lighting conditions
15 it could be set, if it's set manually, it could be set
16 on purpose longer or shorter than, right? It depends
17 if it's set automatically or if it's set manually the
18 exposure time, right? Sometimes we want to over
19 expose, sometimes we want to under expose in general.
20 So the connection that the lighting conditions in an
21 automated fashion relates to the exposure time, that's
22 the sentence there that I have that no matter the
23 exposure time and thus regardless of the lighting
24 condition this parameter stays the same.

25 Q Right. So in paragraph 40, your opinion

1 that the parameter has nothing to do with lighting
2 condition is based on the direct relationship between
3 exposure time and lighting condition, fair?

4 MS. MAO: Objection, form.

5 BY THE WITNESS:

6 A Yeah, paragraph 40 addressed from this
7 excerpt to, out of the provisional, that particular
8 statement there that it does not evolve in function of
9 the exposure time.

10 BY MR. SCHMIDT:

11 Q And with respect to that sentence, it's
12 your opinion that there is a direct link between the
13 exposure time that's mentioned and lighting conditions,
14 correct?

15 A As I mentioned, the exposure time can be
16 set at, you know, some point manually or it can be
17 correlated to the lighting conditions.

18 Q But in rendering your opinion in paragraph
19 40, you're assuming that there is no manual adjustment
20 to the exposure time, correct?

21 MS. MAO: Objection, form.

22 BY THE WITNESS:

23 A In that particular sentence the connection
24 is that, yeah, there is this correlation between
25 lighting conditions and exposure time.

1 BY MR. SCHMIDT:

2 Q Why do you suppose they call it a
3 low-light high-pass parameter if it has nothing to do
4 with lighting conditions?

5 MS. MAO: Objection, form.

6 BY MR. SCHMIDT:

7 Q Do you have any opinion on that, Doctor?

8 MS. MAO: Objection, form.

9 BY THE WITNESS:

10 A As I mention in my supplemental
11 declaration 1165, the low-light high-pass parameter is
12 not a term used in the field of video stabilization and
13 reviewing the transcript of the deposition of
14 Mr. Derbanne he agreed that this low-light high-pass
15 parameter is not a term that is used in the field of
16 video stabilization. Now, why it was given this name,
17 I cannot get into the mind of the inventors, but I can
18 see what the specification and the claims tell us about
19 this parameter, how is it used, what it is used to do,
20 and my opinion is based on what is disclosed in the
21 patent.

22 BY MR. SCHMIDT:

23 Q Your opinion about the meaning of the term
24 is based on what's in the patent and not any attempt to
25 infer what was in the minds of the developers, fair?

1 A Well, as I mentioned, there is a
2 construction by GoPro and Dr. Foroosh, there is a
3 construction by the Board and my position is to agree
4 with -- I agree with the Board's proposed construction.

5 Q I'm asking something different. When you
6 formed your opinions about the meaning of the low-light
7 high-pass parameter, you relied on what's in the patent
8 and not any speculation about what might been in the
9 minds of the inventors or the developers, fair?

10 A Well, when I'm asked to analyze a patent
11 and prior art and this and that, I mean, I cannot try
12 to speculate or imagine what the inventors meant or did
13 not mean. I mean, if the inventors had a specific use
14 for this term then it would have been described in the
15 patent.

16 Q Do you understand what the phrase
17 low-light means, Doctor?

18 MS. MAO: Objection, form.

19 BY THE WITNESS:

20 A This isn't a term that I offered an
21 opinion or was asked to construe in my analysis.

22 BY MR. SCHMIDT:

23 Q So in your opinion the phrase low-light
24 has no plain and ordinary meaning to a person of
25 ordinary skill in the art?

1 MS. MAO: Objection, form.

2 BY THE WITNESS:

3 A It has a plain and ordinary meaning of
4 low-light.

5 BY MR. SCHMIDT:

6 Q What is the plain and ordinary meaning of
7 low-light to a person of ordinary skill in the art?

8 MS. MAO: Objection, form.

9 BY THE WITNESS:

10 A I applied this if needed in my analysis
11 using this plain and ordinary meaning but I cannot
12 define it here for you. It's not something that I
13 formed an opinion about.

14 BY MR. SCHMIDT:

15 Q So just to be clear, you're unwilling to
16 articulate what the plain and ordinary meaning of the
17 phrase low-light is to a person of ordinary skill in
18 the art.

19 MS. MAO: Same objection.

20 BY THE WITNESS:

21 A I said that I did not define this term in
22 my analysis but I used the plain and ordinary meaning
23 in my analysis.

24 BY MR. SCHMIDT:

25 Q Are you willing to articulate what the

1 phrase low-light means to a person of ordinary skill in
2 the art?

3 MS. MAO: Same objection.

4 BY THE WITNESS:

5 A I cannot give you a definition of the term
6 but I know how to apply it in whatever part of the
7 analysis it is needed.

8 MR. SCHMIDT: Okay. Do you want to take another
9 break before we move on?

10 THE WITNESS: Sure.

11 MS. MAO: It's around his lunch hour so I think
12 we should take a longer break.

13 MR. SCHMIDT: We could take lunch. How long do
14 you need?

15 THE WITNESS: 30 minutes or so.

16 MR. SCHMIDT: All right. We'll be back in 30
17 minutes.

18 (Lunch recess taken)

19 - - -

20 (Exhibit 5 marked for identification)

21 BY MR. SCHMIDT:

22 Q Doctor, I would like you now to turn to
23 the '840 patent, which is marked as Exhibit 5 to the
24 deposition, and I want to turn to claim 14 which is in
25 column 32.

1 A The '840 patent, right, column 14 you
2 said?

3 Q Column 32, claim 14.

4 A Okay. I'm there.

5 Q And you see claim 14 mentions the
6 low-light high-pass parameter, correct?

7 A Yes.

8 Q The claim recites that (reading):
9 "The low-light high-pass parameter
10 controls amount or strength of
11 smoothing performed in smooth
12 trajectory generation and an extent of
13 motion blur compensation applied in
14 determination of a smoothed
15 trajectory."

16 Did I read that correctly?

17 A Yes.

18 Q Claim 14 is reciting that the low-light
19 high-pass parameter performs both smoothing and motion
20 blur compensation, correct?

21 A Yes, controls amount or strength of
22 smoothing and an extent of motion blur compensation,
23 yes.

24 Q And those are two distinct operations,
25 correct?

1 MS. MAO: Objection, form.

2 BY MR. SCHMIDT:

3 Q Doctor, you understand there's a question
4 pending, correct?

5 A Yes. Can you please repeat the question.

6 Q The question was simply do you recognize
7 that claim 14 is reciting two distinct operations,
8 number one, smoothed trajectory generation, and number
9 two, motion blur compensation?

10 MS. MAO: Objection, form.

11 BY THE WITNESS:

12 A It recites two objectives which is to
13 smooth the trajectory and at the same time compensate
14 for the motion blur. Now, whether these two operations
15 are controlled separately or in one step, this is not
16 necessarily determined by the claim.

17 BY MR. SCHMIDT:

18 Q But you would agree that in the art it is
19 possible to perform smoothed trajectory generation in a
20 separate operation from motion blur compensation,
21 correct?

22 MS. MAO: Same objection.

23 BY THE WITNESS:

24 A The claim states both these objectives
25 need to be met and we have to do the one while making

1 sure the other is preserved so it doesn't tell us, you
2 know, if we should do it in two steps or one step. It
3 seems reasonable to interpret that I'm smoothing while
4 I'm taking the motion blur into account.

5 BY MR. SCHMIDT:

6 Q Focus on my question, please. I wasn't
7 asking you about the claim. Generally in the art those
8 two operations can be done separately from one another,
9 do you agree?

10 MS. MAO: Same objection.

11 BY THE WITNESS:

12 A Yeah, I'm not sure what particular piece
13 of prior art you are referring to.

14 BY MR. SCHMIDT:

15 Q I'm not referring to any prior art, I'm
16 asking you as a person of ordinary skill in the art do
17 you agree that the step of trajectory smoothing can be
18 done separate and independent from the step of motion
19 blur compensation?

20 MS. MAO: Same objection.

21 BY THE WITNESS:

22 A The claim is asking us to do both and
23 doing them separately at the same time. I mean, the
24 claim reads I want to do A while taking B into account,
25 right?

1 BY MR. SCHMIDT:

2 Q But focus on my question, please. I
3 didn't ask you anything about the claim.

4 My question is as a person of ordinary
5 skill in the art is it possible to perform one of these
6 two operations separate and apart from the other?

7 MS. MAO: Same objection.

8 BY THE WITNESS:

9 A Well, we have to look specifically at what
10 motion blur compensation means. It is a term that is
11 used in a specific way in the claim in the patent.

12 BY MR. SCHMIDT:

13 Q Did you apply the plain and ordinary
14 meaning of the term motion blur compensation?

15 A So the patent states that a low-light
16 high-pass parameter may range between zero and 1 with
17 zero corresponding to no motion blur compensation and
18 the value of zero may result in the observed motion
19 being fully attenuated.

20 Q Doctor, do you remember what the question
21 was?

22 A Yeah, if these two steps can be done
23 separately.

24 Q No, that wasn't the question. The
25 question was did you apply the plain and ordinary

1 meaning of the phrase motion blur compensation or did
2 you apply some other meaning?

3 A Well, I applied the meaning that the '840
4 is teaching so full motion blur compensation means
5 leaving the trajectory as is and no motion blur
6 compensation means fully smoothing so it's a specific
7 meaning that the '840 patent is providing.

8 Q So you did not apply the plain and
9 ordinary meaning of motion blur compensation. Do I
10 understand you correctly?

11 MS. MAO: Objection, form.

12 BY THE WITNESS:

13 A I applied the plain and ordinary meaning
14 and I'm just reciting here how this is described in the
15 '840 patent.

16 BY MR. SCHMIDT:

17 Q Okay. And as a person of ordinary skill
18 in the art before you even got involved in this case
19 you understood what motion blur compensation meant,
20 correct?

21 A To compensate for the motion blur could be
22 understood in different ways what compensation means if
23 it means removal if it means -- here it has a specific
24 meaning, full motion blur compensation means that we
25 just don't do anything with the motion blur, we allow

1 it to go through the system.

2 Q The question was before you got involved
3 in this case you understood the phrase motion blur
4 compensation. Is that true or not true?

5 MS. MAO: Same objection.

6 BY THE WITNESS:

7 A There is, of course, an understanding and
8 it needs to be calibrated with what the '840 patent
9 features.

10 BY MR. SCHMIDT:

11 Q And you understood before you got involved
12 in this case that motion blur compensation could be
13 performed separate from smoothed trajectory generation,
14 correct?

15 A The way it's described here there seems to
16 be an intertwined part of doing this of two steps at
17 the same time like, yeah, it's kind of modulating the
18 strength of smoothing so as to take the motion blur
19 compensation into account.

20 Q I didn't ask you about the claim. I tried
21 to be as clear as possible. Before you got involved in
22 this case, separate and apart from the patent, you
23 understood in the art that there are ways to do motion
24 blur compensation independent of any smoothed
25 trajectory generation, correct?

1 MS. MAO: Same objection.

2 BY THE WITNESS:

3 A Are we referring to motion blur
4 compensation in videos or in still images?

5 BY MR. SCHMIDT:

6 Q In videos.

7 MS. MAO: Same objection.

8 BY THE WITNESS:

9 A Yeah, we have to look at specific
10 literature disclosures to see exactly how this term is
11 implemented and here it is in a very particular
12 setting, right, considering motion trajectories and
13 intra-frame blurring.

14 BY MR. SCHMIDT:

15 Q Okay. So let me ask one more time just so
16 that I can be clear that you can't answer my question.

17 As a person of ordinary skill in the
18 art, you can't tell me whether or not the general step
19 of motion blur compensation can be done independently
20 of smoothed trajectory generation.

21 MS. MAO: Same objection.

22 BY THE WITNESS:

23 A Yeah, we have to look at particular
24 disclosures and particular specific publications of how
25 this can be accomplished. Are we talking about videos,

1 are we talking about motion trajectories, and the two,
2 again, are the smoothing of the motion trajectory and
3 the motion blur compensation are intertwined there and
4 we have to look at, again, specific disclosures to see
5 how different people propose to do this.

6 BY MR. SCHMIDT:

7 Q You would agree with me that generating a
8 smoothed trajectory does not necessarily compensate for
9 motion blur, right?

10 A If an objective is just to generate a
11 smoothed trajectory, this, yeah, can be accomplished in
12 different ways.

13 Q And I think you testified multiple times,
14 but I'll just confirm, claim 14 requires that these two
15 operations be intertwined together. That's how you
16 read it, correct?

17 A I'm not saying that that's what the claim
18 spells out, I'm just thinking, as we discussed, if the
19 objective is smoothing the trajectory it can be done by
20 not considering the motion blur. On the other hand, if
21 I'm to do motion blur compensation, we have to see the
22 specifics if smoothing can be taken out of the equation
23 or is a coupled part of the motion blur compensation,
24 but it's not explicitly stated in 14 how exactly it
25 needs to be performed.

1 Q So your testimony is that claim 14 can be
2 satisfied if the two operations are done separate,
3 distinct, and independent from one another?

4 MS. MAO: Objection, form.

5 BY THE WITNESS:

6 A That's not exactly what I said. Your
7 questioning is if these two operations can be done
8 independently and what I'm just discussing here is that
9 that, you know, the motion blur compensation is
10 intertwined with the smoothing of the motion.

11 BY MR. SCHMIDT:

12 Q Is that a requirement of claim 14 or not,
13 the intertwining of motion blur compensation with
14 smoothing. In your interpretation, is that a
15 requirement?

16 A I don't see an explicit requirement of
17 that.

18 Q So there's no requirement in your opinion
19 in claim 14 that smoothed trajectory generation and
20 motion blur compensation be intertwined, in your words.

21 MS. MAO: Objection, form.

22 BY THE WITNESS:

23 A In my opinions and my analysis I looked at
24 prior art that disclose both the smoothing of the
25 trajectory and the motion blur compensation.

1 BY MR. SCHMIDT:

2 Q You agree least that claim 14 requires
3 that the low-light high-pass parameter be used both to
4 control the amount or strength of smoothing and to
5 control an extent of motion blur compensation, correct?

6 MS. MAO: Let me just put in an objection as to
7 this line of questioning regarding claim 14 as outside
8 scope.

9 BY MR. SCHMIDT:

10 Q Do you understand the question, Doctor?

11 A Can you repeat it for me, please.

12 Q Let me ask you this. What are you
13 referring to on your computer screen in your attempt to
14 answer the question?

15 A I'm looking at 1164, the original
16 declaration.

17 Q Okay. The original question was would you
18 at least agree with me that claim 14 requires the
19 low-light high-pass parameter to both control the
20 amount or strength of smoothing performed in smoothed
21 trajectory generation and to control an extent of
22 motion blur compensation?

23 A Yeah, the way the claim reads, the
24 low-light high-pass parameter controls the amount and
25 extent so...

1 Q It must be used for both operations, fair?

2 A I didn't specifically consider this
3 question. The prior art I relied on does disclose a
4 low-light high-pass parameter that controls both the
5 smoothing of the trajectory and the motion blur
6 compensation.

7 Q But you can't say whether or not that is a
8 requirement of the claim if I understood your testimony
9 correctly.

10 A Yeah, as I said, I haven't analyzed this
11 specific question in my declarations but the prior art
12 I relied on disclosed this parameter controlling both
13 the smoothing and the motion blur compensation.

14 Q I want you to turn to paragraph 50 in your
15 supplemental declaration for the 1165 case. This is
16 Exhibit 3.

17 A Paragraph 50 you said?

18 Q Yes, sir.

19 A Okay, I'm there.

20 Q And I want you to turn to the part of
21 paragraph 50 that spills over to page 20.

22 A Okay.

23 Q In the last sentence of paragraph 50 you
24 write (reading):

25 "Like the '840 patent, Zhou

1 mitigates motion blur by adjusting the
2 smoothed trajectory so that it is not
3 perfectly stable but rather 'follow the
4 natural trail of movement in the image
5 sequence.'"

6 And then it continues from there. Do
7 you see that?

8 A Yes, I do.

9 Q What you're saying here is that the way
10 that Zhou mitigates blur is by adding motion into the
11 original frame, correct?

12 MS. MAO: Objection, form.

13 BY THE WITNESS:

14 A So the sentence you just read, I'm stating
15 there that Zhou like the '840 patent mitigates motion
16 blur by adjusting the smoothed trajectory so that it is
17 not perfectly stable but rather follow the natural
18 trail of movement in the image sequence, i.e., follow
19 the original trajectory.

20 BY MR. SCHMIDT:

21 Q What do you mean by perfectly stable?

22 A The paragraph in the beginning -- the part
23 of Zhou there in the beginning of 50, the idea is that
24 for small amounts of blur, larger stabilization
25 strengths may be employed so that's kind of the notion

1 there that large stabilization strengths provide a
2 stable -- I say perfectly stable without necessarily
3 exactly defining it -- but the result of large
4 stabilization or strengths.

5 Q So when you refer to a perfectly stable
6 trajectory in the last sentence of paragraph 50, you
7 were referring to a trajectory that applied a large
8 stabilization strength?

9 A That's the overall concept, either apply a
10 large stabilization of strength is the one extreme and
11 that could be called a perfectly stable trajectory and
12 at the other end not stabilize at all, do nothing, and
13 therefore follow the original trajectory.

14 Q And your opinion is that the way that Zhou
15 mitigates motion blur is by adding motion to the
16 trajectory that would otherwise result from applying a
17 large stabilization strength?

18 MS. MAO: Objection, form.

19 BY THE WITNESS:

20 A It's not adding any motion, it's just
21 following the original trajectory.

22 BY MR. SCHMIDT:

23 Q Well, the way that Zhou actually works is
24 that for any given frame it averages the motion over
25 some number of past and future frames. Do you recall

1 that?

2 MS. MAO: Objection, form.

3 BY THE WITNESS:

4 A I need to look at Zhou but it has multiple
5 examples or embodiments of how to estimate motion,
6 motion blur that is.

7 BY MR. SCHMIDT:

8 Q Do you remember those Gaussian curves that
9 we looked at earlier in the deposition?

10 A Yes.

11 Q Those Gaussian curves which were
12 representing the approach in Zhou were depicting the
13 weighting function that would be applied to the average
14 of some number of past and current frames, isn't that
15 right?

16 MS. MAO: Objection, form.

17 BY THE WITNESS:

18 A We have to look exactly at what Zhou is
19 doing.

20 MS. MAO: Are you pointing to the prior art or
21 are you pointing to somewhere in his declaration? What
22 are you talking about?

23 MR. SCHMIDT: Objection to form, Counsel, please.

24 MS. MAO: No, just to help me understand because
25 I want to look at what you're talking about.

1 BY MR. SCHMIDT:

2 Q In paragraph 50, Doctor, in the last
3 sentence we're looking at you say Zhou mitigates motion
4 blur by adjusting the smoothed trajectory. Do you see
5 that?

6 A Yeah, I see what you read.

7 Q What did you mean by that?

8 A Well, what is explained above in that part
9 that is out of Zhou of how Zhou teaches these steps so
10 that's --

11 Q So explain to me explain to me based on
12 the prior disclosure how Zhou adjusts the smoothed
13 trajectory.

14 A Yes, Zhou discloses if the amount of blur
15 in the image is smaller, larger stabilization strengths
16 may be employed. On the other hand, if the amount of
17 blur of the image is larger, smaller stabilization
18 strengths may be employed and continues. So it teaches
19 of how to generate the smoothed trajectory either, you
20 know, working between these two extremes doing a lot of
21 smoothing or doing nothing and everything in between.

22 Q But you wrote in the last sentence that
23 Zhou mitigates motion blur by adjusting the smoothed
24 trajectory. So how does Zhou adjust a smoothed
25 trajectory? That's my question.

1 MS. MAO: Same objection. Let me put in my
2 objection, Dr. Katsaggelos. Same objection.

3 BY THE WITNESS:

4 A And that's what I just explained how this
5 adjustment is taking place from either doing a lot of
6 stabilization or doing nothing in a continuous fashion
7 between these two extremes.

8 BY MR. SCHMIDT:

9 Q So you're saying that Zhou mitigates
10 motion blur by applying a weaker stabilization
11 strength. Do I understand that correctly?

12 A A weaker all the way to just follow the
13 natural trail of movement in the image sequence meaning
14 that no stabilization at all, follow the original
15 trajectory.

16 Q And the more blur that is detected in an
17 image, the closer the trajectory will follow the
18 original camera path?

19 A Yeah, for large amounts of blur smaller
20 stabilization strengths are applied.

21 Q And just so we understand your testimony,
22 if the stabilization strength metric in Zhou were zero,
23 there would be no smoothed trajectory generation
24 generated at all, right?

25 MS. MAO: Objection, form.

1 BY THE WITNESS:

2 A I mean, this whole process generates a
3 smoothed trajectory which -- I lost here the exhibit --
4 a smoothed trajectory which moves between these two
5 extremes so doing a lot of smoothing to doing very
6 little or no smoothing.

7 BY MR. SCHMIDT:

8 Q I want to understand the two extremes that
9 you're mentioning. So in the extreme where Zhou's
10 stabilization strength metric is zero, there would be
11 no smoothed trajectory generated at all, isn't that
12 right?

13 MS. MAO: Same objection.

14 BY THE WITNESS:

15 A Yeah, when the stabilization strength
16 parameter is very small, the original trajectory at the
17 extreme will be used.

18 BY MR. SCHMIDT:

19 Q I didn't ask very small, I asked zero.
20 When the stabilization strength metric in Zhou is zero,
21 there would be no smoothed trajectory generation,
22 correct?

23 MS. MAO: Objection, form.

24 BY THE WITNESS:

25 A First of all, the range of the S values

1 Zhou discloses different ways to determine or cap it
2 and move in between the values and so on, but having
3 said that this is the process of this smoothing, the
4 generation of a smoothed trajectory, and the generation
5 of a smoothed trajectory at the two ends is heavy
6 stabilization to all the way to no stabilization and
7 therefore use the original sequence so that's the
8 result of this smoothing operation.

9 BY MR. SCHMIDT:

10 Q Is it your testimony that Zhou does not
11 contemplate a stabilization strength of zero?

12 MS. MAO: Objection, form.

13 BY THE WITNESS:

14 A No. Zero, value of zero is definitely
15 part of Zhou's teachings.

16 BY MR. SCHMIDT:

17 Q And in that case the trajectory would
18 follow the original camera path and there would be no
19 smoothed trajectory generation, right?

20 MS. MAO: Objection, form.

21 BY THE WITNESS:

22 A Well, the '840 patent in part of the
23 specification teaches that there's another example of
24 the low-light high-pass parameter, a value of 1 may
25 result in the smoothed trajectory being the same as the

1 observed trajectory during the exposure periods so the
2 smoothed trajectory is the same as the observed
3 trajectory and that's exactly what Zhou is teaching as
4 well.

5 MR. SCHMIDT: I'm going to object to that answer
6 as completely nonresponsive to the question, Doctor.

7 MS. MAO: Objection, harassing the witness.
8 Could you please stop harassing the witness.

9 MR. SCHMIDT: It's not harassing the witness,
10 Counsel, I'm stating my objection to the nonresponsive
11 answer. I asked absolutely nothing about the '840
12 patent in that question.

13 BY MR. SCHMIDT:

14 Q My question was in Zhou if the
15 stabilization strength metric is zero, then the camera
16 trajectory would follow the original path and there
17 would be no smoothed trajectory generation.

18 MS. MAO: Objection, form, and please calm down,
19 Mr. Schmidt. Same objection.

20 BY MR. SCHMIDT:

21 Q Can you answer the question, Doctor?

22 A Yeah, my answer was in response to your
23 question, and that was the tail end of my answer that
24 was not heard, I guess, that '840 calls the smoothed
25 trajectory as being the same as the observed trajectory

1 and that's what Zhou is doing as well for when the
2 stabilization strength is zero the smoothed trajectory
3 is the observed trajectory.

4 Q Okay. So you agree that when Zhou's
5 stabilization strength metric is zero there's no
6 smoothed trajectory generation. Fair?

7 MS. MAO: Same objection.

8 BY THE WITNESS:

9 A That's not what I said. What I said is
10 when the stabilization strength's around a zero, the
11 smoothed trajectory is the same as the observed
12 trajectory.

13 BY MR. SCHMIDT:

14 Q So your testimony is that when Zhou's
15 stabilization strength metric is zero, there is a
16 smoothed trajectory generation.

17 A The smoothed trajectory is the same as the
18 observed trajectory.

19 Q How is the smoothed trajectory in Zhou
20 generated when the stabilization strength is zero?

21 A The smoothed trajectory is the observed
22 trajectory.

23 Q It's just the adoption of the observed
24 trajectory in that case?

25 MS. MAO: Objection, form.

1 BY THE WITNESS:

2 A Yeah. As I state in 50, the smoothed
3 trajectory follows the original trajectory.

4 BY MR. SCHMIDT:

5 Q So now let's talk about the other extreme.
6 When Zhou's stabilization strength metric is at the
7 maximum possible, the smoothed trajectory would be an
8 average of every frame in the video weighted equally,
9 correct?

10 MS. MAO: Objection, form.

11 BY THE WITNESS:

12 A What are you pointing me to? What are you
13 referring to?

14 BY MR. SCHMIDT:

15 Q I'm asking about your understanding of
16 Zhou and if I understood the description of those
17 Gaussian weighting functions, if the stabilization
18 strength metric and the standard deviation were at a
19 maximum possible value, then my understanding is that
20 the smoothed trajectory would be an average of every
21 frame in the video weighted equally. Is that correct
22 or do I have that wrong?

23 MS. MAO: Objection, form.

24 BY THE WITNESS:

25 A Zhou discloses weighting functions mega x

1 and mega y used to determine the amount of motion then
2 the current frame should be moved in accordance with
3 stabilization operation. He discloses that the
4 weighting functions can be expressed by Gaussians, as
5 an example, and the Gaussian function expressed an
6 amount of adjustment for each frame of the capture
7 video and each frame corresponds to a moment in time.
8 So it considers in a case like this in the example of
9 the use of the Gaussian multiple frames and the weight
10 in the contribution of each frame differs according to
11 the values of the Gaussian weighting function.

12 BY MR. SCHMIDT:

13 Q But as the stabilization strength metric
14 increases, the weighting of past and current frames
15 extends further and becomes more equal, isn't that
16 right?

17 MS. MAO: Objection, form.

18 BY THE WITNESS:

19 A Well, it follows the shape of the Gaussian
20 we looked at those two examples at an earlier point
21 when the variance of the Gaussian is small and as it
22 increases then the Gaussian becomes just smaller value
23 in the middle and then it decays not as fast as when
24 the variance is small. Nevertheless, the contribution
25 of each frame is not exactly the same, it's still

1 weighted by the value of the Gaussian function.

2 BY MR. SCHMIDT:

3 Q Okay. You mentioned in one of your prior
4 responses the idea of Zhou picking between two extremes
5 of a perfectly stable trajectory and the original
6 trajectory. Can you describe for me what happens in
7 the perfectly stable trajectory extreme in Zhou.

8 MS. MAO: Objection, form. Also, we've been
9 going for an hour.

10 BY THE WITNESS:

11 A Well, there's the particular
12 implementation issue of any method, as we discussed,
13 the Gaussian, the continuous Gaussian extends from
14 minus infinity to infinity and in a practical
15 implementation it's reasonable to assume somebody will
16 utilize a buffer with so many past, so many future
17 frames, and so on. So in the extreme case of the
18 largest S that the system, the value of S that the
19 system allows, we have the largest variance Gaussian
20 and would utilize the weights that are dictated by that
21 particular Gaussian to take the neighboring frames into
22 account.

23 BY MR. SCHMIDT:

24 Q And what does that trajectory look like
25 which you refer to in paragraph 50 as the perfectly

1 stable trajectory?

2 MS. MAO: Objection, form.

3 BY THE WITNESS:

4 A This is the trajectory that the system
5 implemented according to the teachings of Zhou based on
6 the particular implementation one might want to do and
7 the particular weight function one might want to
8 implement but that would be, that is dictated by the
9 largest value of the S parameter in the teaching of
10 Zhou.

11 BY MR. SCHMIDT:

12 Q And is it fair to say that the perfectly
13 stable trajectory at this extreme would be the
14 trajectory where the current frame was a composite of
15 all motion across all frames in the video?

16 MS. MAO: Same objection.

17 BY THE WITNESS:

18 A The perfectly stable trajectory here is
19 the one that is produced by the particular
20 implementation of the teachings of Zhou for the largest
21 value of the stabilization strength parameter.

22 BY MR. SCHMIDT:

23 Q And under the teachings of Zhou, the
24 larger the stabilization strength parameter the more a
25 current frame will reflect the motion in prior and

1 current frames. Fair?

2 A I'm sorry. Can you repeat the more -- I'm
3 sorry.

4 Q Sure. Under the teachings of Zhou, the
5 larger the value for the stabilization strength
6 parameter the more a current frame will reflect motion
7 in prior and current frames, fair?

8 MS. MAO: Same objection.

9 BY THE WITNESS:

10 A Well, again, sticking to the example of
11 the Gaussian weight function, it involves past and
12 future frames and based on what we've been discussing
13 here, the larger the variance of the Gaussian, the
14 flatter you might say the Gaussian and the larger the
15 extent, so based on the particular implementation of
16 the teachings of Zhou, this perfectly stable trajectory
17 would result by using the largest value of the
18 stabilization strength parameter.

19 BY MR. SCHMIDT:

20 Q You agree that the larger the value for
21 the stabilization strength parameter the more a current
22 frame will represent motion from the prior and future
23 frames, correct?

24 MS. MAO: Same objection.

25 BY THE WITNESS:

1 A The implementation issues of how do you
2 implement a discrete Gaussian, as I mentioned, the
3 continuous Gaussian has infinite extent, the discrete
4 Gaussian I can implement it with finite extent from my
5 understanding to 10 and there I can truncate and
6 renormalize the values but the important thing is the
7 extent of the past and future frames, it can be a
8 variable, I can have a very large buffer, or it can be
9 constrained by the buffer size in which case you do
10 what I mentioned, right, which is you truncate the
11 Gaussian, the discrete Gaussian obviously, and you
12 renormalize it so that the area under the cap or the
13 sum of the samples in the Gaussian equal 1, and then as
14 the variance changes the contribution, yeah, the larger
15 the stabilization strength parameter, its value, the
16 larger the contribution of the further distant frames
17 based on the shape of the Gaussian, right? While if
18 its smaller, you rely heavier on the closer neighbors
19 not the very far away neighbors.

20 MR. SCHMIDT: Okay, thank you. Why don't we take
21 a break now.

22 THE WITNESS: Okay.

23 MR. SCHMIDT: Ten minutes.

24 (Brief recess taken)

25 BY MR. SCHMIDT:

1 Q Welcome back, Doctor.

2 A Thank you.

3 Q We've been discussing the motion blur
4 problem. Do you agree that motion blur can occur when
5 the camera is in a zero motion state?

6 MS. MAO: Objection, form.

7 BY THE WITNESS:

8 A What do you mean by that, zero motion
9 state? Is it stationary, the camera does not move?

10 BY MR. SCHMIDT:

11 Q The virtual camera has eliminated all
12 actual motion. Do you agree that in that case the
13 intra-frame motion blur problem can occur?

14 MS. MAO: Objection, form.

15 BY THE WITNESS:

16 A Are you talking about the virtual camera
17 or the actual camera?

18 BY MR. SCHMIDT:

19 Q Virtual camera.

20 A I'm sorry. Can you repeat again your
21 question.

22 Q Do you agree that if the virtual camera is
23 in a zero motion state, meaning all actual motion has
24 been canceled, do you agree that in that situation the
25 intra-frame motion blur problem can arise?

1 MS. MAO: Objection, form.

2 BY THE WITNESS:

3 A I don't understand the hypothetical. So
4 the virtual camera is stationary over time for a time
5 interval, is that what you mean?

6 BY MR. SCHMIDT:

7 Q Yes, for a frame.

8 A For a frame?

9 MS. MAO: Objection, form.

10 BY THE WITNESS:

11 A So during the exposure time of the frame,
12 the virtual camera is fixed, it has zero motion, right?

13 BY MR. SCHMIDT:

14 Q Yes.

15 A So the virtual camera -- I'm trying to
16 understand the hypothetical here. This is not a case I
17 analyzed in my reports.

18 Q Okay. What about the situation where the
19 virtual camera enforces the zero motion constraint
20 between two frames --

21 MS. MAO: Same objection.

22 MR. SCHMIDT: I wasn't done with the question so
23 let me start over.

24 BY MR. SCHMIDT:

25 Q In the case where the virtual camera

1 enforces a zero motion state between two frames, do you
2 agree that the intra-frame motion blur problem can
3 still arise?

4 MS. MAO: Finished?

5 MR. SCHMIDT: Yes.

6 MS. MAO: Okay. Same objection.

7 BY THE WITNESS:

8 A Yeah, these are some hypothetical
9 situations that I have a hard time understanding and
10 certainly these are hypothetical situations I didn't
11 consider in my analysis.

12 BY MR. SCHMIDT:

13 Q Do you recall analyzing the prior art
14 reference Cai, C-a-i?

15 A Yes.

16 Q Did you consider whether or not the
17 intra-frame motion blur problem can arise in the system
18 described by Cai?

19 MS. MAO: Same objection.

20 BY THE WITNESS:

21 A Can you point me to either my declarations
22 or Cai?

23 BY MR. SCHMIDT:

24 Q No, it's a general question.

25 In your analysis of analyzing Cai, did

1 you consider the question of whether the intra-frame
2 motion blur problem can arise in the implementation
3 described by Cai?

4 MS. MAO: Same objection.

5 BY THE WITNESS:

6 A I have to look at my declarations to be
7 able to answer your question.

8 BY MR. SCHMIDT:

9 Q Do you recall if Cai discusses a
10 intra-frame motion blur problem?

11 MS. MAO: Same objection.

12 BY THE WITNESS:

13 A I'll have to read my declaration to be
14 able to answer your question.

15 BY MR. SCHMIDT:

16 Q Okay. I'm perfectly capable of reading
17 the declaration when we're not on the record so let's
18 move on.

19 Can you turn to paragraph 88 of your
20 declaration, your supplemental declaration in the 1165
21 case, Exhibit 3.

22 A Okay, I'm there.

23 Q In paragraph 88 you cite from a disclosure
24 in Cai discussing a low-pass filter. Do you see that?

25 A Yes, I do.

1 Q Do you have an understanding of what the
2 low-pass filter described by Cai would entail?

3 A So Cai here discusses a low-pass filter
4 that reduces jitter motion.

5 Q My question was do you have an
6 understanding of what would be involved in the low-pass
7 filter technique that Cai is describing.

8 A What would be involved you said?

9 Q Yes.

10 MS. MAO: Same objection.

11 BY THE WITNESS:

12 A This is an operation according to Cai that
13 removes some of the jitter motions but as it states
14 there it accurately and completely removes all jitter.

15 MR. SCHMIDT: Okay. That's all my questions. I
16 pass the witness.

17 MS. MAO: Can I have a ten-minute break?

18 MR. SCHMIDT: We just took a ten-minute break.

19 MS. MAO: I am like four weeks from being due, my
20 baby being due.

21 MR. SCHMIDT: Let's take a ten-minute break.

22 MS. MAO: Thank you.

23 (Brief recess taken)

24 MS. MAO: No further questions. Thank you,
25 Dr. Katsaggelos. Thank you.

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MR. SCHMIDT: Thank you.

(Adjourned at 2:22 p.m.)

1 UNITED STATES PATENT AND TRADEMARK OFFICE
2 BEFORE THE PATENT TRIAL AND APPEAL BOARD
3 ARASHI VISION (US) LLC (D/B/A INSTA360)
4 Petitioner,

5 v.

6 GOPRO, INC.
7 Patent Owner.

8 CASE NO. IPR2024-01164
9 IPR2024-01165
10 IPR2024-01186
11 US PATENT NO. 10,958,840
12 10,958,840
13 10,574,894

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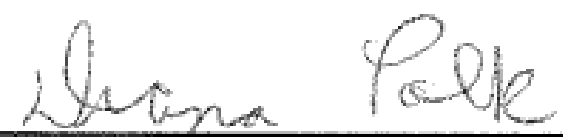
C E R T I F I C A T E

I, Diana G. Rodriguez, an RPR and
Certified Shorthand Reporter do certify that heretofore
said witness appeared before me produced as a witness
for examination in said cause.

I further certify that the said witness
was first duly sworn; that the testimony was reduced to
writing by means of machine shorthand and afterwards
transcribed into typewriting via computer-aided
transcription under my personal direction; and that the
foregoing is a true and correct record of the testimony
given by said witness.

I further certify that my certificate
annexed hereto applies to the original transcript and
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Dated: August 30, 2025



Diana G. Rodriguez, RPR
CSR No. 084-002945

PATRICK SCHMIDT

patrickschmidt@quinnemanuel.com

August 30, 2025

RE: Arashi Vision Inc. v. Gopro, Inc.

8/28/2025, Dr. Aggelos Katsaggelos, (#7567111).

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1 Arashi Vision Inc. v. Gopro, Inc.
2 Dr. Aggelos Katsaggelos (#7567111)
3 E R R A T A S H E E T
4 PAGE_____ LINE_____ CHANGE_____
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21 REASON_____
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24 (Dr. Aggelos Katsaggelos) Date
25

[& - acceleration]

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[stays - thank]

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[thank - understand]

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Federal Rules of Civil Procedure

Rule 30

(e) Review By the Witness; Changes.

(1) Review; Statement of Changes. On request by the deponent or a party before the deposition is completed, the deponent must be allowed 30 days after being notified by the officer that the transcript or recording is available in which:

(A) to review the transcript or recording; and

(B) if there are changes in form or substance, to sign a statement listing the changes and the reasons for making them.

(2) Changes Indicated in the Officer's Certificate. The officer must note in the certificate prescribed by Rule 30(f)(1) whether a review was requested and, if so, must attach any changes the deponent makes during the 30-day period.

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THE ABOVE RULES ARE CURRENT AS OF APRIL 1, 2019. PLEASE REFER TO THE APPLICABLE FEDERAL RULES OF CIVIL PROCEDURE FOR UP-TO-DATE INFORMATION.

VERITEXT LEGAL SOLUTIONS

COMPANY CERTIFICATE AND DISCLOSURE STATEMENT

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