

1 UNITED STATES PATENT AND TRADEMARK OFFICE

2 -----
3 BEFORE THE PATENT TRIAL AND APPEAL BOARD

4 -----
5 ARASHI VISION (U.S.) LLC (D/B/A INSTA360)

6 Petitioner,

7 vs.

8 GOPRO, INC.,

9 Patent Owner.

10
11 Patent No. 10,574,894

12 -----
Inter Partes Review No. IPR2024-01186

13 DEPOSITION OF DR. HASSAN FOROOSH

14 LOCATION: Veritext Orlando
15 800 North Magnolia Avenue
16 Suite 400
17 Orlando, Florida 32803

18 DATE: June 24, 2025

19 TIME: 10:00 a.m. - 1:12 p.m.
20
21

22 Taken before Julie Giordano, Florida
23 Professional Reporter, Notary Public in and for the
24 State of Florida at Large, pursuant to Notice of
25 Taking Deposition filed in the above case.

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PETITIONER'S EXHIBITS

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1 Thereupon,

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

5 DIRECT EXAMINATION

6 BY MS. NGUYEN:

7 Q. Good morning, Dr. Foroosh.

8 A. Good morning.

9 Q. Please state and spell your name for
10 the record.

11 A. Hassan Foroosh.

12 Q. Can you spell your name, please?

13 A. Oh, spell it?

14 Q. Yes.

15 A. Yes. It's H-A double S A-N. Foroosh
16 is F-O-R double O S-H.

17 Q. And you understand that you have taken
18 the oath to tell the truth today?

19 A. I do.

20 Q. And is there any reason you cannot
21 give accurate and correct testimony today?

22 A. No.

23 Q. Okay. So you are here to give
24 deposition testimony. I'm going to ask you a
25 series of questions today. Please give verbal

1 responses to any question because the court
2 reporter cannot pick up non-verbal responses. No
3 head nodding or gestures.

4 Do you understand that?

5 A. I understand. Yes, I do understand.

6 Q. And if I ask you a question that you
7 do not understand, please let me know. And I will
8 either repeat my question or rephrase. But if you
9 answer the question, then I will assume that you
10 understood.

11 A. Okay.

12 Q. Okay. How many times have you served
13 as an expert in prior cases?

14 A. Off the top of my head, probably 20 or
15 more.

16 Q. And do you recall the different
17 companies that you served as an expert for?

18 A. I do some. I served as an expert for
19 Align Technology, for Meta Corporation, for Meta.
20 Some other ones. Off the top of my head, I don't
21 remember.

22 Q. Okay. And are any of those cases --
23 do they involve patent cases?

24 A. Yes. They were mostly, if not all,
25 involve patent cases.

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1 Q. Any of them involve IPRs?
2 A. Vast majority involve IPRs.
3 Q. And do any of them involve cameras?
4 A. Yes.
5 Q. Can you name which ones?
6 A. Align, Meta and other ones too.
7 Q. Okay. And has a court or agency ever
8 excluded or criticized an opinion that you've
9 offered before?
10 A. No.
11 Q. And in these prior cases that you
12 talked about where you served as an expert, would
13 you say you represented plaintiffs more than
14 defendants?
15 A. I've done both.
16 Q. So 50/50?
17 A. I would say so.
18 Q. Okay. So let's quickly talk about
19 your deposition prep. What did you do to prepare
20 for your deposition today?
21 A. I have -- I had meetings on Zoom on
22 Friday with Mr. Patrick Schmidt, couple of hours
23 probably. And then on Sunday, I think about eight
24 hours.
25 Q. With?

1 A. With Mr. Schmidt.
2 Q. Did you meet with anybody else?
3 A. No.
4 Q. Okay. And aside from Friday and
5 Sunday, did you meet at any other time prior?
6 A. You mean for prepping for deposition?
7 Q. Correct.
8 A. No.
9 Q. Okay. And you said eight hours on
10 Sunday. About how much time in total did you spend
11 preparing for the deposition, including preparing
12 independently?
13 A. Maybe additional 10 to 16 hours
14 independently.
15 Q. So eight hours on Sunday, 10 to
16 16 hours independently. And then how many hours on
17 Friday?
18 A. On Friday, it was a couple -- a couple
19 of hours.
20 Q. Okay.
21 A. On Zoom.
22 Q. On Zoom. Okay.
23 And did you review any documents in
24 preparation for today's deposition?
25 A. Can I go back to the previous question

1 just because I said Zoom. But it might have been
2 Teams, but I just don't remember.

3 Q. An online platform?

4 A. An online platform. I just wanted to
5 be exact.

6 Q. So just repeating my question. Did
7 you review any documents in preparation for today's
8 deposition?

9 A. I reviewed my declaration and the
10 exhibits that are cited in any declaration.

11 Q. Okay. And you pointed to a binder
12 that's in front of you.

13 Is that your declaration?

14 A. This binder includes clean copies of
15 my initial declaration and then my supplemental
16 declaration and the patent.

17 Q. Okay. Did you review any other
18 documents in preparation for today's deposition?

19 A. Other than the ones that I mentioned?

20 Q. Correct.

21 A. No.

22 Q. Okay. And that includes any materials
23 that you did not identify in your declaration; is
24 that correct?

25 A. Yes.

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1 Q. Okay. So Dr. Foroosh, I wanted to
2 talk about claim construction. What is your
3 understanding of how a POSITA construes patent
4 claims under U.S. patent law?

5 A. Well, I'm not a lawyer. I was advised
6 about claim construction. I can read through my
7 declaration on that.

8 It says: In my opinion, all claim
9 terms should be given their ordinary and customary
10 meaning in light of the specification.

11 Q. Okay. And just to make the record
12 complete, which exhibit number are you referring
13 to?

14 A. That's my supplemental declaration.
15 Exhibit No. 2027.

16 Q. Okay. And what paragraph?

17 A. That's page 13, paragraph 34.

18 Q. So let me -- if you don't mind, let me
19 give the court reporter Exhibit 2027.

20 (Petitioner's Exhibit 2027 was
21 marked for identification.)

22 BY MS. NGUYEN:

23 Q. And then in performing your analysis
24 of the '413 patent, are you required to consider
25 the claims of the patent?

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1 MR. SCHMIDT: Objection to form.

2 THE WITNESS: All the claims were
3 there, but not this claim.

4 BY MS. NGUYEN:

5 Q. Okay. Are you required to consider
6 the '413 specification?

7 A. I'm not sure what you mean by
8 "required." Of course I consider them right
9 through the specifications.

10 Q. Okay. So in performing your analysis
11 of the '413 patent, looking at the claims, did you
12 consider the entirety of the '413 specification?

13 A. I did.

14 Q. Did you consider the prosecution
15 history of the '413 patent?

16 A. As I'm referring to in my declaration,
17 yes.

18 Q. When you say "as I'm referring to in
19 my declaration," can you point me to which
20 paragraph you're referring to?

21 A. I believe in the discussions of -- I
22 have to go through and find it. It's not in the
23 discussions of -- of one of the prior arts --

24 (Reporter clarification.)

25 THE WITNESS: One of the prior arts

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1 that I refer to as Meulen.

2 Can you remind me of your question
3 again?

4 BY MS. NGUYEN:

5 Q. Yes. So, I asked did you consider the
6 prosecution history of the '413 patent. And you
7 responded "as I'm referring to in my declaration."

8 And then I asked if you can point me
9 to which paragraph in your declaration you're
10 referring to.

11 A. Right. So without trying to find the
12 paragraph -- so I was referring to the fact that my
13 opinion is that one of the claim texts of the
14 claims is -- in Claim No. 1 is that the camera has
15 to be embedded in the -- in the device and that
16 Meulen does not disclose that. And I'm referring
17 to prosecution history that -- I'm sorry. I need
18 to make a correction.

19 I referred to the wrong -- I referred
20 to the wrong step in Claim 1. The step that I'm
21 referring to, the step of determining. So in the
22 step of determining, I'm referring to the
23 prosecution history that initially the examiner
24 rejected based on a couple of arts that they
25 considered and rejected. And then the patent owner

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1 basically returned back and separated that portion,
2 the determining step. And by doing that, the
3 examiner accepted and the patent was approved.

4 Q. And this is in context of Meulen. Is
5 that what you said earlier?

6 MR. SCHMIDT: Objection to form.

7 THE WITNESS: Well, it relates to all
8 the prior arts, actually, because that step
9 of determining is a crucial step. And the
10 patent owners separated and made an
11 independent step so that the patent was
12 approved.

13 BY MS. NGUYEN:

14 Q. Okay. And earlier, you said that all
15 claimed terms should be given their ordinary and
16 customary meaning, right?

17 A. Yes.

18 Q. What does it mean to have ordinary and
19 customary meaning?

20 MR. SCHMIDT: Objection to form.

21 THE WITNESS: That means that a POSITA
22 as of the priority date of 2013, with
23 understanding the meaning of the words
24 as -- as a person of ordinary skill at that
25 time.

1 BY MS. NGUYEN:

2 Q. Okay. And where does the meaning of
3 the words come from?

4 A. It's -- as I say, it's the customary.
5 Meaning at that time, POSITA would understand what
6 the meaning of those words are. The plain and
7 customary meaning. It says what it says. It means
8 that that's how it would be understood without
9 referring to -- without trying to define the terms,
10 the meaning of the terms in the context or without
11 referring to additional things like a dictionary,
12 that the meaning was known to a POSITA at that
13 time.

14 Q. So, in your analysis of the '413
15 claims, did you consider dictionary definitions?

16 A. Well, as I just read for you in the
17 claim construction, in my opinion, all claim terms
18 should be given their ordinary and customary
19 meaning in light of the specifications.

20 So no, I did not. I -- I just took
21 the ordinary and customary meaning as a POSITA
22 myself as of 2013.

23 Q. And then in performing your analysis
24 of the '413 patent claims, are you -- did you
25 construe the claims from the perspective of an

1 expert?

2 MR. SCHMIDT: Objection. Form.

3 THE WITNESS: Well, again, when it
4 comes to considering obviousness, I
5 construed the claims from the point of a
6 POSITA as of 2013, August 2013.

7 BY MS. NGUYEN:

8 Q. And, is it your understanding that if
9 a patent specification describes an example, that
10 the claims must cover that example?

11 A. What do you mean by "cover"?

12 Q. Encompass.

13 A. If they're examples given in the
14 specifications, those are examples. So that means
15 that yes, I mean, claims include those examples.

16 Q. Okay. And are the claims limited to
17 the examples covered in the specification?

18 A. Although claims may not be limited to
19 the examples. But if all the examples given are
20 going certain ways, certain directions, then there
21 are no other examples given that are different from
22 the type of examples given, then I would assume
23 that there are no other examples.

24 Q. So -- sorry.

25 A. So, can I continue? Unless it's

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1 spelled out. Basically, these -- this is just one
2 example, but there are other possibilities.

3 Q. Okay. Let me see if I can understand
4 your testimony.

5 So, when you say if all the examples
6 given are going in certain directions, and there
7 are no other examples in this specification, then
8 in your opinion, do the claims -- are they limited
9 to the examples only given in the specification?

10 MR. SCHMIDT: Objection to form.

11 THE WITNESS: No. That's not what I
12 said.

13 BY MS. NGUYEN:

14 Q. Okay.

15 A. What I said, that those examples -- so
16 trying to show different embodiments, the way I see
17 it. Now, if all the embodiments are pointing out
18 that certain step is done in a certain way, then if
19 no other examples are given to -- against that
20 particular way of doing that step, then I just say
21 there are no other examples. That's it. I'm not
22 saying that necessarily it's limited to that.

23 Q. So you're not saying that the claims
24 are limited to examples not disclosed in the
25 specification?

1 MR. SCHMIDT: Objection to form.

2 THE WITNESS: My understanding is that
3 the claim language is the claim language.
4 And if you are interpreting it, as I said
5 -- interpreting the words and terms in the
6 plain and customary meaning of the words,
7 then those are the claims. But then in the
8 specifications, those are just embodiments
9 that are described.

10 BY MS. NGUYEN:

11 Q. Okay. So, then, the embodiments
12 described in the specification. Do the claims
13 cover just the embodiments described in the
14 specification?

15 MR. SCHMIDT: Objection. Form.

16 THE WITNESS: I mean, we have to look
17 at the -- I mean, this is -- you're asking
18 a very general question.

19 BY MS. NGUYEN:

20 Q. Okay.

21 A. I mean, we have to make it specific.
22 You know, let's say the '413 patent.

23 Q. Yes.

24 A. You have to read -- read the claim and
25 look at the specifications to see, do you know if

1 the embodiments are fully basically describing all
2 possibilities for the claim or not?

3 I mean, you're asking a very general
4 question. I think there's no yes or no answer, per
5 se.

6 Q. So, in the context of the '413, do the
7 '413 claims cover just the embodiments described in
8 the '413 specification?

9 MR. SCHMIDT: Objection. Form.

10 THE WITNESS: No. Not just
11 embodiments. The claims stand as they
12 stand. You know, an interpretation of the
13 claims -- or rather an understanding of the
14 claims would be in terms of, as I said,
15 plain and ordinary meaning of words that
16 are used in the claim.

17 BY MS. NGUYEN:

18 Q. So I think you have the '413 patent
19 with you. If you'd like, I have a copy as well.
20 So let me hand the court reporter the '413 patent,
21 which is Exhibit 1001.

22 (Petitioner's Exhibit No. 1001 was
23 marked for identification.)

24 BY MS. NGUYEN:

25 Q. So Dr. Foroosh, you cited parts of the

1 '413 patent in your declaration, right?

2 A. Yes.

3 Q. And did you cite parts of the '413
4 patent that you found to be relevant?

5 A. Did you say "relevant" or
6 "irrelevant"?

7 Q. Relevant.

8 A. Yes. Of course. Yes, I cited the
9 parts that were relevant.

10 Q. And did you cite to the best
11 disclosures to the '413 patent in your declaration?

12 MR. SCHMIDT: Objection. Form.

13 THE WITNESS: I believe so. And
14 whenever there was a citation, I tried to
15 put it in quotes.

16 BY MS. NGUYEN:

17 Q. Okay. Thank you for that.

18 Did you consider every word of the
19 '413 patent?

20 A. What do you mean by every -- did I
21 consider every word?

22 Q. In reviewing the '413 patent, there
23 are a lot of words, correct?

24 A. Yes. I read the patent in its
25 entirety. I reviewed it. So therefore, I read

1 every word, if that's what you mean by "did you
2 consider every word."

3 Q. Is there anything about the '413
4 patent that you don't understand?

5 A. I don't think so.

6 Q. Okay. So let's turn to Claim 1 of the
7 '413 patent.

8 A. Yes. Is that page 12?

9 Q. Yes. I usually refer to column
10 numbers.

11 Is that okay?

12 A. Yes.

13 Q. So it starts at column 8, line 65?

14 A. Yes.

15 Q. And in your opinion, must Claim 1 of
16 the '413 patent cover all of the examples described
17 in the '413 specification?

18 MR. SCHMIDT: Objection to form.

19 THE WITNESS: Must cover all of the
20 examples? Not necessarily. Those examples
21 in the specifications are examples. And
22 what matters from my point of view in the
23 patent is initially the claim language and
24 the plain claim language.

25 BY MS. NGUYEN:

1 Q. Okay. Are there any examples
2 described in the '413 specification that are not
3 covered by Claim 1 of the '413 patent?

4 MR. SCHMIDT: Objection. Form.

5 THE WITNESS: I don't recall. But
6 maybe. I don't have the answer really for
7 your question, whether there is -- which
8 way around was your question? Whether the
9 claim covers every example or whether every
10 example describes a claim? I'm confused
11 about your question.

12 BY MS. NGUYEN:

13 Q. All right. So my question is, are
14 there any examples described in the '413
15 specification that are not covered by Claim 1 of
16 the '413 patent?

17 MR. SCHMIDT: Objection to form.

18 THE WITNESS: I don't believe so, no.

19 BY MS. NGUYEN:

20 Q. And are there any examples described
21 in the '413 specification that are not covered by
22 Claim 2 of the '413 patent?

23 MR. SCHMIDT: Objection to form.

24 THE WITNESS: Well, I believe Claim 2
25 was disclaimed. And the only reason in my

1 declaration I went into Claim 2 is because
2 Claims 6 and 7 that are not disclaimed are
3 dependent on that.

4 So again, going to back to your
5 question, I mean, Claim 2 probably doesn't
6 cover every example as in the
7 specifications. It's broader than the
8 claim probably. But so not every example
9 may -- may cover everything that Claim 2 is
10 saying.

11 BY MS. NGUYEN:

12 Q. Okay. And are there any examples
13 described in the '413 specification that are not
14 covered by Claim 6 of the '413 patent?

15 MR. SCHMIDT: Objection to form.

16 THE WITNESS: I don't believe so. In
17 that direction, I mean, examples certainly
18 fall under "Claims." But do a combination
19 of -- that's what I'm trying to say. They
20 do a combination of all the examples would
21 cover everything that claim says, if I'm
22 clear on that. So one is subset of the
23 other one.

24 So in other words, examples may not be
25 able to cover everything that the claim

1 is -- is stating. But those are just
2 examples. So, it's not a one-to-one
3 relationship.

4 BY MS. NGUYEN:

5 Q. So, going back to my question about
6 Claim 6, just to make sure I understand your
7 testimony correctly. What you're saying is Claim 6
8 does not cover all of the examples of the '413
9 specification; is that right?

10 MR. SCHMIDT: Objection to form.

11 THE WITNESS: No. Actually, the
12 opposite.

13 BY MS. NGUYEN:

14 Q. Okay.

15 A. So I'm saying that examples are just
16 examples and claim is claim language, may be
17 broader and cover more. So those are just examples
18 in the specifications.

19 Q. Okay. And, are there any examples
20 described in the '413 specification that are not
21 covered by Claim 7 of the '413 patent?

22 MR. SCHMIDT: Objection to form.

23 THE WITNESS: Again, same as before.
24 I don't believe so, no. Claim -- every
25 example falls -- every example related to

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1 Claim 7 fall under Claim 7. But it doesn't
2 mean that Claim 7 cannot cover claim
3 language, cannot cover beyond the examples
4 that are stated in the specifications.

5 BY MS. NGUYEN:

6 Q. Okay. So let's look at Claim 2. Back
7 to Claim 2, column 9, line 28.

8 A. Yes.

9 Q. In your opinion, does Claim 2 of the
10 '413 patent require an image sensor?

11 A. I do, yes.

12 Q. Okay. And in your opinion, does Claim
13 6 of the '413 patent require an image sensor?

14 A. Well, let's read Claim 6. It says:
15 The system of Claim 2, wherein the one or more
16 physical processors are included within a camera.

17 So because it says "a camera," it
18 means there's an image sensor.

19 Q. Okay. Does Claim 2 require a camera?

20 A. Let's read Claim 2: A system that
21 converts between aspect ratios, the system
22 comprising: one or more physical processors
23 configured by machine-readable instructions to:
24 obtain an input image, the input image having a
25 source aspect ratio, the input image including

1 pixels located at input positions defined along a
2 first axis and a second axis, the first axis
3 perpendicular to the second axis.

4 I think that spells it out right there
5 before -- I mean, without continuing any further.
6 It's talking about although -- it starts by talking
7 about physical processor, but it's talking about
8 the image, the aspect ratio of the image and the
9 axis -- I can continue reading.

10 It says: Determine a portion within
11 the input image, the portion including a subset of
12 the pixels and apply a transformation to the input
13 image to generate an output image, the output image
14 having a target aspect ratio different than the
15 source output ratio, the output image including the
16 pixels located at output positions defined along
17 the first axis and the second axis, wherein, the
18 transformation non-uniformly shifts the pixels from
19 the input positions to the output positions based
20 on, one, the input positions along the first axis
21 and, two, the input positions along the second
22 axis, and the transformation non-uniformly shifts
23 the pixels such that differences between the input
24 positions and the output positions of the subset of
25 the pixels within the portion are less than the

1 differences between the input positions and the
2 output positions of others of the pixels.

3 So it's clearly talking about that
4 there's an imaging sensor. Images are taken and
5 portions are determined and some transformations
6 would apply.

7 Q. So in your opinion, Claim 2 requires
8 an image sensor?

9 MR. SCHMIDT: Objection. Form.

10 THE WITNESS: Well, in my opinion,
11 Claim 1, 2 and 6 and 7 are clearly pointing
12 out there is an imaging sensor on the
13 apparatus.

14 (Reporter clarification.)

15 THE WITNESS: There is.

16 And I believe that's -- that was --
17 that's also the board's position, and it's
18 undisputed.

19 BY MS. NGUYEN:

20 Q. So in your opinion, does Claim 2 alone
21 require an image sensor?

22 MR. SCHMIDT: Objection to form.

23 THE WITNESS: I just read the claim.
24 I have to read it, of course, in the
25 context. It's -- it's when it's referring

1 to an image, it's obviously coming from a
2 previous claim -- I mean Claim No. 1. I'm
3 assuming that image is referring to the
4 same image that Claim 1 is saying.

5 And therefore yes, I do believe that
6 Claim 2 requires that there's an imaging
7 sensor under the device. And I believe
8 that the board agrees with that.

9 BY MS. NGUYEN:

10 Q. And Claim 2 recites obtaining an input
11 image, correct?

12 A. Yes.

13 Q. And in your opinion, does obtaining an
14 input image from Claim 2 require that the image
15 sensor obtain an input image?

16 MR. SCHMIDT: Objection to form.

17 THE WITNESS: I think the input image
18 is coming from Claim 1. And therefore,
19 yes, I think, you know, POSITA would
20 understand that when in Claim 2, it says
21 "input image," it's referring to the same
22 input image that was there in Claim 1. And
23 Claim 1 is saying there's a sensor in the
24 device. There's an imaging sensor in the
25 device.

1 BY MS. NGUYEN:

2 Q. And Claim 1 refers to an image capture
3 apparatus, correct?

4 A. Yes.

5 Q. So in your opinion, is the image
6 capture apparatus of Claim 1 the same as the system
7 of Claim 2?

8 MR. SCHMIDT: Objection. Form.

9 THE WITNESS: I believe the system of
10 Claim 2 is expanding on what was described
11 in Claim 1. And Claim 1 is describing that
12 there's an imaging sensor on the apparatus.

13 BY MS. NGUYEN:

14 Q. When you say the system of Claim 2 is
15 expanding what was described in Claim 1, do you
16 mean that some of Claim 2 is broader than the image
17 capture apparatus of Claim 1?

18 A. No. I don't mean broader. I mean
19 providing further explanations.

20 I don't believe that Claim 2 should be
21 viewed out of context completely saying that it
22 says image is obtained. But it says input image.
23 And in Claim 1, it's talking about input image.
24 And it says "input image is obtained from the image
25 sensor." Therefore, I assume -- and I believe a

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1 POSITA would understand that Claim 2 was referring
2 to the same input image that was in Claim 1.

3 Q. What's the difference between Claim 2
4 and Claim 1?

5 MR. SCHMIDT: Objection. Form.

6 THE WITNESS: I'm not sure if I
7 understand your question. What do you mean
8 by "the difference"?

9 BY MS. NGUYEN:

10 Q. Do you believe that Claim 1 and Claim
11 2 are different?

12 MR. SCHMIDT: Objection to form.

13 THE WITNESS: They each cover
14 different aspects of invention or parts of
15 the aspects of invention. But they're
16 interrelated.

17 So I'm saying that if Claim 1 is
18 referring to input image and if the
19 remaining claims are referring to input
20 image, they're referring to the same
21 entity, to the same concept.

22 BY MS. NGUYEN:

23 Q. Okay. But you do agree that Claim 1
24 and Claim 2 are different, right?

25 A. No. I didn't say that. I don't agree

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1 they're different or identical. They're just
2 describing various parts of the invention, but
3 they're interrelated.

4 Q. So you don't have an opinion as to
5 Claim 1 and Claim 2 are different?

6 MR. SCHMIDT: Objection to form.

7 THE WITNESS: Well, obviously, they --
8 if they spell out certain aspects in Claim
9 2, it is to expand on the description of
10 what was in Claim 1.

11 In particular, for instance, the image
12 captured by the imaging sensor -- or rather
13 -- I should be more precise. The input
14 image captured by the imaging sensor.

15 BY MS. NGUYEN:

16 Q. I'm sorry. I'm still not
17 understanding, Dr. Foroosh.

18 In your opinion, is Claim 2 different
19 from Claim 1?

20 MR. SCHMIDT: Objection to form.

21 THE WITNESS: I think it's too
22 general. I mean, this question is too
23 general. What does it mean different?

24 I mean, when I read a patent and that
25 patent consists of multiple claims, there's

1 some independent claims and dependent
2 claims. But the claims, when they refer to
3 some words -- like, for instance, input
4 image -- I'm going to take it that unless
5 otherwise mentioned in the remaining
6 claims, that what the definition of input
7 image is, is following up on the previous
8 portions that describe what input image is.

9 For instance, in Claim 1, it says: An
10 image capture apparatus comprising an image
11 sensor completed to capture an input image.

12 So from my point of view, if they
13 define what input image is there, when
14 Claim 2 is referring to input image, that's
15 the input image they are talking about.

16 Now you're saying, are they different,
17 Claim 1 and Claim 2? Well, the wordings
18 are different. But that doesn't mean the
19 meaning of the terms used are different.

20 So if Claim 1 is saying input image,
21 I'm assuming that if Claim 2 is saying
22 input image, and if it's not saying that
23 input image is different, this is different
24 from input image that's described in Claim
25 1, then I'm assuming they're referring to

1 the same input image.

2 BY MS. NGUYEN:

3 Q. So, in your opinion, claim terms in
4 different claims should have the same meaning; is
5 that right?

6 A. Unless otherwise mentioned. I'm
7 saying that claim terms -- if it understood -- you
8 know, as I said, input image is captured by the
9 image sensor. Therefore, the remaining claims,
10 from my point of view, unless otherwise mentioned,
11 that should be understood to be the same.

12 Q. And if claim terms are different,
13 should they also have the same meaning?

14 MR. SCHMIDT: Objection to form.

15 THE WITNESS: If -- I mean, you're
16 talking about synonyms? Is that what
17 you're referring to? I'm not sure if I
18 understand your question.

19 BY MS. NGUYEN:

20 Q. If you have two claim terms that are
21 different, in your opinion, do they have the same
22 meaning?

23 MR. SCHMIDT: Objection. Form.

24 THE WITNESS: It's a very general
25 question.

1 BY MS. NGUYEN:

2 Q. Uh-huh.

3 A. Can you show me in particular related
4 to '413 patent -- I mean, it could be. You know, I
5 can imagine that two claim terms are synonymous.

6 Q. Okay.

7 A. In which case, yes. But otherwise --
8 give me an example. It's just too broad of a
9 question, too general of a question.

10 Q. Sure. So Claim 1 requires an image
11 capture apparatus, right?

12 A. Yes.

13 Q. And Claim 2 requires a system?

14 A. Uh-huh.

15 Q. An image capture apparatus is a
16 different term than system.

17 Do you agree?

18 MR. SCHMIDT: Objection to form.

19 THE WITNESS: Could be. Could be in
20 the sense that, you know, here, the word
21 "system" may be referring to image capture
22 apparatus.

23 And my understanding is that yes, it
24 does and -- or maybe it's referring to a
25 subset of it that is describing the

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1 portions that I read. But it's part of the
2 same apparatus, yes.

3 BY MS. NGUYEN:

4 Q. So in your opinion, the system of
5 Claim 2 is the same as the image capture apparatus
6 of Claim 1?

7 MR. SCHMIDT: Objection to form.

8 THE WITNESS: Or an integral part of
9 it.

10 BY MS. NGUYEN:

11 Q. They're the same or integral?

12 A. Integral. I said or an integral part
13 of it.

14 Q. Which one?

15 A. Well, the system could be an integral
16 part of imaging apparatus.

17 Q. So they're not the same?

18 MR. SCHMIDT: Objection to form.

19 THE WITNESS: What does it mean not
20 the same? I mean, as I said, they're
21 just -- it could be an integral part of
22 that system because the system is talking
23 about readable instructions. It's talking
24 about determining a portion. It's talking
25 about applying the transformation. So it's

1 talking about the computing component of
2 that apparatus. So that's an integral part
3 of that camera or imaging apparatus.

4 BY MS. NGUYEN:

5 Q. It's a subset?

6 A. Right. That's what I meant.

7 Q. Understood. Got it. Okay.

8 So turning back -- well, we've been on
9 the claims this whole time. In your opinion,
10 Dr. Foroosh, do any of the claims, 1, 6 or 7, in
11 this proceeding require that the number of pixels
12 between the input image and output image stay the
13 same?

14 MR. SCHMIDT: Objection. Form.

15 THE WITNESS: No. The specifications
16 don't say that the number of pixels should
17 remain the same. That doesn't mean that it
18 couldn't because there's various different
19 ways -- those are implementation details
20 from my point of view. Although the
21 patents, I believe, refers to -- did they
22 say the technique -- preserves the field of
23 view.

24 BY MS. NGUYEN:

25 Q. Okay. And looking at Claim 2, column

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A. Yes.

Q. Actually, sorry. Let's -- Claim 1, column 9, lines 10 and 11.

Do you see that?

A. Yes.

Q. And Claim 1 requires generating an output image?

A. Yes.

Q. And this output image in Claim 1 of the '413 patent is a digital image.

Would you agree?

MR. SCHMIDT: Objection to form.

THE WITNESS: It talks about pixels. So that implies digital.

BY MS. NGUYEN:

Q. And from your knowledge, Dr. Foroosh, what are some formats of files for digital images?

A. There are many different formats. Some are compressed, some uncompressed, you know, raw data. There's so many different formats.

Q. Okay. Have you heard of a bitmap format?

A. Yes.

Q. Okay. So that is -- a bitmap format

1 is a type of format for a digital image?

2 A. Yes.

3 Q. Okay. And a bitmap format would be
4 covered by the output image claimed in Claim 1 of
5 the '413 patent?

6 MR. SCHMIDT: Objection to form.

7 BY MS. NGUYEN:

8 Q. Right?

9 A. Well, the claim language does not talk
10 about formats, image formats. So I'm not going to
11 speculate anything that it covers or it doesn't
12 cover. It talks about pixels, which means they're
13 digital. I don't want to go beyond that and talk
14 about formats. Claim language, none of the claims
15 are talking about formats.

16 Q. Okay. But a digital image could be a
17 bitmap format image?

18 A. It could be.

19 Q. Could a digital image be a PNG format?

20 A. It could be.

21 Q. What about TIFF format? T-I-F-F.

22 A. Yes.

23 Q. What about PSD format?

24 A. It could be any of the formats. But
25 I'm just saying that the claim language does not

1 get into that, which format it is or is not.

2 Q. But a POSITA would have understood a
3 digital image to be a PSD format, could be?

4 A. I mean, it could be. As I said, a
5 POSITA could understand that it could be any image
6 formats that by 2013, were available. Off the top
7 of my head, I don't remember which one of those
8 formats back then we used.

9 Q. Understood.

10 Okay. So let's look at column 7 of
11 the '413 patent.

12 A. Yes.

13 Q. And column 7 of the '413 patent
14 includes a bunch of equations, right?

15 A. Yes.

16 Q. Do you know where these equations came
17 from?

18 A. From the patent.

19 Q. Right.

20 A. During patent -- the authors of the
21 patent put it there. I'm not sure if I understand
22 your question.

23 Q. Where did the authors of the patent
24 find these equations?

25 A. I don't know. I mean, I haven't had

1 any discussions with the authors of the patent. So
2 they put it there in their specification. These
3 are examples of equations that can be used. Those
4 are polynomial equations.

5 (Reporter clarification.)

6 THE WITNESS: Polynomial. It's

7 P-O-L-Y-N-O-M-I-A-L.

8 BY MS. NGUYEN:

9 Q. So you as an expert opining on what a
10 POSITA would have understood would not be able to
11 guess where these equations came from?

12 MR. SCHMIDT: Objection to form.

13 BY MS. NGUYEN:

14 Q. How the authors derived at these
15 equations?

16 MR. SCHMIDT: Same objection.

17 THE WITNESS: I didn't guess. Did you
18 say "guess"?

19 I mean, I don't know. I mean -- and I
20 don't see any point of guessing that. Just
21 to put it in -- put that in their
22 specification as an example, actually, and
23 say Hey, you know, this could be example
24 equations.

25 I mean, I can read it here. It says

1 that intermediate horizontal coordinates
2 can be inter-polated from the example
3 equations given below.

4 BY MS. NGUYEN:

5 Q. Okay.

6 A. These are example equations. They're
7 not restricting saying that these are the only
8 equations that can be used.

9 Q. Okay. But the authors -- and if it's
10 okay with you, I'll say "inventors."

11 A. Inventors, yes.

12 Q. But the inventors must have determined
13 these equations somehow, right?

14 MR. SCHMIDT: Objection. Form.

15 THE WITNESS: Well, somehow.

16 Obviously, it refers to any possible -- all
17 possibilities.

18 You know, it could be that they came
19 up with these equations or they might have
20 heard it from some colleagues. I don't
21 know. I'm not going to speculate to where
22 they got their equations from. They don't
23 say where they got them. They said these
24 are examples of equations that could be
25 used.

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1 BY MS. NGUYEN:

2 Q. In your experience, do inventors in
3 the field of image processing -- do they typically
4 come up with equations that resemble these example
5 equations?

6 MR. SCHMIDT: Objection. Form.

7 THE WITNESS: They could, yes.

8 BY MS. NGUYEN:

9 Q. And do you know the process that they
10 take in order to come up with these equations?

11 A. That's what invention is about, to
12 come up with new ideas.

13 Q. But does an inventor just start
14 writing down 6th order polynomial equations or --
15 I'm trying to understand the process.

16 A. The process of inventing?

17 Q. The process of coming up with these
18 specific equations.

19 A. As I said, they're not just these
20 specific equations. Because the inventors, they
21 say that intermediate horizontal coordinates can be
22 inter-polated from the example equations given
23 below.

24 It's examples. So, I mean, the patent
25 is not limited to only these equations.

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1 Q. Right.

2 But in terms of the inventors coming
3 up with these equations as examples, is there some
4 sort of iterative process to arrive at these
5 equations?

6 A. I don't know. There could be. There
7 could be that an iterative process that they tested
8 their equations and many examples, or it could be
9 that there was just a bright idea and tested once.

10 Q. Okay. So it's possible the inventors
11 said let's use negative 0.0749 V to the 6 minus
12 0.3167 V to the 5, plus 1.0939 V to the 4, et
13 cetera and said let's write that down in the
14 patent?

15 MR. SCHMIDT: Objection to form.

16 THE WITNESS: So that's the Equation 1
17 you were reading?

18 BY MS. NGUYEN:

19 Q. Yes. Yes.

20 A. So you're referring to specific values
21 that have been --

22 Q. Yeah. I'm trying to understand how
23 the inventors got here. And the '413 patent
24 doesn't guide me, at least, to how the inventors
25 got here.

1 A. It could --

2 MR. SCHMIDT: Hold on. Hold on.

3 There's no question pending.

4 THE WITNESS: I'm sorry.

5 BY MS. NGUYEN:

6 Q. So I would like to know, Dr. Foroosh,
7 in your experience, how would the inventors have
8 gotten to the equations shown in column 7?

9 MR. SCHMIDT: Objection to form.

10 THE WITNESS: As I said earlier, it
11 could be by trial and error.

12 BY MS. NGUYEN:

13 Q. Okay.

14 A. Fine-tuning. Or maybe -- I'm just
15 speculating now because your question is general.

16 I have to get into the mindset of the
17 inventors. Or it could be -- or even knowing what
18 happened, how they came up with. I don't know. I
19 mean, it could be many things. It could be that
20 somebody told them. I don't know. It could be any
21 of the possibilities. I don't see how that -- that
22 is relevant to the question of obviousness that we
23 want to answer.

24 Q. I'm not asking about obviousness. I'm
25 just trying to understand where these equations

1 came from.

2 So, in your opinion, Dr. Foroosh,
3 looking at these equations, are you able to, at
4 least, understand how these inventors -- the
5 process that these inventors took to arrive at
6 these equations shown in column 7 of the '413
7 patent?

8 MR. SCHMIDT: Objection to form.

9 THE WITNESS: As I said, just by
10 looking at the equations, no, I cannot tell
11 how they came up with these equations.

12 But as I said earlier also, they said
13 these are just examples. Those numbers and
14 even the order of the polynomial equations
15 or, indeed, even using the very specific
16 non-linear equation, which is polynomial,
17 those are specific examples. You know,
18 that patent owner says these are examples.

19 BY MS. NGUYEN:

20 Q. And when you say the patent clearly
21 says these are examples, do you mean that the
22 patent claims are not limited to these examples?

23 MR. SCHMIDT: Objection to form.

24 THE WITNESS: Yes. The patent claims
25 talk about non-linear. They don't say 6th

1 order polynomial.

2 BY MS. NGUYEN:

3 Q. Okay. Looking at column 9 -- or
4 column 7, sorry, line 7.

5 A. Yes.

6 Q. So column 7 starting at line 7. It
7 describes a vertical warp distortion being
8 represented as a family of equations that we've
9 been talking about.

10 Do you see that?

11 A. Yes.

12 Q. And then it talks about this variable
13 N being the horizontal coordinate expressed as a
14 percent of the total horizontal image size.

15 A. I see that.

16 Q. What is your understanding of
17 expressed as a percent of the total horizontal
18 image size?

19 A. The plain and customary meaning of
20 expressed in terms of the percent of the total
21 horizontal image size. So, I'm not sure how else
22 you want me to describe that.

23 I think in my declaration, I refer to
24 them as deciles. So there are ten equations. And
25 looking at different sections along the X axis --

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1 horizontal, rather, axis, as they say.

2 Q. Different sections based on
3 percentage, right?

4 A. Uh-huh. There are --

5 (Reporter clarification.)

6 THE WITNESS: So, let me read it
7 again.

8 Therefore, the vertical warp
9 distortion can be represented as a family
10 of equations $\Delta V \text{ over } V \text{ sub } N$, where N
11 is the horizontal coordinate expressed as a
12 percent of the total horizontal image size.

13 So you have a total horizontal image
14 size, a percentage of that describes the
15 horizontal coordinate.

16 BY MS. NGUYEN:

17 Q. So, let's take Equation 1 as an
18 example, just so that I understand this. Equation
19 1, which is shown in column 7, line 14 to 15 --

20 A. Uh-huh. Yes.

21 Q. -- is an example equation for what
22 percentage of the total horizontal coordinate image
23 size?

24 A. We have ten equations here. One may
25 assume it's 10 percent of it.

1 Q. First 10 percent?

2 A. You can call it first 10 percent.

3 Q. And then the second equation, column

4 7, lines 17 to 18 would be an example equation for

5 the second 10 percent?

6 A. That would be the case. But as I

7 said, this is just an example.

8 Q. Right. Right. Understood.

9 So, then, in this example in column 7,

10 you would apply the input image using all ten

11 equations; is that right?

12 A. Yes. You would apply the ten

13 equations.

14 Q. And each equation is applied to a

15 different percentage of the horizontal coordinates

16 of the image -- input image, correct?

17 A. This example is doing that. It

18 doesn't mean that what the patent is saying they're

19 practicing. It's just an example.

20 Q. Okay. And it could be applied to an

21 input image regardless of the input size -- input

22 image size, correct?

23 A. Yes. It says that it's a percentage

24 of the -- of the horizontal coordinate.

25 Q. Okay. And that is the whole reason

1 for expressing these equations as a percentage, is
2 so that you don't need to know the input image
3 size?

4 A. I am not sure if that's the only
5 reason because this is just an example. No, it
6 doesn't say that. The patent doesn't say the
7 reason we do that, to make it independent of the
8 input image size. I don't see that there.

9 Q. But that could be a reason?

10 MR. SCHMIDT: Objection. Form.

11 THE WITNESS: Well, again, I don't see
12 that there. So I'm not going to speculate
13 on that.

14 BY MS. NGUYEN:

15 Q. But you don't know if that could be a
16 reason?

17 MR. SCHMIDT: Objection to form.

18 THE WITNESS: Maybe. Maybe not. I
19 mean, it really doesn't matter at the end
20 of the day because, as they said, this is
21 just an example.

22 BY MS. NGUYEN:

23 Q. Okay. Why would the inventors apply
24 the equations that are based on a percent of total
25 horizontal coordinates?

1 MR. SCHMIDT: Objection. Form.

2 THE WITNESS: Again, they said that
3 this is an example. Of course, again, we
4 see other places, they say that it's not
5 just horizontal. They do vertical. And in
6 fact, they have figures that they describe
7 that also.

8 BY MS. NGUYEN:

9 Q. Right.

10 So, Dr. Foroosh, my question is not
11 necessarily about the horizontal part. Maybe that
12 is throwing you off. It's more about the
13 percentage. So let me ask the question --

14 A. What was the question?

15 Q. Yeah. Why would the inventors apply
16 the equations based on a percentage of total
17 horizontal coordinates?

18 MR. SCHMIDT: Objection. Form.

19 BY MS. NGUYEN:

20 Q. Rather than actual horizontal
21 coordinates?

22 A. Again, it's an example. I don't think
23 they -- they exclude other options. They just say
24 this is an example.

25 MR. SCHMIDT: Counsel, when you get to

1 a good stopping point, can we take a break?
2 It's been about an hour.

3 MS. NGUYEN: Yes.

4 BY MS. NGUYEN:

5 Q. Right.

6 So putting aside whether you believe
7 other options are excluded or not, my question is
8 why would the inventors apply a percentage?

9 MR. SCHMIDT: Objection. Form.

10 THE WITNESS: I mean, regardless of
11 this example, the plain language of the
12 patent claims do not refer to this example
13 as, you know, the only way to implement it.

14 I mean, as I said, this is one
15 example. Claim language is just talking
16 about non-linear. So they don't even talk
17 about percentages, what type of non-linear
18 functions. The claim language is not
19 limited to that. So this is just an
20 example.

21 And you're asking me why do they do
22 that in this example. Well, it's just an
23 example. So they don't say that is limited
24 to that. It's just an example.

25 BY MS. NGUYEN:

1 Q. Okay. Have you ever come up with
2 equations that are based solely on percentage?

3 A. I might have, yes. That statistical
4 process dealing with percentiles. So I might have
5 developed techniques dealing with percentiles, yes.

6 Q. Dealing with percentile of the
7 coordinates of an input image?

8 A. Well, if it coordinates as some
9 statistical distribution, sure. I mean, I don't
10 remember off the top of my head doing this. But
11 it's quite likely. I mean, it's not -- it's not
12 uncommon to do that.

13 MS. NGUYEN: Okay. Let's take a
14 break.

15 (A brief recess was taken from
16 10:59 a.m. to 11:10 a.m.)

17 BY MS. NGUYEN:

18 Q. Okay. Dr. Foroosh, did you speak with
19 counsel about the substance of this IPR proceeding
20 during the break?

21 A. No.

22 Q. Did you speak with counsel about the
23 deposition during the break?

24 A. No.

25 Q. Dr. Foroosh, back to the '413 claims.

1 Claim 1. So Claim 1 recites the word
2 "non-uniformly shifts," right?

3 A. Can you tell me which column, which
4 line, please?

5 Q. Column 9, line 16.

6 A. Yes. The transformation non-uniformly
7 shifts the pixels from the input positions to the
8 output positions based on, one, the input positions
9 along the first axis and, two, the input positions
10 on the second axis.

11 Q. Okay. And in your opinion, should the
12 term "non-uniform" be given its ordinary and
13 customary meaning?

14 A. As I mentioned earlier, I treated all
15 the terms ordinarily and customary.

16 Q. And in your opinion, does non-uniform
17 mean non-linear?

18 A. In the context of the '413 patent, in
19 my opinion, they are treated as synonymous. Or
20 when I go through the patent whether the
21 specifications or the claims, whenever they're
22 talking about pixel shifts, they say that the
23 pixels are shifted non-uniformly. And they say
24 that -- and then when they refer to transformation
25 or warping, they say non-linear transformation and

1 warping.

2 Yes. So -- so I think in the context
3 of -- to my opinion, in the context of the '413
4 patent, they are synonymous in the sense that
5 non-linear transformation creates non-uniform
6 shifting of pixels.

7 Q. Is there anything in the '413
8 specification, other than the claims, that use the
9 word "non-uniform"?

10 MR. SCHMIDT: Objection to form.

11 THE WITNESS: Did you say in the
12 specification?

13 BY MS. NGUYEN:

14 Q. Correct. The '413 specification.

15 A. No. I mean, I don't know if I've
16 expressed any opinion on that in my declaration.
17 You want to refer to something specific?

18 Q. Well, actually -- no. I'm just asking
19 you whether, when you were reviewing the '413
20 specification, whether there was anything in the
21 '413 specification -- any passage that used the
22 word non-uniform.

23 MR. SCHMIDT: Objection to form.

24 THE WITNESS: In the patent, the words
25 "non-uniform" and "non-linear" have been

1 used. You're talking about specifications.
2 So, I mean, if I have expressed any opinion
3 related to that, I would be more than glad
4 to look at my declaration. But, yes the
5 words "non-uniform" and "non-linear" have
6 been used.

7 BY MS. NGUYEN:

8 Q. In the '413 specification?

9 A. In the '413 patent. Maybe in the
10 specifications and in the claims, as we just read.

11 Q. Do you recall if the word
12 "non-uniform" was used in the '413 specification?

13 MR. SCHMIDT: Objection to form.

14 THE WITNESS: Again, off the top of my
15 head, I believe it was used, the
16 non-uniform and non-linear. And I
17 explained why I take them as synonymous in
18 the sense that when you apply non-linear
19 working, it results in non-uniform shifting
20 of pixels.

21 BY MS. NGUYEN:

22 Q. Did you see anything in the '413 file
23 history that talked about the meaning of
24 non-uniform?

25 A. I don't recall. But I don't see why

1 that would be relevant. As I said, I was apprised
2 that I considered every term in terms of the plain
3 and customary meaning of those words.

4 (Reporter clarification.)

5 BY MS. NGUYEN:

6 Q. And Dr. Foroosh, you reviewed
7 Dr. Katsaggelos's declaration, right?

8 A. I did. Yes.

9 Q. In your opinion, does Dr. Katsaggelos
10 have the same meaning of non-uniform as your
11 meaning of non-uniform?

12 MR. SCHMIDT: Objection to form.

13 THE WITNESS: Again, I don't recall
14 expressing any opinion on that in my
15 declaration. So, if you point out to a
16 specific place I talk about that, then we
17 can go over that.

18 BY MS. NGUYEN:

19 Q. Right.

20 I'm asking because you didn't talk
21 about Dr. Katsaggelos's meaning of the word
22 "non-uniform" in your declaration.

23 So, sitting here today, do you believe
24 that Dr. Katsaggelos has a different meaning of
25 non-uniform than you do?

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1 A. You said that I didn't express any
2 opinions. So, if I didn't express any opinions,
3 that means I did not express any opinions.

4 Q. So you don't have any?

5 A. So, not on Dr. Katsaggelos. If I
6 pronounce his name correctly. I'm not sure. On
7 the meaning of those terms, I didn't express any
8 opinion on that.

9 Q. Do you know what Dr. Katsaggelos's
10 meaning of non-uniform is?

11 MR. SCHMIDT: Objection to form.

12 THE WITNESS: Again, if I did not
13 express any opinion, that means that I did
14 not express any opinion on that.

15 BY MS. NGUYEN:

16 Q. So you don't know whether
17 Dr. Katsaggelos's meaning of non-uniform -- you
18 don't know what it is?

19 MR. SCHMIDT: Objection. Form.

20 THE WITNESS: Again, I did not express
21 any opinion on that.

22 BY MS. NGUYEN:

23 Q. Right.

24 So my question wasn't whether you
25 expressed an opinion. I'm just asking whether you

1 understood what Dr. Katsaggelos's meaning of
2 non-uniform is.

3 MR. SCHMIDT: Objection. Form. Asked
4 and answered.

5 THE WITNESS: So, yes. I mean, my
6 answer is still the same. I did not
7 express any opinion. I mean, you're asking
8 me to offer an opinion on the fly. No, I'm
9 not going to do that. I did not express
10 any opinion on that.

11 BY MS. NGUYEN:

12 Q. You don't have an opinion whether you
13 understood Dr. Katsaggelos's meaning of
14 non-uniform?

15 MR. SCHMIDT: Objection to form.

16 THE WITNESS: You're asking the
17 question in various different ways. I'm
18 going to give the same answer.

19 I did not express any opinion on
20 Dr. Katsaggelos's understanding of the term
21 "non-uniform."

22 BY MS. NGUYEN:

23 Q. And you're not expressing an opinion
24 today because you don't have an opinion; is that
25 right?

1 A. I did not -- I am not expressing any
2 opinion on Dr. Katsaggelos's understanding of the
3 term "non-uniform" because I did not express any
4 opinion, meaning considering the obviousness of
5 this patent.

6 Q. Is there an a reason why you're
7 unwilling to provide testimony about what your
8 opinion is?

9 A. What my opinion is on
10 Dr. Katsaggelos's opinion on what the meaning of
11 the term "non-uniform" is?

12 Is that your question?

13 Q. Yes.

14 A. No. I mean, if I did not offer any
15 opinion, I -- you know, I did not offer any
16 opinion. So I'm not going to offer any opinion.
17 In my declaration, I did not offer any opinion.

18 Q. Is there a reason why?

19 A. I mean, do I have to have a reason? I
20 did not offer any opinion on that.

21 Q. But you don't disagree that
22 Dr. Katsaggelos has a different meaning of
23 non-uniform than you do?

24 MR. SCHMIDT: Objection to form.

25 THE WITNESS: I did not -- I did not

1 offer an opinion on that.

2 BY MS. NGUYEN:

3 Q. But you don't disagree?

4 MR. SCHMIDT: Objection to form.

5 Asked and answered.

6 THE WITNESS: I did not offer an
7 opinion. That's my answer.

8 BY MS. NGUYEN:

9 Q. Okay. So Dr. Foroosh, Exhibit 2027 --
10 I believe you have that with you, right? I handed
11 it to you. On the last page of Exhibit 2027 --

12 A. Is that my declaration?

13 Q. Correct.

14 A. On the last page, you said?

15 Q. Correct.

16 A. Yes.

17 Q. -- it has your signature; is that
18 right?

19 A. Correct.

20 Q. And you signed your declaration,
21 right?

22 A. Correct.

23 Q. And before the proceeding -- or before
24 the deposition began, counsel handed me what seems
25 to be an errata sheet, correct?

1 A. Correct.

2 Q. And this is an errata sheet that we're
3 going to mark as Exhibit 1.

4 (Petitioner's Exhibit No. 1 was
5 marked for identification.)

6 BY MS. NGUYEN:

7 Q. So you signed the errata sheet; is
8 that correct, Dr. Foroosh?

9 A. Correct.

10 Q. And this errata sheet includes what
11 looks like five corrections that you would like to
12 be made to your declaration, Exhibit 2027?

13 A. Correct.

14 Q. Are there any other changes you would
15 like to be made to your declaration, Exhibit 2027?

16 A. I did not notice any other errors.

17 Q. Okay. So let's turn back to the '413
18 patent, column 1, starting at line 4.

19 Okay. So column 1 of the '413 patent
20 starting at line 4 has a paragraph in the
21 background section, right?

22 A. Yes.

23 Q. And the background section of the '413
24 specification, line 6, it discusses converting
25 between aspect ratios as a common problem in the

1 field of image and video processing -- sorry -- yes
2 -- image and video processing.

3 Do you see that?

4 A. I see that.

5 Q. Do you agree with this statement?

6 A. It says what it says. It says that
7 converting between aspect ratio is a common problem
8 in the field of image and video processing.

9 Q. Do you agree with this statement?

10 A. Again, it says what it says.

11 Q. Do you disagree with this statement?

12 A. I neither agree or disagree. It says
13 -- I can read it as you read it.

14 It says that the converting between
15 aspect ratios is a common problem in the field of
16 image and video processing.

17 Q. And you believe that you are a POSITA
18 for the '413 patent, correct?

19 A. I believe that, as of the proprietary
20 date, I was --

21 Q. And you --

22 A. -- a POSITA.

23 Q. -- had no opinion with respect to
24 whether converting between aspect ratios is a
25 common problem in the field of image and video

1 processing at the time of the '413 patent; is that
2 right?

3 A. No, I didn't say that. I said that do
4 -- I think you asked me do I agree or disagree with
5 that. I said it says what it says.

6 You know, is it a common problem?
7 Then it gets into the meaning of what is common and
8 what is not common. I mean, it's a problem. It
9 was a problem back in 2013.

10 Q. Okay. So, then, it goes on to talk
11 about conventional aspect ratio conversion
12 techniques such as cropping, linear scaling and
13 padding?

14 A. Yes.

15 Q. After that, it discusses some of the
16 downsides of conventional conversion techniques,
17 such as cropping, removing content from the image
18 and reducing the field of view of the image, linear
19 scaling and perceivable distortion into the image
20 and padding, resulting in unused display space.

21 Do you see these passages?

22 A. Yes.

23 Q. And would you agree that the '413
24 patent is directed to a technique for aspect ratio
25 conversion?

1 A. Among others, yes.

2 Q. Okay. And that's because the '413
3 patent claims aspect ratio of the input image being
4 different than the aspect ratio of the output
5 image, right?

6 MR. SCHMIDT: Objection to form.

7 THE WITNESS: Well, we can look at the
8 claim. Claim 1, it says: An image capture
9 apparatus comprising an image sensor
10 configured to capture an image -- an input
11 image -- I'm sorry -- having the source
12 aspect ratio, the input image, including
13 pixels located at input positions defined
14 along a first axis and a second axis, the
15 first axis perpendicular to the second
16 axis.

17 And then it goes on saying that the
18 display coupled to one or more physical
19 processors and the one or more physical
20 processors configured by machine-readable
21 instructions to obtain the input image
22 determine a portion within the input image,
23 the portion including a subset of the
24 pixels and apply a transformation to -- to
25 the input image to generate an output

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1 image, the output having a target aspect
2 ratio different than the source aspect
3 ratio.

4 So I'm not going to continue. So it
5 says that there's a source aspect -- source
6 image aspect ratio and a target aspect
7 ratio and apply a transformation to
8 converting from source aspect ratio to the
9 output image aspect ratio.

10 BY MS. NGUYEN:

11 Q. And it says the output image has a
12 target aspect ratio different than the source
13 aspect ratio, right?

14 A. That's what the claim says here. Yes.
15 Target aspect ratio different than the source
16 aspect ratio.

17 Q. And would you agree that the '413
18 patent is trying to improve upon conventional
19 aspect ratio conversion techniques, such as
20 cropping, linearly scaling and padding?

21 A. I would say yes. That's -- that
22 certainly was one of the motivations to do that.

23 Q. And would you agree that the '413
24 patent is not trying to avoid distortion?

25 A. Actually, I think that the '413 patent

1 went out of its way back at the proprietary date to
2 come up with the concept of introducing
3 distortions.

4 Q. Okay. So let's go to your
5 declaration, Exhibit 2027, paragraph 107. Let me
6 know when you're there.

7 A. Yes. I'm there.

8 Q. Okay. So, paragraph 107 of your
9 declaration, the last line, you state that
10 Dr. Katsaggelos agreed that the conversion of the
11 aspect ratio will always involve some distortion.

12 A. I see that.

13 Q. Do you agree with Dr. Katsaggelos?

14 A. Conversion of aspect ratio, yes, it
15 would involve some distortions.

16 Q. Okay. So let's turn to paragraph 63
17 of your declaration.

18 A. Yes.

19 Q. And in paragraph 63 of your
20 declaration, you discuss a user-selected mode?

21 A. Yes.

22 Q. I believe you're discussing a
23 user-selected mode of the '413 patent; is that
24 right?

25 A. That's right, yes.

1 Q. Okay. And in your opinion, the
2 user-selected mode described in the '413
3 specification is encompassed by the '413 patent
4 claims; is that right?

5 A. Yes.

6 Q. Can you explain to me how the
7 user-selected mode of the '413 patent works?

8 MR. SCHMIDT: Objection to form.

9 THE WITNESS: This is a too general
10 question. What do you mean, can I explain
11 to you how the selection of a user-selected
12 mode?

13 BY MS. NGUYEN:

14 Q. Yeah. So, I'm asking a general
15 question because I just don't know.

16 A. Yeah.

17 Q. I guess let's start by your paragraph
18 63.

19 A. Yes.

20 Q. The second sentence, you say: A
21 user-selected mode can configure a warping
22 function?

23 A. Yes.

24 Q. So is the user -- how is the user
25 selecting a mode that configures a warping

1 function?

2 A. So again, referring to the '413
3 patent. For instance, it could be the pad's
4 disclosing its specification. It could be, for
5 instance, Superview, linear view or Wide view.
6 Those are modes that are selected by the user too.

7 So, under that paragraph, I'm
8 referring to those user-selected modes.

9 Q. So is this on a display screen, and
10 the user is selecting between Superview or Wide
11 view?

12 Is it a menu?

13 A. Well, this is getting into
14 implementations. I'm not going to speculate on
15 that. That requires looking at the product, seeing
16 how it is done. The patent is talking about that
17 one example, the example of user-selected mode.

18 Q. Okay. So -- yes. I'm not asking you
19 to talk about the product. But the '413 patent,
20 when you say "a user-selected mode can configure a
21 warping function."

22 A. Uh-huh, yes. That's correct.

23 Q. What I'm trying to understand is how
24 is the user configuring a warping function?

25 A. You mean how it is implemented?

1 Q. No. No. No. How is the user --
2 okay. Again, paragraph 63 where you say a
3 user-selected mode can configure a warping
4 function. Not how is it implemented. But how is
5 the user selecting a mode to configure a warping
6 function?

7 A. What user selects, the warping
8 function. Another example would be a user-selected
9 mode.

10 A user-selected mode can configure a
11 warping function, which is later applied to the
12 image, so that the less distortion occurs in a
13 center portion, such as in GoPro's commercial
14 embodiments which allow a user to select between
15 different modes, e.g. Superview or Wide view, that
16 results in a warping grid that determines different
17 less distorted portions when applied to the image.
18 '413 patent at Abstract, in one embodiment, the
19 output image is non-linearly warped relative to the
20 input image such that a distortion in the output
21 image relative to the input image is greater in the
22 corner region of the output image than a center
23 region of the output image.

24 And then I'm referring to page numbers
25 and -- I'm sorry -- the column and line numbers.

1 Q. Okay. But how -- oh, go ahead.

2 A. Well, I guess I don't understand your
3 question. What do you mean how the user does this?
4 From my point of view, that gets into
5 implementation.

6 Q. Implementation of what?

7 A. How it is -- how the user is
8 selecting. Earlier, you said does the user select
9 it on a screen. I mean, this is a more general
10 question. It gets into -- or rather it gets into
11 implementation details. That's not what I
12 considered in expressing my opinion here, how it is
13 implemented. I wasn't concerned with that in that
14 paragraph.

15 Q. Okay. Maybe you can explain this
16 paragraph. I'm having a hard time understanding
17 it. What are you saying in paragraph 63 of your
18 declaration?

19 A. I'm saying that one example is a
20 user-selected mode. But that user-selected mode
21 can configure the warping function. That's -- I
22 think the first two sentences is basically
23 describing it. It says one example is a
24 user-selected mode. And that user-selected mode
25 defines the warping function. That defines the

1 non-linear function that you're going to use for
2 warping.

3 Q. What do you mean by "configure"?

4 A. Well, it defines that non-linear
5 function that is used for warping the image.

6 Q. So, then you say "a user-selected
7 mode." Does that mean a user selects a mode?

8 A. Yes.

9 Q. Okay.

10 A. That's one example.

11 Q. Okay.

12 A. That's one example. The user selects
13 a mode. For instance, Superview, Wide view or
14 linear view.

15 And there was another example that I
16 was discussing is that the -- that because I'm --
17 I'm talking in the context of Claim 1. A portion
18 needs to be determined and that a non-linear
19 transformation needs to be applied to that portion.
20 So those are two specific steps after the image --
21 taking the image step.

22 So I'm saying that that user selects
23 -- one example is that user selects the mode that
24 configures or defines that that non-linear
25 transformation would be applied.

1 Q. So then the mode that the user
2 selects, there are multiple modes; is that right?

3 A. So, I'm saying that with a
4 user-selected mode, there are multiple options
5 probably in the mode, what I'm referring to as a
6 single mode here. I'm saying that one example is
7 that user-selected mode. And the other example
8 could be, for instance, the determining step of the
9 portion could be dynamic. That is determined --

10 Q. Okay.

11 A. You know it could be a moving object,
12 for instance. But -- but here, I'm not talking
13 about that. I'm talking about specifically the
14 step three, if I call it, is configuring the
15 transformation, the warping that needs to be
16 applied. And that could be user selected. Like
17 for instance, Superview, Wide view.

18 Q. Okay. Perhaps I don't understand.
19 How does the user select between Superview or Wide
20 view, as an example? Is it the user is holding a
21 camera and pushing a button, or is the user at a
22 computer typing code? This is where I don't
23 understand.

24 A. No. I don't think user is typing
25 code, but user is selecting mode. How -- the user

1 is selecting the mode. Those are implementation
2 details.

3 Q. But the user could be selecting the
4 mode on a button?

5 A. On the camera. It could be a button.
6 It could be a dial. It could be on the screen.
7 There could be many ways of selecting the mode.
8 And I don't want to get into how the user is
9 selecting the mode. It could be many different
10 options implemented on the camera.

11 So, but that's one example where we
12 have a user-selected mode. That's what I'm saying.
13 You're saying how is it selected. I don't know. I
14 mean, it could be many different ways. Those are
15 implementation details.

16 Q. Okay. I think I -- I think I
17 understand.

18 Okay. So, Dr. Foroosh, you were hired
19 as an expert by GoPro, right?

20 A. Yes.

21 Q. How many times have you represented
22 GoPro?

23 A. This is my first time.

24 Q. Your first time.

25 And how many times have you worked

1 with the law firm of Quinn and Emanuel before this
2 IPR?

3 A. Off the top of my head, I didn't work
4 with Quinn and Emanuel before. But there was a
5 case where they asked me to -- I don't know what
6 the legal term is -- jointer. I think it's called
7 jointer expert or something like that. Again, I
8 don't remember the legal term.

9 So there was a case where Quinn and
10 Emanuel was not involved, but they were interested
11 in that case. And they asked me that if it gets
12 settled, they want to come -- come to me and
13 potentially work with me.

14 Q. Okay.

15 A. So I did sign, I think, a contract.
16 This was quite a while ago. So I don't remember.
17 I did sign a contract that if the case is settled,
18 then I agreed to work with them or something like
19 that.

20 Q. And when did you begin working on this
21 IPR proceeding?

22 A. Sometime last year, 2024. I don't
23 exactly remember the date.

24 Q. And were you familiar with the '413
25 patent before you began your work on this IPR

1 proceeding?

2 A. No. But I was familiar with GoPro
3 products.

4 Q. Okay. Were you familiar with any of
5 the prior art involved in the '413 IPR proceeding
6 before you began your work?

7 A. No. I did not consider these.

8 Q. So let's take a look at paragraph 9 of
9 your declaration.

10 A. Paragraph 9, you said?

11 Q. Yes. Yes.

12 A. Yes.

13 Q. Okay. So paragraph 9 is talking about
14 the number of courses you've taught. And then at
15 the bottom, it talks about someone's dissertation?

16 A. Yes.

17 Q. Where it involved working with a GoPro
18 camera system for mobile aerial platforms?

19 A. Yes.

20 Q. All right. So let's go to paragraph
21 11. I believe we're still talking about your work
22 as a professor; is that right?

23 A. Yes.

24 Q. That's the research that you're
25 referring to?

1 A. Yes.

2 Q. And in the middle of paragraph 11,
3 you, again, mentioned a GoPro camera system and
4 software?

5 A. Yes.

6 Q. Okay. So, it looks like you're pretty
7 familiar with the GoPro cameras, right?

8 A. I mean, that term "pretty familiar" is
9 ambiguous. I don't know what you mean. But I've
10 used them, yes, before in my projects.

11 Q. In your projects as a professor?

12 A. Yes.

13 Q. Okay. Do a lot of your research
14 projects as a professor involve GoPro cameras?

15 A. Only the ones that I cited here.

16 Q. Okay. And has GoPro funded any of
17 your research work as a professor?

18 A. Never.

19 Q. You didn't receive any gifts from
20 GoPro for any of these research projects?

21 A. Never.

22 Q. Is there a reason why you use GoPro
23 cameras in your research projects?

24 A. Yes. The good reason was that we
25 found out they had features like Superview and

1 other features, stabilization features that were
2 perfect for our application. In my research, I
3 didn't want to reinvent the wheel. The wheel was
4 already there. So off the shelf, we wanted to use
5 it.

6 Q. Okay. And have you ever sought money,
7 grant money from GoPro for any of your research?

8 A. Never.

9 Q. Okay. Do you anticipate asking GoPro
10 for any research money in the future?

11 A. I don't.

12 Q. So talking about the GoPro cameras,
13 were there any other cameras at the time of the
14 '413 patent that you were familiar with?

15 A. Oh, I've been in this domain for over
16 30 years. I've used many different types of
17 cameras. I think -- I mean, even different
18 modalities. Not just electrooptical. I used FLIR,
19 polarized, et cetera. So I've used many different
20 cameras.

21 Q. I think you said FLIR, right?

22 A. Yes, FLIR.

23 Q. F-L-I-R?

24 A. F-L-I-R, yes. That's forward-looking
25 infrared.

1 Q. So you would consider yourself
2 familiar with the cameras that were available at
3 the time of the '413 patent?

4 A. I would say so. Yes.

5 Q. And the cameras that were available at
6 the time of the '413 patent, did they include
7 built-in displays?

8 A. Some did.

9 Q. Okay. And did some of the cameras
10 that were available at the time of the '413 patent
11 include image sensors to capture an image?

12 A. Well, if a camera doesn't have an
13 image sensor, then I don't think it's a camera.

14 Q. Right. Okay.

15 And at the time of the '413 patent,
16 were some of the devices that were available -- did
17 they capture an image and then display that
18 camera-captured image on its built-in display?

19 A. As I said, some of those cameras back
20 then, to my recollection, had a display. And
21 therefore, they displayed. Yes.

22 Q. Okay. And you would consider yourself
23 knowledgeable about how the cameras at the time of
24 the '413 patent used the image sensor to capture an
25 image?

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1 A. How -- that's an ambiguous question.
2 What do you mean how did they use in order to --
3 what do you mean by that?

4 Q. So, if I were to have you draw a
5 diagram, okay, of how -- a general diagram of how
6 an image -- sorry -- how a camera works at the time
7 of the '413 patent, do you think you'd be able to
8 do that?

9 A. Even if I'm able to, I wouldn't do
10 that on the fly, draw because I don't think these
11 are -- I don't believe that I expressed any
12 opinions about these things in my declaration.

13 Q. Okay. Understood.

14 But you think you'd be able to do
15 that? I'm not asking you to draw it. Not today.

16 A. I'm an expert in imaging. So I mean,
17 again, the word "camera" is such a general term.
18 Does it -- in most public domain, most people think
19 about, what I call "electrooptical camera," which
20 is like the types of cameras we're dealing with.
21 But there are tons of types of other cameras.

22 Q. Sure.

23 A. So this is a very general question.
24 You know, saying can you do that. So the ones I'm
25 familiar with, yes.

1 Q. Okay. So do you know in a camera,
2 there's an image sensor, as we talked about, that
3 captures an image. Do you know what happens right
4 after the image sensor captures an image?

5 MR. SCHMIDT: Objection. Form.

6 THE WITNESS: I don't think I
7 expressed any opinion on that in my
8 declaration.

9 BY MS. NGUYEN:

10 Q. But do you know?

11 A. Again, I did not express any opinion
12 on that.

13 Q. Okay. So you're not willing to say
14 whether you know or not?

15 A. Well, my knowledge, I think, is
16 relevant to here because -- in the sense that I did
17 not express my opinion. If you related to anything
18 in my declaration, I will be more than happy to
19 answer that.

20 Q. So in your declaration -- if you go to
21 paragraph 100 of your declaration. Oh, sorry.

22 A. Yes. I'm there.

23 Q. Sorry. I meant paragraph 53. So in
24 paragraph 53. Let me know when you're there.

25 A. I'm there.

1 Q. You talk about Claim 1, I believe, of
2 the '413 patent?

3 A. Yes.

4 Q. And you say: The input image comes
5 from the image sensor?

6 A. Yes.

7 Q. What do you mean by "comes from the
8 image sensor"?

9 A. It's that it's taken by the image
10 sensor.

11 Q. Does anything happen after the input
12 image is taken from the image sensor?

13 MR. SCHMIDT: Objection to form.

14 THE WITNESS: Again, I did not -- what
15 do you mean by "anything"? I mean, that's
16 a very general term. Unless you
17 specifically refer to a specific part of
18 the patent or my declaration, I can say
19 this is what happens. I mean, does
20 anything happen is a very general question.

21 BY MS. NGUYEN:

22 Q. Okay. So let me reask that.

23 What happens after the input image is
24 taken from the image sensor?

25 MR. SCHMIDT: Objection to form.

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1 THE WITNESS: Again, this is general.
2 Would you like to refer to anywhere in my
3 declaration where I discuss that?

4 BY MS. NGUYEN:

5 Q. Yeah. Exactly the same sentence. I'm
6 trying to understand what you mean by "comes from."

7 A. Well, captured. Is acquired by the
8 image sensor on the apparatus.

9 Q. So in your opinion, in Claim 1, the
10 input image is captured from the image sensor?

11 A. It's -- image acquisition is performed
12 by the image sensory that is on the apparatus.
13 Yes.

14 Q. And then you continue to say: Of the
15 image capture apparatus that performs the
16 transformation.

17 A. Can you please tell me which
18 paragraph?

19 Q. Oh, same sentence.

20 A. Paragraph 53; is that correct?

21 Q. Yes. Second sentence.

22 A. Second sentence. In Claim 1, the
23 input image comes from -- I'm sorry-- image sensor
24 of the image capture apparatus that performs the
25 transformation.

1 Yes. What was your question? I'm
2 sorry.

3 Q. My question was what happens after the
4 input image comes from the image sensor?

5 MR. SCHMIDT: Objection to form.
6 BY MS. NGUYEN:

7 Q. And when I asked you that last time,
8 you asked me to refer you to where you talk about
9 that. And I'm referring to where you talk about
10 that.

11 A. I mean, again, so what happens
12 afterwards? So this is just, you're referring to
13 one sentence I put here. The only thing I'm
14 saying, the apparatus that performs the
15 transformation. So I'm referring to
16 transformation.

17 But your question is very general.
18 You know, unless -- again, that question is just
19 talking about the fact that input image is captured
20 by the sensor embedded in the apparatus. That's
21 what I'm saying there in that sentence.

22 Q. Okay. And what about the aspect ratio
23 of the input image that you're referring to here in
24 paragraph 53 of your declaration? Is the aspect
25 ratio of the image captured from the image sensor?

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1 Has that changed after it's captured?

2 A. Where do I refer to aspect ratio in
3 paragraph 53?

4 Q. No. I'm asking you a question about
5 its aspect ratio.

6 A. Oh. So it's not in paragraph 53
7 you're referring to?

8 Q. No. No. I'm referring to the second
9 sentence of paragraph 53. You're talking about an
10 input image --

11 A. Yes.

12 Q. -- coming from the image sensor?

13 A. Yes.

14 Q. So my question is about the input
15 image that you're referring to in paragraph 53.

16 A. Yes.

17 Q. Does that input image have an aspect
18 ratio that gets changed after it's captured by the
19 image sensor?

20 A. Again, you're putting it in -- in a
21 whole, one sentence. We can go back to Claim 1 of
22 '413 patent. Do you want me to go back and read
23 it?

24 Q. Sure. Sure.

25 A. Sure. So if you look at Claim 1, it

1 basically describes the steps.

2 It says: An image capture apparatus
3 comprising: an image sensor configured to capture
4 an input image having a source aspect ratio, the
5 input image including pixels located at input
6 positions defined along a first axis and a second
7 axis, the first axis perpendicular to the second
8 axis.

9 (Reporter clarification.)

10 THE WITNESS: And then it goes on
11 saying: The display coupled to one or more
12 physical processors. And the one or more
13 physical processors configured by
14 machine-readable instructions to, one,
15 obtain the input image.

16 So, in that sentence that I'm talking
17 about input image, I'm referring to this.

18 Determine a portion within the input
19 image, the portion including a subset of
20 the pixels and apply the transformation to
21 the input image to generate an output
22 image. The output image having a target
23 aspect ratio different than the source
24 aspect ratio. The output image including
25 the pixels located at output positions

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1 defined along the first axis and the second
2 axis.

3 And then it continues from there
4 additional. Do you want me to continue to
5 read?

6 So I'm saying that in that paragraph
7 53, basically I'm referring to this first
8 step that the image sensor on the apparatus
9 is capturing the input image.

10 BY MS. NGUYEN:

11 Q. Right. And in paragraph 53, same
12 sentence, second sentence only, you're also
13 referring to the image capture apparatus performing
14 the transformation?

15 A. Yes. Transformation.

16 Q. This is -- I think what you're
17 referring to is the apply a transformation
18 limitation of Claim 1 of the '413; is that right?

19 A. I do.

20 Q. Okay. And so this apply a
21 transformation limitation changes the aspect ratio,
22 right?

23 A. Among others.

24 Q. Okay. Among others.

25 Does anything else change the aspect

1 ratio, any other step?

2 A. Well, no. I mean -- when I say "among
3 others" is that it performs non-uniform shifting of
4 pixels by applying a non-warping. So it introduces
5 distortions. It's not just aspect ratio change but
6 this process of changing the aspect ratio, it
7 introduces distortions in a non-linear fashion.

8 Q. Okay. But is the aspect ratio changed
9 by any other step other than to apply a
10 transformation step in the '413 claims?

11 A. Not in the claims. No.

12 Q. Okay. Let me hand you -- I don't
13 think you have Dr. Katsaggelos's declaration.

14 (Petitioner's Exhibit No. 1002 was
15 marked for identification.)

16 BY MS. NGUYEN:

17 Q. And if you can go to paragraph 100.

18 A. Yes.

19 Q. So in paragraph 100, Dr. Katsaggelos
20 -- starting at line 9 -- line 7. Sorry. It is a
21 one paragraph.

22 A. Paragraph 100. You said starting at
23 line 7?

24 Q. Yes.

25 A. Is that what you said? Yes.

1 Q. So Dr. Katsaggelos is talking about
2 cameras at the time of the '413 patent. Okay?

3 A. Can you tell me which sentence you
4 want me to read?

5 Q. Yes. Hold on. I just want to make
6 sure we're at paragraph -- I mean, just paragraph
7 100 starting at line 7. You're there. Yes?

8 A. Yes.

9 Q. Okay. So, that sentence.
10 Dr. Katsaggelos talks about the aspect ratio of
11 images captured by cameras at the time of the '413
12 patent.

13 Okay? You're still with me?

14 A. Yes. It says: The aspect ratios of
15 images captured by an image sensor were, e.g., 3:2
16 or 4:3.

17 Q. Okay. And he talks about these aspect
18 ratios being different than the aspect ratio of the
19 images stored in memory or displayed on the display
20 of a camera.

21 Do you see that?

22 A. You mean the next sentence?

23 However, the files that stored the
24 captured images may be in a format for a different
25 aspect ratio, such as 16:9, (e.g., for landscape

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1 orientation) or the LCD displays within the camera
2 may have a different aspect ratio, such as 16:10 --
3 16:10 -- I'm sorry -- (for viewing the captured
4 image).

5 Is that the sentence you're referring
6 to?

7 Q. Yes. Yes.

8 A. Yes, I see that.

9 Q. Do you agree with Dr. Katsaggelos?

10 MR. SCHMIDT: Objection. Form.

11 THE WITNESS: No.

12 BY MS. NGUYEN:

13 Q. Okay. Why is that?

14 A. I think there's no evidence that
15 cameras at the time would have an imaging sensor
16 that would capture in one aspect ratio and then
17 save it in a file in a different aspect ratio.

18 And I think in fact, not only that
19 there is no evidence that there was such a thing
20 back in 2013. I think that would have been a major
21 design problem because that means that the
22 designers of the camera didn't think about that,
23 Hey, I have a sensor of one aspect ratio on the
24 same device than if they had put a display that is
25 displaying in a different aspect ratio. Not only

1 there is no evidence of that, I think that claim, I
2 disagree with.

3 Q. Okay. You were familiar with cameras
4 at the time of the '413 patent, right?

5 A. Well, yes. I mean, in general. Yes,
6 I know of the technology at that time.

7 Q. In your experience, did you encounter
8 any cameras that had an image sensor with one
9 aspect ratio and a display in another aspect ratio
10 at the time of the '413 patent?

11 MR. SCHMIDT: Objection to form.

12 THE WITNESS: Again, I don't believe
13 there is evidence of that.

14 BY MS. NGUYEN:

15 Q. Did you have experience finding any
16 cameras like that?

17 A. No. I don't remember any experience
18 on that.

19 But as I said, not only no evidence of
20 that, I think that would have been a major design
21 error or manufacturing error because why
22 intentionally have the image sensor in one aspect
23 ratio, whereas the display is using a different
24 aspect ratio. I think that would be very costly,
25 increase the complexity of the camera. I don't

1 believe that that was the case, no.

2 Q. Okay. Okay. And Dr. Foroosh,
3 earlier, you said you've -- you have experience
4 working with image processing, right?

5 A. I've worked in this area over
6 30 years.

7 Q. Over 30 years. Got it.

8 So in your experience, have you ever
9 heard of the term "lookup tables"?

10 A. Did I ever express any opinion about
11 lookup tables in my declaration?

12 Q. I don't know. I'm just asking if
13 you've heard the term.

14 A. Well, whether -- again, I'm not -- I'm
15 asking you -- I didn't express any opinion. Even
16 if I heard about lookup tables, I never expressed
17 any opinion in my declaration or anything to do
18 with lookup tables.

19 Q. Okay. So you've never heard the term
20 "lookup tables"?

21 A. I did not say that. I didn't say that
22 I don't know what lookup tables are. I did not say
23 that I did or did not. I'm just saying that I
24 expressed no opinion on lookup tables in my
25 declaration.

1 Q. Okay. So outside of your declaration,
2 do you know what a lookup table is?

3 A. Again, same answer. I never
4 expressed -- I know what they are, but I never
5 expressed any opinion.

6 Q. Okay. What is a lookup table?

7 A. You want me to express an opinion
8 outside my declaration? If you show me how it is
9 related to my declaration, then I would be more
10 than glad to specify.

11 Q. No. I'm asking you a question
12 relating to what a POSITA would understand what a
13 lookup table would be.

14 MR. SCHMIDT: Objection to form.

15 THE WITNESS: Same answer. I did not
16 express any opinion on that in my
17 declaration, what a POSITA would think to
18 what a lookup table is.

19 BY MS. NGUYEN:

20 Q. So you're not willing to express an
21 opinion because it's not in your declaration; is
22 that right?

23 A. I am not giving an opinion on the fly
24 here because I never expressed any opinion in my
25 declaration on that subject.

1 Q. About lookup tables?
2 A. About lookup tables.
3 Q. But you know what they are?
4 A. I know what lookup tables are. Sure.
5 Q. And they were around at the time of
6 the '413 patent, right?

7 MR. SCHMIDT: Objection. Form.

8 THE WITNESS: Again, I did not --
9 you're asking me to express an opinion. I
10 did not express any opinion on lookup
11 tables as of the proprietary date of the
12 patent.

13 BY MS. NGUYEN:

14 Q. Right. But were they around at the
15 time of the '413 patent?

16 MR. SCHMIDT: Objection to form.
17 Asked and answered. Scope.

18 THE WITNESS: Again, same answer. You
19 know, I'm -- I did not express any opinion
20 on lookup tables, whether they were
21 available or not. I did not express any
22 opinion on that as of, you know, in my
23 declaration.

24 BY MS. NGUYEN:

25 Q. Okay. So let's take a look at

1 paragraph 58 of your declaration.

2 A. Sorry. What paragraph did you say?

3 Q. 58. Okay. So in paragraph 58, you
4 discuss camera applications?

5 A. Do you want me to read it?

6 Q. No. What does a camera application
7 do?

8 A. So I need to read what I say here.

9 Even assuming there's a mismatch
10 between the display screen and image sensor of
11 Meulen's device, conventional camera applications
12 for mobile devices like those described in Meulen
13 used much simpler, alternative techniques for
14 dealing with the aspect ratio issue, such as
15 cropping, padding or linear scaling.

16 I'm here -- by camera applications,
17 I'm referring to the software tools that --
18 software tools that implement the methods that
19 Meulen is talking about for aspect ratio change.

20 Q. But you say here in paragraph 58:
21 These techniques were considered sufficient for
22 previewing content on mobile devices at the
23 relevant time?

24 A. Yes. I see that.

25 Q. So in your opinion, does the camera

1 application allow previewing content on mobile
2 devises at the relevant time?

3 A. Yes. At the time, some cameras had
4 the previewing capabilities.

5 Q. Okay. And do some cameras -- sorry --
6 camera applications allow capturing images at the
7 time of the '413 patent?

8 A. Well, I'm not -- I'm not -- when I
9 talk about camera application, I'm talking about
10 capturing here. I'm saying that -- camera
11 applications, I'm referring to methods that once
12 the image is captured, that they would change the
13 aspect ratio.

14 That's what I'm talking about when I
15 say "camera application." So talking about the
16 softwares that they use in the cameras at the time.
17 I'm saying that for aspect ratio change, they would
18 be using cropping, padding and linear scaling.
19 That was the -- that was the common approaches to
20 be applied to the input image that is taken by the
21 sensor.

22 Q. Okay. 1007.

23 (Petitioner's Exhibit No. 1007 was
24 marked for identification.)

25 BY MS. NGUYEN:

1 Q. So let's turn to column 1, line 26 of
2 Meulen.

3 A. Column 1, line 26.

4 Q. Yep. And would you agree that column
5 1, line 26 of Meulen is located in its background
6 section?

7 A. Yes.

8 Q. And starting at the same line, line
9 26, it talks about conventional best fit algorithms
10 and that they produce a black bar on the square
11 displays.

12 Do you see that?

13 A. So if you read that, it says:
14 Conventional best fit algorithms such as those
15 defined by the synchronized multimedia integration
16 language, SMIL, specification may be suitable for
17 fitting content to non-square displays but produce
18 a black bar on square displays.

19 Is that the sentences you're referring
20 to?

21 Q. Yep. Do you see that?

22 A. Yes.

23 Q. Okay. And then the next sentence
24 says: Consequently, there may be a need for
25 improved display systems and techniques for a

1 wireless device?

2 A. I see that.

3 Q. Okay. And would you agree that Meulen
4 does not perform padding?

5 A. In that sentence, does not mention
6 that. But, it could be one of the other operations
7 that we discussed, you know, like linear scaling.
8 It doesn't say what it doesn't do in that sentence.
9 I'm not going to speculate on that.

10 Q. Okay. But when it talks about
11 producing a black bar on square displays, is it
12 referring to padding?

13 A. Padding gives you -- yes.

14 Q. Okay. So then let's go to column 2,
15 line 2.

16 A. Yes.

17 Q. It says: In such implementations, a
18 wireless device having a square or substantially
19 square display may be arranged to emulate a
20 non-square display and to better match the aspect
21 ratio of typical video content without cropping.

22 A. Yes. I see that.

23 Q. Would you agree that Meulen does not
24 perform cropping?

25 A. Okay. Let me read that sentence.

1 Q. Yeah.

2 A. In such implementations, a wireless
3 device having a square or substantially square
4 display may be arranged to emulate a non-square
5 display and to better match the aspect ratio of
6 typical video content without cropping.

7 Yes, I see that.

8 Q. But do you agree that Meulen does not
9 perform cropping?

10 A. Meulen is not doing cropping, but --
11 yes. I mean, in that sentence, it says that Meulen
12 is not doing cropping.

13 Q. Okay. So let's look at Figure 5 in
14 Meulen.

15 A. Yes.

16 Q. Figure 5 illustrates some of the
17 components in Meulen's wireless device, right?

18 A. Yes.

19 Q. And one component included in Figure 5
20 in the wireless device is display controller 504?

21 A. Yes.

22 Q. Would you agree that display
23 controller 504 is a processor?

24 A. It might be. Because there is a
25 separate processor. No, I don't necessarily say

1 it's a processor. Otherwise, why do they have a
2 processor? So it says processor is 510. Display
3 controller might be a processor.

4 Q. Okay. Turning back to your
5 declaration paragraph 48. In paragraph 48, you
6 describe Table 1 of Meulen?

7 A. Yes.

8 Q. Sorry. Paragraph 48. You actually
9 reproduced Table 1.

10 Okay. And in paragraph 48 -- feel
11 free to read it, and then I can ask.

12 A. Okay. It says: The aspect ratio
13 conversion described in Meulen is a piece-wise
14 linear transformation where certain pre-specified
15 regions are compressed at pre-designated ratios.
16 Table 1 provides one specific implementation of
17 this conversion where the portion covering the
18 middle 200 horizontal pixels are not compressed,
19 whereas the first and last portions of 10
20 horizontal pixels are compressed at a "4:1" ratio.

21 And then I refer to Exhibit 1007,
22 column 6, lines 4 through 37 and then the table.

23 Q. Yes.

24 So you talk about this portion
25 covering the middle 200 horizontal pixels which are

1 not compressed, and then the first and last
2 portions of 10 horizontal pixels are compressed at
3 a 4:1 ratio?

4 A. Yes. I refer to that.

5 Q. So would you agree that Meulen's image
6 compression and/or scaling method is not the same
7 in all parts or areas of the image?

8 A. Not the same does not mean non-linear,
9 if that's what you're referring to.

10 Q. No, that's not what I'm referring to.
11 Are they the same?

12 A. With the compressions at the center or
13 at the borders, ten border, ten pixels.
14 Compression at the center 200 pixels versus the ten
15 pixels on the edges are not the same.

16 Q. Okay. And in your opinion, Meulen
17 uses the term "compression," right?

18 A. Yes.

19 Q. Does Meulen use the term "compression"
20 according to its ordinary and customary meaning?

21 A. Yes, in the context. Because the word
22 compression depends on the context of the subject
23 matter also. But generally speaking, even those
24 differences are subtle. Yes, I think -- as I said,
25 that I'm treating all the terms as the plain and

1 customary.

2 Q. And Meulen uses the word "scaling,"
3 right?

4 A. Yes.

5 Q. And so, you said that you're treating
6 all the terms according to its ordinary and
7 customary meaning. That includes Meulen's use of
8 the word "scaling"?

9 A. Yes. I do treat all the terms as
10 their plain and customary meaning.

11 Q. Okay. Going to paragraph 71 of your
12 declaration. And actually, the end of paragraph
13 71, there's an image.

14 A. Yes. So that's on page 29, is it?

15 Q. Correct. Correct.

16 So Dr. Foroosh, where did this image
17 come from?

18 A. It's my own. I created it. It's my
19 own.

20 Q. So you created the image?

21 A. Uh-huh.

22 Q. What is the label for the X axis?

23 A. Oh, I -- it's not labeled. So it
24 could be X and Y there.

25 Q. Right. But what do you mean for that

1 X axis to represent?

2 A. This is not related to X in the image
3 or Y in the image. So these are not referring to
4 axis in the image.

5 Q. Okay.

6 A. I'm just discussing here -- may I read
7 this?

8 Q. Yes. Go ahead.

9 A. So it says: A classic example -- and
10 this is still paragraph 71, somewhere in the
11 middle.

12 I say that the classic example is
13 using multiple rectangles to find the area under a
14 curve. Instead of performing a non-linear
15 calculation, the area is divided into multiple
16 rectangles, whose areas are significantly easier to
17 calculate.

18 So that's what I'm referring to.

19 Using a linear calculation, i.e.,
20 height multiplied by width. So areas of rectangles
21 are easier to calculate. Since there are multiple
22 rectangles, this constitutes a piece-wise linear
23 transformation.

24 So that graph is just a depiction of
25 those sentences I read.

1 Q. Okay. So you say: Multiple
2 rectangles to find the area under a curve?

3 A. Right.

4 Q. The area of the image?

5 A. No. As I said, I'm talking -- I'm
6 trying to give an example of piece-wise linear.
7 I'm saying that this is something that, you know,
8 it's known what piece-wise linear means. And
9 piece-wise linear -- and a good example of that
10 piece-wise linear is when you have a function, you
11 want to integrate that. You know, I have been
12 avoiding technical details. That would give you
13 the area under the curve between two ends.

14 I'm saying that one way of
15 approximating that area under that curve is divided
16 into parts. And each part approximated with the
17 rectangle and the sum of those rectangles. This is
18 a piece-wise linear approach to estimate the area
19 under this curve. That's what I'm saying.

20 I'm saying that this is different from
21 exactly -- this is approximately -- this is
22 approximating the area under the curve. It's not
23 giving us the area under the curve. I'm trying to
24 draw a parallel that piece-wise linear is not the
25 same as non-linear.

1 Q. So this figure -- and I'm just having
2 a hard time understanding this figure because I
3 don't know what it represents.

4 It doesn't represent an image. Is
5 that what you're saying?

6 A. That is correct.

7 Q. Okay. So let's start with the first
8 rectangle on the left.

9 A. Yes.

10 Q. The bottom left corner of the first
11 rectangle is at -- I'll say 00?

12 A. Yes. At the origin.

13 Q. And then the bottom right corner of
14 that same left-most rectangle, what does that
15 represent?

16 A. Some coordinates along the X axis for
17 that curve.

18 Q. The coordinate for the curve but not
19 the coordinate for the image?

20 A. No. Again, let me be clear.

21 Q. Yes. Please.

22 A. This was just an example of the
23 piece-wise linear approximation. I'm saying that a
24 classic example of a piece-wise approximation is
25 using rectangles to estimate the area under a

1 curve. That curve is non-linear. You can see it's
2 not a line. It's non-linear. You try to estimate
3 that by dividing into pieces and estimate the area
4 under the curve.

5 That's all I'm saying. I'm just
6 giving an example that has nothing to do with image
7 processing. I'm saying that a classical example of
8 using, you know, piece-wise linear approach is this
9 one.

10 You know, a POSITA would be familiar,
11 for instance, from undergraduate studies what is
12 meant by "piece-wise linear" by coming across a
13 simple example in math like this. This is a
14 mathematical parallel that I'm showing. I'm saying
15 what -- the POSITA would know what piece-wise
16 linear is. It's only an approximation to a
17 non-linear curve.

18 Q. So this image is a mathematical
19 representation; is that right?

20 A. It's an example. As I said, it's an
21 example where I'm saying that using multiple
22 rectangles, which is a piece-wise linear approach,
23 you can find the area under the curve.

24 MR. SCHMIDT: Counsel, we're at about
25 an hour again. So whenever you get to a

1 break.

2 MS. NGUYEN: It'll be soon.

3 BY MS. NGUYEN:

4 Q. So in your figure, there are four
5 approximations, is that right, because there are
6 four rectangles?

7 A. No. There are four pieces. So
8 piece-wise linear, that means that you divide the
9 problem into pieces, and you treat -- you
10 approximate each piece by a linear function.

11 So here, I have an example. It's a
12 one-dimensional function, if you want to, where
13 it's a curve. And I'm saying that one can
14 approximate that non-linear function with a set of
15 rectangles. Each of them is linear now.

16 And then if you want, for instance, to
17 find the area under that curve, it becomes a simple
18 complexity review, if you want to. It becomes a
19 simple matter. But visibly, that area under the
20 curve calculated by those four angles is not the
21 same as the true area under the curve.

22 I'm just trying to show an example of
23 application of piece-wise linear.

24 Q. So, then, how many approximations are
25 shown by this -- this figure?

1 A. Just one approximation.

2 Q. One approximation?

3 A. Just one approximation using four
4 pieces.

5 Q. So you're not approximating for each
6 piece.

7 Is that what you're saying?

8 A. I'm approximating the area under the
9 curve for each piece by some linear model, which is
10 the area of the rectangle. And then I sum them up,
11 and I get an estimate of the area under the curve.
12 But that estimate, obviously, as that graph shows,
13 is not the same as the true area of the curve.

14 So what I'm trying to say is that this
15 curve is not the same as the sum of these four
16 rectangles. Therefore, estimating the area under
17 the curve using those four rectangles is just an
18 approximation.

19 Q. Of the curve?

20 A. Of the area under the curve. Or
21 those -- those four rectangles approximate the
22 curve. That step function that is touching the
23 curve on top, if you want to, is a piece-wise
24 linear approximation of that function. Actually,
25 truly, it's a special case of piece-wising. It's a

1 piece-wise constant.

2 Q. Of a non-linear curve?

3 A. The curve is non-linear. Yes. If the
4 curve was linear, it would be a straight line.

5 Q. Okay. We can take a break.

6 (A brief recess was taken from
7 12:20 p.m. to 12:30 p.m.)

8 BY MS. NGUYEN:

9 Q. So, Dr. Foroosh, going back to
10 paragraph 48 of your declaration, Table 1.

11 A. Yes.

12 Q. So Meulen uses this phrase "image
13 compression and/or scaling."

14 Do you remember that?

15 A. I do remember. But would you like to
16 refer to a line here in paragraph 48?

17 Q. Yeah. Well, we can just go to Meulen.

18 A. Okay.

19 Q. So column 5 of Meulen.

20 A. Yes.

21 Q. Line 16 -- or 15.

22 A. Yes.

23 Q. It says "perform image compression
24 and/or scaling."

25 A. Yes.

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1 Q. Okay. And, image compression and/or
2 scaling, is that what is being performed in Table 1
3 of Meulen?

4 A. It's -- as you can see, it talks about
5 in Table 1, the second row of Table 1, it's talking
6 about compression ratio. So yes, compression
7 ratio.

8 Q. And this is column 5, line 58, is that
9 right, from Meulen?

10 A. No. No. No. I'm referring back to
11 my own.

12 Q. Oh, your declaration. Got it.

13 A. I'm sorry. My declaration.

14 I'm looking at Table 1, which is
15 coming, of course, coming from Meulen. And Table
16 1, the highlighted portion in pink, it says
17 "compression ratios." So, yes. This table -- I
18 mean...

19 Q. Okay. Got it.

20 A. Here, it's talking about compression.

21 Q. I thought you were referring to Meulen
22 itself.

23 And, this term "image compression
24 and/or scaling" used by Meulen, is that an aspect
25 ratio conversion method?

1 A. In the context of Meulen --

2 Q. Yes.

3 A. -- that's how I take it. Yes.

4 Q. In the context of Meulen. Yes.

5 So Dr. Foroosh, do you remember, in
6 reviewing all the materials for the '413 IPR,
7 reviewing a reference called Liu?

8 A. Did I -- again -- so I see in my
9 declaration.

10 Q. Let me show you Liu. And you can tell
11 me whether it looks familiar. This is
12 Exhibit 1005.

13 (Petitioner's Exhibit No. 1005 was
14 marked for identification.)

15 BY MS. NGUYEN:

16 Q. And I can help maybe refresh your
17 memory. But Liu was used by petitioner and
18 discussed from Dr. Katsaggelos in combination with
19 Obara.

20 Do you remember that?

21 A. Yes. Was that one of the -- did I
22 express again any opinion on that combination in my
23 declaration? I don't recall expressing any opinion
24 on this in my declaration.

25 Q. Yeah. I just wanted to see if it

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1 looks familiar to you.

2 A. Yes. I've seen this before, yes. But
3 as I said, I don't believe I expressed any opinion
4 in my declaration on this.

5 Q. Okay. So going to your declaration,
6 paragraph 13.

7 A. Paragraph 13, you say?

8 Q. Yes. Yes. I believe this is a
9 paragraph talking about your background slash CV,
10 right?

11 A. Yes.

12 Q. And in paragraph 13, you're talking
13 about this patent, which is, I believe, you're an
14 inventor of?

15 A. Yes.

16 Q. And in paragraph 13 of your
17 declaration, this patent, Patent No. 8,755,569, do
18 you recall anything about that patent?

19 A. Yes. This was one of my doctoral
20 students. And we worked on a problem which is
21 called "Action recognition and pose estimation" --
22 "Human action recognition and pose estimation in
23 video data." Came up with some innovative method.
24 It was published in a conference, and we suggested
25 -- or I suggested to my university to patent this.

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1 And, of course, we have the general counsel at UCF
2 or my university. They go through the process.
3 I'm not familiar with the legal steps to get there.

4 Q. Sure.

5 A. But we went through a whole process
6 of, you know, in writing the text and all of that.
7 And the patent was approved, I believe -- I don't
8 remember -- back in 2014, apparently.

9 Q. Yeah. I think it was filed in 2010
10 and then, per the usual, it takes some time to --

11 A. Some time. Yes.

12 Q. Okay. So as it says, it's entitled
13 "Methods for Recognizing Pose and Action of
14 Articulated Objects with Collection of Planes and
15 Motion"?

16 A. Uh-huh.

17 Q. So, does this patent talk about
18 identifying objects in an image or a video?

19 Do you remember?

20 A. Yes. Of course. I remember exactly
21 what this technique is. As I said, it's
22 identifying human actions --

23 Q. Human actions. Okay.

24 A. -- in a video or a human pose, as we
25 call it a posture, if you want to, in a single

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1 image. That's what it was about. So I can go into
2 details, but I don't know if it's relevant to this
3 case.

4 Q. Well, it's in your declaration.

5 A. Sure.

6 Q. And there's only one sentence in
7 paragraph 13. So I'm trying to understand what
8 this patent was about. And you said identifying
9 human pose?

10 A. Or action in video.

11 Q. Or action.

12 A. So if it's video data, you recognize
13 human action.

14 Q. I see. I see. Okay. Okay.

15 And so this -- like we talked about,
16 right, issued in 2014, as you say in paragraph 13
17 of your declaration. And I can assure you it was
18 filed in 2010.

19 A. Sure. I don't remember.

20 Q. Yeah. Understood.

21 Would you agree that identifying
22 objects in an image was known at the time of the
23 '413 patent?

24 A. It depends what you define identifying
25 objects because -- so it has gone through -- I

1 mean, the development in that area has been going
2 through many years. Identifying objects was a
3 problem that we were looking at at the time in
4 computer vision.

5 Q. In computer vision? Is that what you
6 said?

7 A. Computer vision. Yes. Yes.

8 Q. Okay. Okay.

9 (Petitioner's Exhibit No. 1008 was
10 marked for identification.)

11 BY MS. NGUYEN:

12 Q. So I'm sure your's pretty familiar
13 Chao.

14 Dr. Foroosh, do you recall Chao using
15 the term "stretch"?

16 A. Can you please point me to that?

17 Q. Yes. Let me find where Chao uses the
18 word "stretch." For example, in the Abstract, in
19 the middle.

20 A. Okay. I can see that the method
21 further compromises creating resized background
22 elements by stretching or shrinking the background
23 elements to fit the dimensions of the resized image
24 and repositioning the resized foreground and
25 background elements and the resized image while

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1 maintaining the design intention of the original
2 image.

3 Is that the line you're referring to?

4 Q. Yes. Yes.

5 A. Yes.

6 Q. So Chao uses the word "stretching or
7 shrinking"?

8 A. Yes.

9 Q. In your opinion, does Chao use the
10 term "stretching or shrinking" according to their
11 ordinary and customary meanings?

12 A. Yes. I said that I treated all the
13 terms in the ordinary and customary meaning. And
14 that's including in the exhibits.

15 Q. Okay. So let's turn to paragraph 002,
16 paragraph 2 of Chao.

17 A. 002. Yes.

18 Q. And the first sentence says:
19 Typically, current automation image resizing
20 programs simply scale an original image to fit a
21 new page size without regard to the original design
22 intent of the original image.

23 A. It says "automatic." Not automation.
24 Yes.

25 Q. Oh, I'm sorry. Automatic.

1 What is Chao describing?

2 MR. SCHMIDT: Objection to form.

3 THE WITNESS: Again, did I express any
4 opinion on this? You're asking me to
5 just --

6 BY MS. NGUYEN:

7 Q. About Chao?

8 A. No. About that particular sentence.

9 It says: Typically, current automatic
10 image resizing programs simply scale an original
11 image to fit a new page size without regard to the
12 original design intent of the original image.

13 I don't believe I expressed any
14 opinion on that sentence or paragraph or statement
15 in Chao.

16 Q. Okay. But you don't have any opinion
17 on that?

18 A. I did not express any opinion on it.

19 Q. Do you know what he means by "original
20 design intent of the original image"?

21 A. Again, I did not express any opinion
22 on that.

23 Q. Okay. So let's go to paragraph 49 of
24 your declaration.

25 A. Yes.

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1 Q. Okay. Paragraph 49. Do you see the
2 last sentence, you talk about a group of pixels.
3 And I'm trying to understand what you mean by
4 "group of pixels."

5 A. It's -- so let me read it because we
6 need to put it into context.

7 It says: Polyphase filters are known
8 to --

9 (Reporter clarification.)

10 THE WITNESS: P-O-L-Y-P-H-A-S-E.

11 Polyphase filters are known to take a
12 group of pixels and average them into a
13 single pixel.

14 So, I'm sorry. What was your
15 question?

16 BY MS. NGUYEN:

17 Q. Oh, I'm trying to understand what
18 group of pixel means.

19 A. Well, a group of pixels to which the
20 filter is applied.

21 Q. Okay. I'm sorry. I'm trying to
22 understand what a group of pixels means for an
23 image.

24 A. So it could be the portion of the
25 image. It could be part of an image. A group of

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1 pixels usually filters -- I mean, polyphase filters
2 in particular. What we call the extent of the
3 filter.

4 They take a group of pixels and apply
5 a filter to that. So that's how polyphase filters
6 work. I'm talking about the group of pixels to
7 which the filter is applied.

8 Q. Okay. So, let's not get to polyphase
9 filters yet because I'm trying to understand the
10 group of pixels first. And then we can talk about
11 polyphase filters.

12 But by a group of pixels, do you
13 mean a portion of the image?

14 A. No. So we cannot separate them
15 because I'm talking about a group of pixels in the
16 context of polyphase filters. And as I said, a
17 filter -- there are different types of filters.
18 They are so-called FIR or polyphase filters.

19 They have -- they take a group of
20 pixels, and they apply some filter to that.
21 Polyphase filter is not an exception to that. It's
22 just a filter that consists of two steps. A
23 low-pass filter, which is called the "anti-aliasing
24 filter," followed by a downsampling. So these are
25 shift-invariant filters that you apply to -- I try

1 to put it in the, you know, ordinary, customary
2 language and say that basically what they do, they
3 blend a group of pixels to a single pixel by
4 applying some averaging and downsampling. So it's
5 -- that averaging is, in fact, a weighted average.
6 So it's really a low-pass filter is applied
7 followed by downsampling. That's what polyphase
8 filters are.

9 Q. Okay. So maybe we can use the '413 as
10 an example because, like I said, I'm still trying
11 to understand what group of pixels means.

12 So the '413 figure, to me, shows --

13 A. So let me go to '413.

14 Q. Yes.

15 A. Figure? What was it?

16 Q. 2B?

17 A. 2B. Yes.

18 Q. You see how there's 25 circles?

19 A. Yes.

20 Q. In 212. So, if you have a group of
21 pixels, would it be one pixel for each circle, and
22 the whole thing is a group of pixels?

23 A. I -- first of all, we are talking
24 about the one exhibit. And we're going to '413. I
25 don't see how -- I mean, '413 is not talking about

1 applying polyphase filters.

2 Q. Right. I'm just asking about what
3 group of pixels means.

4 A. So we don't need to go to '413 to say
5 what a group of pixels are.

6 As I said, polyphase filters take a
7 group of pixels, apply a low-pass filter to that
8 followed by a downsample. That's what a polyphase
9 filter is. And group of pixels basically are the
10 group of pixels to which the filter is applied at
11 that low-pass filter. It's an anti-aliasing
12 filter. Because you --

13 (Reporter clarification.)

14 THE WITNESS: So it's the word
15 "alias," with "ing" at the end. It was a
16 group of filters.

17 I was saying that -- I was describing
18 what polyphase filters are. And they are
19 not part of the '413 patent, I was saying.
20 And I don't see why we are going through
21 this diagram. I mean, there's no way I can
22 talk about polyphase filter here, and '413
23 patent is doing something else. '413
24 patent is talking about pixels shifting,
25 shifting pixels. Not applying a polyphase

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1 filter to compress the pixels.

2 BY MS. NGUYEN:

3 Q. So we don't have to talk about the
4 '413 patent. I'm a very visual person. I'm trying
5 to understand what a group of pixels is.

6 Is it one pixel?

7 A. No. A group is a group. So at least
8 two pixels. Two or more pixels.

9 Q. Okay. So it's two pixels. Let's say
10 -- and maybe we don't like circles. Let's say we
11 want to represent squares. I'm only using squares
12 because it's simple.

13 If I have a picture of two squares, do
14 I use one pixel? Do I use two pixels? What is a
15 group?

16 A. A group is two or more. Two or more
17 pixels.

18 Q. Okay. So I wanted to represent two
19 squares, how do I represent that with a group --
20 how is that shown with a group of pixels?

21 A. I think we are really completely
22 getting out of --

23 Q. Yeah. I'm having a hard time
24 understanding what group of pixels means.

25 A. Well, so, for instance, let's look at

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1 -- this relates to Meulen.

2 Q. Okay.

3 A. For instance, in Table 1, Meulen,
4 second row, it says that -- I have it on page 18 of
5 my declaration, that table I have reproduced. It
6 talks about compression ratio.

7 It says that, for instance, that ten
8 pixels on the edges are compressed by a factor of
9 four. So every four pixels is reduced to one
10 pixel. So that group of four pixels are reduced to
11 one pixel in order to get the compression ratio
12 one. So that's a group of pixels. And they say
13 that in order to do that, we apply polyphase
14 filters.

15 Now, you asked me what is a group of
16 pixels. I said, polyphase filters are
17 shift-invariant filters that perform that
18 operation, the combining multiple pixels in the
19 case of borders, for instance, four pixels into one
20 pixel to reduce or compress -- if you want to read
21 in the language used in Meulen -- to compress every
22 four pixels into the one pixel.

23 MR. SCHMIDT: Just a clarification.

24 He just said shift-invariant.

25 BY MS. NGUYEN:

1 Q. Okay. So you said four -- group of
2 four pixels, right?

3 A. I didn't say four -- group of four
4 pixels. I said that in order to understand what a
5 group of pixels means here, I said that, well, it's
6 in the context of Meulen.

7 Q. Meulen. Okay.

8 A. Meulen says that the way I compress
9 multiple pixels into one is using polyphase
10 filters. So that's what polyphase filters do.
11 They combine multiple pixels into one.

12 And to understand better, basically,
13 for instance, Meulen says in Table 1, he says that
14 the ten pixels on the edge, Group 1 pixels, I
15 compress them by a factor of four, which means
16 that, you know, every four pixels should reduce to
17 one, one pixel, so in order to get compressed.

18 Q. Every four pixels...

19 A. Because the compression ratio is 4:1.

20 Q. So if I have an image of squares, and
21 I have four squares, and I use Meulen with the 4:1
22 compression ratio, do I reduce the four squares to
23 one square?

24 A. No. You're talking about pixels. I'm
25 not sure what you mean by "squares."

1 I'm just describing in that line what
2 a group of pixels are. A group of pixels --
3 because polyphase filters -- again, I repeat.
4 Those are filters that take a group of pixels and
5 blend them into one pixel.

6 Q. Right.

7 So if my group of pixels represents
8 four squares -- right? Let's say we have four
9 pixels, four squares. I'm trying to show a picture
10 of four squares.

11 A. How can four pixels represent four
12 squares? So you're talking about each pixel is a
13 square? Is that what you're referring --

14 Q. Yeah. I'm asking, is that a group of
15 pixels, where each pixel --

16 A. No. As I said, a group of pixels is
17 two or more pixels.

18 Q. But how would I be able to represent
19 four squares and then combine them into one?
20 That's where I'm having a hard time.

21 A. Yes. So polyphase filters, they
22 apply, as I said earlier, a low-pass filter, which
23 is called "anti-aliasing filter."

24 Q. Okay.

25 A. And then they downsample, which means

1 that they -- let's say a cruder way of saying it,
2 they decimate. So they don't keep every pixel.

3 So they first apply what is called
4 anti-aliasing to make sure that when we do the
5 decimation -- which I don't like that term. I'd
6 rather say "downsampling." When they do
7 downsampling, then the filter becomes
8 shift-invariant because -- so let me tell you why
9 that's important, I think, in the context of
10 Meulen.

11 Meulen is saying that -- let's look at
12 Group 1. It says that there are ten pixels there.
13 It's ten pixels wide. It says that regardless of
14 where that pixel is in that group, we are
15 compressing those pixels by a ratio 4:1.

16 So in other words, it treats the pixel
17 all the way to the left of that region the same way
18 it treats the pixel in the middle and the same way
19 the pixel to the right of that region. This is the
20 notion of shift-invariant.

21 So, basically, it's a piece-wise -- in
22 Meulen's method, I know that -- I agreed with
23 Dr. Katsaggelos. I said that it is piece-wise
24 linear. But it actually is a very special case of
25 piece-wise linear. It's a piece-wise constant. In

1 other words, it's an extreme case, a marginal case
2 of piece-wise linear.

3 So that's why they're applying the
4 polyphase filters, because it is taking the group
5 of pixels, it applies the same operation for all
6 the pixels in region one, the same operation for
7 all the pixels in region two and so on and so
8 forth.

9 MR. SCHMIDT: I just want to make a
10 clarification in the transcription.

11 The witness is saying
12 "shift-invariant."

13 (Reporter clarification.)

14 MR. SCHMIDT: No. It's important.
15 Shift-invariant.

16 THE WITNESS: Yeah. So usually
17 hyphenated. Shift hyphen invariant.

18 BY MS. NGUYEN:

19 Q. Okay. I still don't quite understand
20 what you're saying, but it's okay.

21 A. So how about -- can I -- I don't know.

22 Q. No. I'm just trying -- like I said,
23 I'm a very visual person. So I'm trying to
24 understand it from a visual. But it's okay.

25 MS. NGUYEN: Can we take a break?

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1 MR. SCHMIDT: Sure.

2 (A brief recess was taken from
3 12:57 p.m. to 1:05 p.m.)

4 BY MS. NGUYEN:

5 Q. Okay. Dr. Katsaggelos. You cited
6 some of his deposition testimony in paragraph 111
7 of your deposition.

8 A. Yes.

9 Q. And, before citing his testimony on
10 page 44, right, you say: As I discussed above,
11 POSITA would have understood that the claimed
12 non-linear transformations are generally complex?

13 A. Yes. I see that.

14 Q. What do you mean by "generally
15 complex"?

16 A. I mean that -- I'm talking about
17 actually the complexity, computational complexity
18 or is also time complexity.

19 Q. So, what criteria are you using to
20 determine whether a non-linear transformation is
21 complex?

22 A. It's my general knowledge as a
23 computer scientist. So a POSITA with a computer
24 science background would know that non-linear
25 transformations have higher complexity as opposed

1 to linear transformations.

2 Q. Okay. So it's relative to linear
3 transformations?

4 A. Yes.

5 Q. I see. Okay.

6 Dr. Foroosh, have you ever heard of
7 the term "bit shift"?

8 A. Bit shift?

9 Q. Yes.

10 A. I don't think I ever expressed any
11 opinion on bit shift in my declaration.

12 Q. So do you think bit shifts are complex
13 calculations? Do they involve complex
14 calculations?

15 MR. SCHMIDT: Objection to form.

16 THE WITNESS: Again, I have not
17 expressed any opinion on that.

18 I'd like to go back to the previous
19 question and say that, when I said that
20 non-linear is complex relative to linear,
21 it's also complex, meaning a higher
22 computational complexity, relative to
23 piece-wise linear or piece-wise constant.

24 BY MS. NGUYEN:

25 Q. Okay. So thank you for that.

1 So going back to my question. Do you
2 think bit shifts involve complex calculations?

3 MR. SCHMIDT: Objection to form.

4 THE WITNESS: Again, I expressed no
5 opinion on that in my declaration.

6 BY MS. NGUYEN:

7 Q. Okay. So you don't know?

8 A. I didn't say I don't know or I do. I
9 said that I did not express any opinion on that.

10 Q. So you're not willing to say?

11 A. Well, that's my answer. I have not
12 expressed any opinion on that.

13 MS. NGUYEN: Okay. I have no further
14 questions.

15 CROSS-EXAMINATION

16 BY MR. SCHMIDT:

17 Q. Dr. Foroosh, I just have a couple
18 clarifying questions.

19 If you turn to the '413 patents. Can
20 you take a look at Claim 2?

21 A. Yes.

22 Q. In Claim 2 of the '413 patent, you
23 cite an image sensor?

24 A. Can I read?

25 Q. Yes.

1 A. It says: A system that converts
2 between aspect ratios, the system comprising, one,
3 or more physical processors configured by
4 machine-readable instructions to: obtain an input
5 image, the input image having a source aspect
6 ratio --

7 (Reporter clarification.)

8 BY MR. SCHMIDT:

9 Q. Why don't we try this. Dr. Foroosh,
10 why don't you read the claim to yourself.

11 A. To myself?

12 Q. And then I'm going to ask you the
13 question again.

14 A. Okay. I read it.

15 Q. Does Claim 2 recite an image sensor?

16 A. No.

17 Q. And Claim 2 is an independent claim,
18 correct?

19 A. Correct.

20 Q. Can you turn to paragraph 53 of your
21 declaration?

22 A. Yes. I'm here.

23 Q. In the second sentence of paragraph
24 53, you write: In Claim 1, the "input image" comes
25 from the "image sensor" of the "image capture

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1 apparatus" that performs the transformation.

2 Do you see that?

3 A. Yes.

4 Q. And that was the analysis you applied
5 for Claim 1?

6 A. Correct.

7 Q. And then the next sentence, you write:
8 In Claim 2, all of the claimed steps are performed
9 by "physical processors," which Claim 6 recites
10 must reside in a "camera."

11 Do you see that?

12 A. Yes.

13 Q. Is that the analysis you applied for
14 Claim 2 and Claim 6?

15 A. Yes.

16 Q. Did you apply any requirement --
17 strike that.

18 In analyzing all of the prior art in
19 this case, did you apply any requirement with
20 respect to Claim 2 that would require an image
21 sensor in Claim 2?

22 MS. NGUYEN: Objection. Form.

23 THE WITNESS: No.

24 BY MR. SCHMIDT:

25 Q. Thank you.

1 When you were being asked about
2 polyphase filters, you made the point that those
3 filters are shift-invariant.

4 Can you describe what that means?

5 A. It means that regardless of the
6 position where the filter is applied, that the same
7 operation is applied.

8 But in the context of Meulen, it means
9 that pixels are not shifted. But they're combined
10 together and blended together to create
11 compressed -- as Meulen refers to, compressed
12 pixels. So no shifting.

13 Q. Thank you.

14 MR. SCHMIDT: I have no further
15 questions.

16 MS. NGUYEN: Okay. I have no
17 questions.

18 MR. SCHMIDT: We'll reserve the right
19 to read.

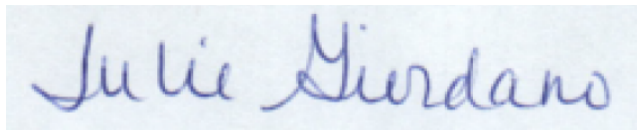
20 (The proceedings were concluded at
21 1:12 p.m.)
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I, Julie Giordano, Florida
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and that the foregoing transcript, pages 1
through 132 is a true record of my stenographic
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I FURTHER CERTIFY that I am not a
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counsel connected with the action, nor am I
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Dated this 26th day of June, 2025.



JULIE GIORDANO

Florida Professional Reporter-Certified

1 PATRICK SCHMIDT, ESQUIRE

2 patrickschmidt@quinnemanuel.com

3 June 27, 2025

4 RE: Arashi Vision (U.S.) LLC v. Gopro, Inc.

5 6/24/2025, Dr. Hassan Foroosh (#7414975)

6 The above-referenced transcript is available for
7 review.

8 Within the applicable timeframe, the witness should
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1 Arashi Vision (U.S.) LLC v. Gopro, Inc.

2 Dr. Hassan Foroosh (#7414975)

3 ACKNOWLEDGEMENT OF DEPONENT

4 I, Dr. Hassan Foroosh, do hereby declare that I
5 have read the foregoing transcript, I have made any
6 corrections, additions, or changes I deemed necessary as
7 noted above to be appended hereto, and that the same is
8 a true, correct and complete transcript of the testimony
9 given by me.

10
11 _____
12 Dr. Hassan Foroosh

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