

1 UNITED STATES PATENT AND TRADEMARK OFFICE
2 BEFORE THE PATENT TRIAL AND APPEAL BOARD

3
4 ARASHI VISION (U.S.), LLC)
(d/b/a INSTA360),)
5)
Petitioner,)
6) Inter Partes Review
vs.) No. IPR2024-00984
7)
GOPRO, INC.,)
8)
Patent Owner.)

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11 Deposition of DR. AGGELOS K. KATSAGGELOS,
12 taken remotely before NADINE J. WATTS, CSR, RPR, and
13 Notary Public, pursuant to the Rules of the United
14 States Patent and Trademark Office and the Federal Rules
15 of Civil Procedure for the United States District Courts
16 pertaining to the taking of depositions, commencing at
17 9:06 a.m. Central Daylight Time on the 28th day of
18 March, A.D., 2025.
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2 deposition the following counsel:

3 (Appeared via videoconference)

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DEPOSITION OF DR. AGGELOS KATSAGGELOS
TAKEN MARCH 28, 2025

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EXHIBITS	
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EXHIBIT 1	4
Declaration of Dr. Aggelos Katsaggelos	
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United States Patent No. 10,015,413 B	
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United States Patent Application 2008/0095470 A1	

1 THE REPORTER: Okay. Do all counsel agree that the
2 reporter may swear in the witness remotely?

3 MS. NGUYEN: Yes.

4 MR. SCHMIDT: Yes.

5 DR. AGGELOS KATSAGGELOS,
6 called as a witness herein, having been first duly
7 sworn, was examined upon oral interrogatories and
8 testified as follows:

9 EXAMINATION

10 by Mr. Schmidt:

11 MR. SCHMIDT: Q Good morning, Doctor. Could you
12 please introduce yourself for the record.

13 A Surely. I'm Aggelos Katsaggelos.

14 Q Okay. Dr. Katsaggelos, before we begin, I
15 marked two exhibits to the deposition. They should be
16 available to you in Exhibit Share. Can you just verify
17 that they're there?

18 A I assume I need to download them, right? I
19 don't see anything on the Share right now. Oh, I do
20 now. I refreshed. Yes, I do see Exhibit 1 and Exhibit
21 2.

22 (Documents marked as Deposition

23 Exhibit 1 and Exhibit 2 for identification.)

24 Q Okay. If you can just open up Exhibit 1 please.

1 Do you recognize Exhibit 1 as the declaration that you
2 provided in this matter?

3 A It's still opening up. Yes. Yes, I do.

4 Q Okay. And then, for identification, do you
5 recognize Exhibit 2 as the '413 patent that's at issue
6 in this matter?

7 A Yes, I do.

8 MS. NGUYEN: And, Counsel, we have clean hard copies
9 of both Exhibit 1 and Exhibit 2 that we can provide to
10 Dr. Katsaggelos here to make things easier.

11 MR. SCHMIDT: Q Sure, that's fine. And let me
12 just ask, Dr. Katsaggelos, since we're appearing
13 remotely, other than the documents that your counsel
14 just referenced, do you have any other documents in
15 front of you?

16 A No, I don't.

17 Q And other than the computer that you're using to
18 access this proceeding, do you have any other electronic
19 devices that are open and available to you right now?

20 A No.

21 Q And I would just ask, since we're appearing
22 remotely and we're not in the same room, if anybody
23 tries to message you or signal you by any means, if
24 you'd just let me know. Is that fair?

1 A Yes, sir, certainly.

2 Q Okay. I want to turn to your declaration, feel
3 free to refer to it in hard copy, which is Exhibit 1 to
4 the deposition. And I'm going to be asking you about
5 the Meulen ground that you've opined on. Are you with
6 me?

7 A I'm sorry, I didn't hear everything you said.

8 Q Sure. My questioning for you is going to start
9 with the Meulen ground --

10 A Okay.

11 Q -- that you've opined about. Okay?

12 So I want to direct you to paragraph 249 of
13 Exhibit 1, your declaration.

14 A Okay. I'm there.

15 Q And in paragraph 249 you're analyzing claim
16 element 2A of the '413 patent. Do you see that?

17 A Yes, I do.

18 Q And that's the limitation relating to one or
19 more physical processors, correct?

20 A Correct.

21 Q And it's your opinion that Meulen discloses the
22 one or more physical processors in its disclosure of the
23 wireless device 100, correct?

24 A Yes, that is correct.

1 Q Now, you understand that the '413 patent
2 requires that this wireless device obtain an input
3 image, correct?

4 MS. NGUYEN: Objection, form.

5 THE WITNESS: Are you referring to a specific claim
6 of the '413 patent?

7 MR. SCHMIDT: Q Yes, limitation 2B, which is on
8 page 156 of Exhibit 1. Do you see the limitation
9 reading obtain an input image and it continues on from
10 there?

11 A Yes, I see the limitation in the '413 patent.

12 Q Okay. And it's your opinion that the wireless
13 device 100 of Meulen is configured to obtain an input
14 image, correct?

15 A In 2B -- 2B from 2A, yeah, Meulen discloses that
16 a media source content received by the wireless device.

17 Q And it's your opinion that the media source
18 content disclosed by Meulen is the input image as
19 claimed by the '413 patent?

20 A Yes, this media source content is the input
21 image according to the '413 patent.

22 Q Now, in Meulen, Meulen discloses that the media
23 source content is received by the wireless device from a
24 media source, correct?

1 A This is one example in Meulen, that this media
2 source content is received by a wireless device.

3 Q And do you opine that there's any other sources
4 of the media content other than media source in Meulen?

5 MS. NGUYEN: Objection, form.

6 THE WITNESS: Meulen discloses that the wireless
7 device may comprise a camera; therefore, the camera
8 might provide this input image.

9 MR. SCHMIDT: Q Isn't it true, Doctor, that Meulen
10 never discloses obtaining an input image from the camera
11 on Meulen?

12 A Well, Meulen discloses, again, that the wireless
13 device may comprise a camera, and there's a processor as
14 well on the system, run an operating system, and,
15 therefore, the device itself is the camera, and using
16 the processor can provide the input image.

17 Q But in paragraph 251 of Exhibit 1, your
18 declaration, you rely on the media source content
19 received by the wireless device as the input image. Do
20 you see that?

21 A Yeah, I see 251, but -- that's what Meulen
22 discloses, but this is one embodiment of the disclosure.

23 Q And isn't it true, Doctor, that Meulen never
24 discloses media source content received from the digital

1 camera that's part of the wireless device 100?

2 A Again, Meulen discloses that the wireless device
3 comprises a camera; therefore, the wireless device is a
4 camera itself, the same way now days iPhone is a camera.

5 Q Okay. Focus on my question, Doctor. The
6 question is, isn't it true that Meulen never discloses
7 media source content received from the digital camera
8 that's part of the wireless device 100?

9 MS. NGUYEN: Objection, asked and answered.

10 THE WITNESS: It is understood from Meulen's
11 disclosure that this wireless device has a camera, has
12 an operating system, it operates as a camera, a digital
13 camera, and, therefore, it's clear that this camera
14 provides this input image to the processor.

15 MR. SCHMIDT: Q I asked you about the media source
16 content that's disclosed in Meulen. There's no
17 disclosure in Meulen about media source content coming
18 from the digital camera on the wireless device, is
19 there, Doctor?

20 MS. NGUYEN: Objection, form.

21 THE WITNESS: Yeah, my reading of Meulen is, again,
22 that it discloses a camera that has the capability of
23 also receiving wirelessly data, and, therefore, the
24 system itself provides the input to the processor. The

1 camera provide this input image.

2 MR. SCHMIDT: Q I'm asking you now specifically
3 about the media source content that you quote in the
4 first sentence of paragraph 251. Isn't it true, Doctor,
5 that the media source content in Meulen is only received
6 from external media sources?

7 MS. NGUYEN: Objection, form.

8 THE WITNESS: Again, in 251 Meulen discloses that
9 it's one way to receive this media source content. It
10 does not disclose that it is the only way to do so.

11 MR. SCHMIDT: Q But there's no disclosure of
12 receiving media source content from anything other than
13 an external source; you would agree with you that,
14 wouldn't you?

15 MS. NGUYEN: Objection, form.

16 THE WITNESS: Well, the disclosure, again, is the
17 existence of the camera that provides this media source
18 content

19 MR. SCHMIDT: Q But Meulen never describes the
20 digital camera on the wireless device as a media source,
21 does it?

22 A It's clear that the media camera provides --
23 media provides all the -- it provides video. That's the
24 media content we are talking about.

1 Q My question was, isn't it true that Meulen never
2 describes the digital camera on the wireless device 100
3 as a media source, right?

4 A Can you repeat your question please?

5 Q Isn't it true that there is no disclosure in
6 Meulen of the digital camera on the wireless device 100
7 comprising a media source?

8 A Again, the camera is -- Everybody understand
9 that the camera provides media content. It's there in
10 Meulen. The existence of the camera and the operating
11 system and the processor, it is understood that media
12 content is provided by the camera.

13 Q But isn't it true that the plain meaning of
14 media source to a person of ordinary skill in the art
15 implies some external source of information?

16 MS. NGUYEN: Objection, form.

17 THE WITNESS: What's clear to a POSITA is that media
18 source content is images, audio, video. It signals that
19 the camera can provide, does provide.

20 MR. SCHMIDT: Q I'm just asking you about the term
21 media source. Isn't it true, Doctor, that the plain
22 meaning of media source implies an external source of
23 information?

24 MS. NGUYEN: Same objection.

1 THE WITNESS: No, externally build is a source that
2 provides media content. Such a source, a prime example,
3 is a camera. The camera is on the cellphone, therefore,
4 that's the media source.

5 MR. SCHMIDT: Q You're aware, Doctor, that Meulen
6 provides multiple examples of media sources?

7 A Can you point me to where Meulen is doing that?

8 Q Sure. Take a look at -- Actually, let me mark
9 Meulen.

10 (Document marked as Deposition
11 Exhibit 3 for identification.)

12 Q If you refresh your Exhibit Share, you should
13 now see Exhibit 3.

14 A Yes, I did, and I can see Meulen, yes,
15 Exhibit 3.

16 Q And, for the record, Exhibit 3 is U.S. Patent
17 7,693,500, which we'll call Meulen in the deposition.

18 Do you have that document available to you,
19 Doctor?

20 A Yes, I do.

21 Q Do you have it in hard copy in front of you?

22 A I do. I do have a hard copy.

23 Q Is it an unannotated version of Meulen?

24 A Yes, it's a fresh, clean copy. Yes.

1 Q I want to direct you to column 1, beginning at
2 line 18. In column 1, beginning at line 18 of Meulen,
3 the disclosure reads, most media sources however have a
4 non-square aspect ratio, such as 4 by 3, 3 by 2, 16 by
5 9, or even 2 by 1. For example, the aspect ratio for
6 standard television, as well as for many websites in
7 multimedia products is 4 by 3. High definition
8 television, HDTV, and many digital video cameras use an
9 aspect ratio of 16 by 9. Digital videodisc DVD players
10 may be designed to use an aspect ratio of either 4 by 3
11 or 16 by 9. Do you see that?

12 A Yes, I do.

13 Q And in that disclosure the examples of the media
14 source are things like televisions, websites, multimedia
15 products, DVD players, correct?

16 MS. NGUYEN: Objection, form.

17 THE WITNESS: Yeah, the examples that are mentioned
18 here are indeed about TV, HDTV, videodisc. But that's
19 just examples. There are many more.

20 MR. SCHMIDT: Q Those examples are all examples of
21 external media sources providing media source content to
22 the wireless device, correct?

23 A Yeah, this is background information. It says
24 that the aspect ratio of the media sources -- It gives

1 many examples, and then -- Yeah, just three examples out
2 of the many examples that one can present.

3 Q You've mentioned in the deposition that Meulen
4 discloses that the wireless device 100 can include a
5 digital camera, correct?

6 A Yes, it did state that -- in Meulen that the
7 wireless device may comprise a camera, yes.

8 Q There's no discussion in Meulen about how the
9 aspect ratio of that camera compares to the display on
10 Meulen, is there?

11 MS. NGUYEN: Objection, form.

12 THE WITNESS: Meulen discloses that the wireless
13 device may include the display as well and discloses
14 ways to improve the performance of the device to display
15 content from the media source. So a disclosure is
16 there, but the device is capable of changing the aspect
17 ratio of the media.

18 MR. SCHMIDT: Q But you would agree with me that
19 if a digital camera on a wireless device has an image
20 sensor with an aspect ratio equal to the aspect ratio of
21 the display, then there's no need to change the aspect
22 ratio, right?

23 A Well, this is a hypothetical, and it might be
24 the case that there's no need for that. But Meulen

1 discloses that the capability of the wireless device is
2 there to perform this conversion of the aspect ratio.

3 Q But Meulen doesn't disclose that -- the
4 capabilities needed in order to display an image
5 captured by the digital camera that's part of the
6 wireless device; you'd agree with that, correct?

7 MS. NGUYEN: Objection, form.

8 THE WITNESS: Meulen discloses ways to do this
9 transformation. So that's the main -- the main thesis
10 of Meulen's disclosure. So it has the capability to do
11 this aspect ratio conversion of the images acquired by
12 the camera and the display device.

13 MR. SCHMIDT: Q But I'm asking you a very specific
14 question. Meulen doesn't teach that the capability of
15 changing aspect ratios is necessary for displaying
16 digital images captured by the digital camera that's
17 part of the wireless device, right?

18 A Meulen discloses improving the performance of
19 the wireless device to display content from a media
20 source. The media source being the camera is
21 therefore -- That's what Meulen is teaching us, how to
22 change aspect ratio data supplied by the camera in order
23 to be displayed on the display of the phone.

24 Q What's the aspect ratio of the image sensor of

1 the digital camera on Meulen?

2 A It may or may not be disclosed, but -- the exact
3 aspect ratio, but, again, the capability's there of
4 Meulen to improve the performance of the wireless device
5 display content of the media source by performing this
6 aspect ratio conversion.

7 Q Now, the display on Meulen is a 1 by 1 aspect
8 ratio, correct?

9 A Can you point me to where this is disclosed in
10 Meulen?

11 Q Column 5, at line 62, reading, in this
12 implementation, the display 138 may have an aspect ratio
13 of 1 by 1, with a resolution of 320 by 320. Do you see
14 that?

15 A Yes, I do. So that's a possible aspect ratio.
16 It doesn't have to be that. But as stated here in this
17 one implementation, yes, it is 1 to 1.

18 Q And, in fact, all the embodiments in Meulen
19 disclose a 1 by 1 aspect ratio display; isn't that
20 right?

21 A Well, I see implementation. I see embodiment.
22 But it doesn't mean that that's the only aspect ratio of
23 the display device that is accommodated by Meulen if we
24 look at the claims.

1 Q Let's just focus on the 1 by 1 implementation,
2 the implementation where Meulen has a 1 by 1 aspect
3 ratio display. Are you with me?

4 A Okay.

5 Q If Meulen also had an image sensor that was 1 by
6 1 aspect ratio, then you would agree that there would be
7 no purpose to the '413 aspect ratio functionality being
8 applied for displaying that image on Meulen's display,
9 correct?

10 MS. NGUYEN: Objection, form.

11 THE WITNESS: Well, to start with, most cameras
12 don't have a 1 by 1 aspect ratio. But if you think
13 about just about one implementation out of many, that's
14 not -- I mean, what Meulen discloses is how to perform
15 aspect ratio conversion, and just amount of
16 implementation -- any of the disclosures here of the
17 '413 or this or that would be needed. We are talking
18 about the situation where there is a need to change the
19 aspect ratio.

20 MR. SCHMIDT: Q Turn to column 13 of Meulen. That
21 would be column 13 at line 5. Meulen reads, in various
22 embodiments the processor 510 may be arranged to receive
23 information, such as media source content, through a
24 communication interface 512. Do you see that?

1 A Yes, I do.

2 Q And the communication interface 512 would be an
3 implementation where the media source content is being
4 received from an external source, correct?

5 A External source is not there. It's just
6 receiving information from a media source. That's what
7 it reads there, right?

8 Q But receiving information through a
9 communication interface implies an external source; you
10 would agree with that, right?

11 MS. NGUYEN: Objection, form.

12 THE WITNESS: It says that the processor may be
13 arranged to receive this information. And the
14 communications interface, that's always implying
15 external source. It's an interface where you connect
16 the processor to an input.

17 MR. SCHMIDT: Q Okay. Let's turn back to your
18 declaration, which is Exhibit 1, and I want to turn to
19 paragraph 253.

20 A Yes, I'm there.

21 Q And in this portion of the declaration you were
22 analyzing claim element 2C of the '413 patent. Do you
23 see that?

24 A Yes, I do.

1 Q That's the determining a portion requirement,
2 correct?

3 A Correct.

4 Q At paragraph 253 you write, Meulen discloses the
5 central display region 140-3 may comprise 200 pixels and
6 require the media source content to undergo no image
7 compression, and it continues from there. Do you see
8 that?

9 A Yes, I do.

10 Q Do I understand that it's your opinion that the
11 central display region 140-3 is the portion of element
12 2C of the '413 patent?

13 A Yes, in this example, this is the part of the
14 image that undergoes no compression and, therefore,
15 corresponds to the subset of the source pixels that are
16 then in the portion of the image.

17 Q And at the end of this sentence you cite to
18 Meulen at column 6, lines 27 through 31. Do you see
19 that?

20 A Yes, I do.

21 Q Okay. Let's turn to that citation in Meulen.
22 So Exhibit 3, column 6, lines 27 through 31.

23 In that passage of Meulen you're citing to the
24 central display region as described in table 1 of

1 Meulen. Do you see that?

2 A Yes.

3 Q And in table 1 of Meulen, what table 1 is
4 describing is a pre-determined partition of the total
5 display area, correct?

6 MS. NGUYEN: Objection, form.

7 THE WITNESS: Yeah, it shows that there are five
8 regions there that -- again, it's an example of five
9 regions that you can output image. That's correct.

10 MR. SCHMIDT: Q And those five regions are all
11 allocated some number of pixels from the total display
12 width of Meulen, correct?

13 A Yeah. I mean, this is an example of five
14 regions. In other examples there may be seven or as
15 many regions as we want. And this is an example that
16 shows how 480 source pixels can be marked in the target
17 region pixels.

18 Q And in this approach of partitioning the display
19 into different regions, the regions are all pre-assigned
20 some compression ratio. Do you see that?

21 MS. NGUYEN: Objection, form.

22 THE WITNESS: Yeah, in this embodiment of the many
23 embodiments, it demonstrates how this change in aspect
24 ratio can take place.

1 MR. SCHMIDT: Q So, for example, in table 1, which
2 you cited to in your analysis, region 3 is allocated in
3 advance 200 pixels of the display and a compression
4 ratio of zero, fair?

5 MS. NGUYEN: Objection, form.

6 THE WITNESS: Again, this is one embodiment, one
7 example, where this portion that needs to be determined
8 is this 200 pixels. In other examples this portion of
9 the input image is different. In this example, yes,
10 this portion of the input image is this 200 pixels.

11 MR. SCHMIDT: Q And I need to make sure that
12 you're being responsive to my question. You agree that
13 in table 1 region 3 is allocated in advance 200 pixels
14 of the display and a compression ratio of zero, correct?

15 MS. NGUYEN: Objection. Same objection.

16 THE WITNESS: Yeah, this, again, is an example where
17 this portion that needs to be determined of the input
18 image is represented by this 200 pixels.

19 MR. SCHMIDT: Q And in this example, if a person
20 of skill in the art wanted to implement table 1 as
21 taught by Meulen, the allocation of the display happens
22 before any input image is received, correct?

23 MS. NGUYEN: Objection, asked and answered.

24 THE WITNESS: This, again, is an example. This

1 allocation may differ, and it differs -- it's understood
2 based on the content that needs to be displayed. This
3 choice is not done arbitrarily, but is done -- is made
4 with respect to the content of the image. That's what a
5 POSITA would understand.

6 MR. SCHMIDT: Q The allocation in table 1 is
7 something that Meulen teaches -- Well, strike that.

8 Meulen teaches that the allocation in table 1
9 is made in advance of receiving any input image; isn't
10 that right?

11 MS. NGUYEN: Objection, form.

12 THE WITNESS: I haven't seen this spelled out like
13 this in Meulen. This is an example of many. There are
14 many choices. And these choices are made based on the
15 content that needs to be displayed.

16 MR. SCHMIDT: Q Where do you see in Meulen a
17 choice being made about the allocation of the display
18 based on the content that's received?

19 A Well, Meulen gives a number of examples in which
20 the size of the central region is -- the portion that is
21 determined differs. It's 200 pixels, 260 pixels, 230
22 pixels. The number of regions differs. The compression
23 ratios differ. And they don't have to be symmetric or
24 to the left and to the right of this portion. And it

1 is, therefore, a designer's choice based on what type of
2 content needs to be displayed.

3 Q Those different examples in Meulen that you
4 cited to me, those are all alternative implementations
5 of the wireless device, correct?

6 A Yeah, examples of embodiments.

7 Q And you said it was a designer's choice. The
8 designer would choose which one of those alternatives to
9 implement as part of the design of the device itself;
10 agreed?

11 MS. NGUYEN: Objection, form.

12 THE WITNESS: By designer, I meant the person who
13 implement that, having all these choices, and these
14 choices can change based on the content. It is not a
15 static choice that's done once, right? Depending on
16 what content needs to be displayed, one has a choice --
17 many choices and has to pick one.

18 MR. SCHMIDT: Q And it's the designer who makes
19 that choice in Meulen?

20 MS. NGUYEN: Objection, form.

21 THE WITNESS: The way a POSITA understands Meulen is
22 that these choices are based on content. It can change
23 based on the content of the input device. One has the
24 freedom to use these many implementations. These are

1 just examples. But that is not a static implementation
2 that's done once for the device and that's the end of
3 it. But it's something that can change dynamically.

4 MR. SCHMIDT: Q But your understanding, if I
5 understand your testimony, is that it's the designer who
6 makes the choice between these different
7 implementations, right?

8 A By designer, I meant the person who operates the
9 device, not the person who designed the physical -- the
10 physical processor of the phone.

11 Q So the operator of the device will make the
12 determination of what pixels are allocated to what
13 region, fair?

14 A That's what a POSITA would infer. But this
15 is -- What Meulen teaches is that all these are
16 possibilities, and, based on how they're implemented, in
17 what device, one can have different implementations.

18 Q But you haven't seen any disclosure in Meulen of
19 the capability of receiving user inputs to change the
20 allocation of pixels in different regions, correct?

21 MS. NGUYEN: Objection, form.

22 THE WITNESS: I don't recall a specific place where
23 Meulen does that. I'd need to go through each and every
24 line of Meulen to see if this is exactly disclosed or

1 not. But it's the understanding of a person that is
2 skilled in this art to see that this is the teaching of
3 Meulen.

4 MR. SCHMIDT: Q That's your interpretation today,
5 correct?

6 MS. NGUYEN: Objection, form.

7 THE WITNESS: Yeah, again, by looking at Meulen here
8 right now, I cannot point to the passage where such
9 input is mentioned.

10 But the understanding of a POSITA is that
11 there are very many choices to be made on how to pick
12 this portion of the input image, how to divide the
13 screen in how many regions. And, of course, again, this
14 portion is that it's a choice that is up to the user to
15 make if it's something that could be implemented this
16 way.

17 MR. SCHMIDT: I'm about to shift gears. Do you want
18 to take a break now or do you want to keep going?

19 THE WITNESS: I could use a break.

20 MR. SCHMIDT: Okay. Why don't we take a break.

21 THE WITNESS: Okay. Just five minutes or --

22 MR. SCHMIDT: Yeah, five minutes maybe.

23 THE WITNESS: Okay. Thank you.

24 (Recess was taken.)

1 MR. SCHMIDT: Q Can we go back on the record
2 please.

3 Welcome back, Doctor. During the break did you
4 have any discussions with your lawyers about the
5 substance of your testimony?

6 A No.

7 Q Thank you. Please turn to Exhibit 2, which is
8 the '413 patent.

9 A Okay.

10 Q And I want to direct you to claim 1. And I just
11 had a few questions about claim 1.

12 In column 9, at about line 8, do you see the
13 limitation reading, determine a portion within the input
14 image, the portion including the subset of pixels?

15 A Yes, I see that.

16 Q And then the next limitation reads, apply a
17 transformation to the input image to generate an output
18 image, and then it continues from there. Do you see
19 that?

20 A Yes, I do.

21 Q Okay. Those are two different operations that
22 the claim is contemplating, correct?

23 A Yes, there are two different limitations here.

24 Q And then at about line 21 do you see the claim

1 reads, the transformation non-uniformly shifts the
2 pixels such that differences between the input positions
3 and the output positions of the subset of the pixels
4 within the portion are less than differences between the
5 input positions and the output positions of others of
6 the pixels. Do you see that?

7 A I see that.

8 Q Okay. So when the transformation is applied,
9 the transformation needs to shift the pixels that are
10 within the portion less than other pixels, right?

11 A Yes.

12 Q So, therefore, the portion has to be identified
13 or determined before the transformation is applied;
14 would you agree?

15 MS. NGUYEN: Objection, form.

16 THE WITNESS: The way I read it, that these
17 limitations need to be there determining the portion
18 applied to the transformation. But the order on which
19 they have to be applied or whether they can be applied
20 at the same time is not something that is determined by
21 the reading of the claims.

22 MR. SCHMIDT: Q Well, just as a technical matter,
23 you can't apply a portion -- I'm sorry, strike that.

24 You can't apply a transformation that shifts

1 pixels less within a portion than other pixels unless
2 you know what the portion is, right?

3 MS. NGUYEN: Objection, form.

4 THE WITNESS: You can apply the transformation so
5 that a portion is determined so when the pixels in the
6 portion, the portion are shifted less than pixels
7 outside the portion in one step.

8 MR. SCHMIDT: Q So, in your opinion, the portion
9 could impliedly arise just from the nature of the
10 transformation?

11 MS. NGUYEN: Objection, form.

12 MR. SCHMIDT: Q Do you understand the question,
13 Doctor?

14 A Can you repeat it please?

15 Q Is it your opinion that the determination of the
16 portion could be accomplished just by virtue of the
17 nature of the transformation that's applied?

18 MS. NGUYEN: Objection, form.

19 THE WITNESS: The transformation can be -- design
20 can be picked in such a way that determines the portion
21 that should have less, I guess, smaller shifts than the
22 other shift. It's all done in one step. It's something
23 that can be done that way.

24 MR. SCHMIDT: Q Well, the claim tells us that the

1 transformation has to non-uniformly shift the pixels,
2 right?

3 A That's correct.

4 Q Is it possible to do a non-uniform shifting of
5 pixels without determining a portion?

6 MS. NGUYEN: Objection, form.

7 MR. SCHMIDT: In your mind.

8 THE WITNESS: Can you repeat the question please?

9 MR. SCHMIDT: Q Is it technically possible to have
10 a system that non-uniformly shifts the pixels, as were
11 cited by the '413 patent, without determining a portion?

12 MS. NGUYEN: Same objection.

13 THE WITNESS: It is possible to determine a
14 non-linear transformation that determines which parts of
15 the image are shifted which way, and, therefore,
16 determine the portion that would have less shift than
17 other parts of the image.

18 MR. SCHMIDT: Q But my question for you is, if you
19 apply a non-uniform transformation, as recited by the
20 '413 patent, are you necessarily determining a portion?

21 A Well, the transformation shifts non-uniformly.
22 The transformation -- It is not the transformation that
23 is non-uniform. It's the shifts are non-uniform. The
24 transformations -- The non-linear transformation results

1 in non-vertical shift.

2 Q Okay. So if you do a non-uniform shifting of
3 pixels, as were cited in the '413 patent, are you
4 necessarily determining a portion or is it possible to
5 do that non-uniform shift without determining a portion
6 in your reading of the claim?

7 MS. NGUYEN: Objection, form.

8 THE WITNESS: The reading of -- my reading of the
9 claim is that it's the transformation that does both
10 determining the portion and resulting in non-uniform
11 shifts of the pixels.

12 MR. SCHMIDT: Q I'm asking a different question.
13 Is it possible to have an implementation that does a
14 non-uniform shifting of pixels, yet does not accomplish
15 the determination of a portion? Is that possible?

16 A It's a hypothetical. There's a transformation
17 involved here, right? The transformation is the glue
18 that makes everything happen here.

19 Q What I'm getting at, Doctor, is if a non-uniform
20 shifting of the pixels impliedly determines a portion,
21 then why is the claim reciting determine a portion
22 separately in your reading?

23 MS. NGUYEN: Objection, form.

24 THE WITNESS: The determination of the portion and

1 the application of a transformation is coupled together.
2 It's just an integral part of it. And, you know, one
3 can determine the other.

4 But, you know, in the portion to have very
5 small shifts or no shifts at all and -- this implies a
6 linear part of the transformation outside its non-linear
7 or piecewise linear. So they are just intertwined,
8 these two steps.

9 MR. SCHMIDT: Q When you were given your legal
10 understanding in this case, were you given the
11 understanding that you're supposed to interpret the
12 claims in a manner that gives meaning to all the
13 limitations?

14 MS. NGUYEN: Objection, form.

15 THE WITNESS: I don't understand the legal aspects
16 of everything. I'm not a lawyer. But, yeah, I can read
17 the limitations and assign meaning to them.

18 MR. SCHMIDT: Q Well, did you understand that when
19 you read a claim and interpret its meaning to a person
20 of ordinary skill in the art, you're supposed to read
21 the claim in a way that doesn't render any limitation
22 meaningless? Did you have that understanding when you
23 did your analysis?

24 MS. NGUYEN: Objection, form.

1 THE WITNESS: Yeah, I would not argue that the
2 limitation is meaningless.

3 MR. SCHMIDT: Q I'm asking, did you understand
4 when you did your analysis that you were supposed to
5 read these claims in a way to not render any particular
6 limitation meaningless?

7 A Yes.

8 Q And that's the understanding that you applied in
9 carrying out your analysis?

10 A Yes.

11 Q Is it possible to apply a non-uniform shifting
12 of pixels in an input image without determining a
13 portion in your understanding?

14 MS. NGUYEN: Objection, form.

15 THE WITNESS: The way I look at it is that the
16 limitations are required to apply transformation, and
17 then it's this transformation that, therefore, is this
18 non-vertical shift. So I cannot take that limitation,
19 but then you apply transformation out, and say that's
20 meaningless.

21 MR. SCHMIDT: Q If we just struck out the portion
22 of the claim that reads, determine a portion within the
23 input image, the portion including a subset of pixels,
24 and the portion reading that the transformation

1 non-uniformly shifts the pixels, such that differences
2 between the input positions and the output positions of
3 the subset of the pixels within the portion are less
4 than differences between the input positions and the
5 output positions of others of the pixels, would there be
6 any change in scope of the claim?

7 A If we remove the limitation that would determine
8 the portion and to remove that the shifts inside the
9 portion are smaller than, right --

10 Q Right.

11 A -- the shifts in other parts?

12 Q Yeah.

13 A It would not be the same claim.

14 Q Would there be any change in scope?

15 A I don't understand your question. What do you
16 mean by change in scope?

17 Q Let me ask you this. Would it change your
18 invalidity opinions with respect to Meulen?

19 MS. NGUYEN: Objection, form.

20 THE WITNESS: Well, this is a hypothetical. I
21 didn't perform an analysis of what would happen if we
22 strike out the limitations. It's something that I'll
23 need to look into in much more detail before I'm able to
24 answer your question.

1 MR. SCHMIDT: Q Okay. So you can't tell me
2 whether or not striking those two limitations would
3 affect your invalidity opinions with respect to Meulen,
4 fair?

5 A Yeah, it's something that I did not consider. I
6 would need time to think as well.

7 Q Turning back to the limitation about the
8 non-uniform shifting of pixels, would you agree that in
9 order to accomplish a non-uniform shifting, you need to
10 apply a non-linear transformation?

11 A Yeah, the application of a non-linear
12 transformation results in the non-vertical shifting of
13 the pixels.

14 Q And a non-linear transformation is one that will
15 shift a pixel by a different amount based on where it's
16 located on the display; fair?

17 MS. NGUYEN: Objection, form.

18 THE WITNESS: Only if transformation is chosen in
19 such a way that for a portion of the image the shifts
20 are smaller than the other portions, and this portion of
21 the input image can be anywhere in the image.

22 MR. SCHMIDT: Q Let's turn to column 7 of Exhibit
23 2, the '413 patent. Do you see the equation at line 3
24 of column 7 of the '413 patent?

1 A Yes, I do.

2 Q That's Delta H divided by H, and then there's an
3 equality. Do you see that?

4 A Yes, I do.

5 Q That is an example of a non-uniform -- Strike
6 that.

7 The equation at line 3 of column 7 is an
8 example of an equation implementing a non-uniform
9 shifting of pixels based on the horizontal position of
10 the pixel, correct?

11 A It is an equation I did not analyze in my
12 declaration, and I will need time to look into that
13 before being able to analyze it here.

14 Q Did you analyze the equations in column 7 as
15 part of forming your expert analysis and opinions in
16 this case?

17 A Yes, I looked at the equations.

18 Q Can you tell me whether or not those are
19 examples of a non-linear transformation as claimed by
20 the '413 patent?

21 MS. NGUYEN: Objection, form.

22 THE WITNESS: This is an equation that gives us the
23 horizontal offsets, the Delta H, HH. Yeah, this gives
24 us just a parameter offset.

1 MR. SCHMIDT: Q When you did your expert analysis
2 in this case, did you understand this equation as an
3 example of non-uniform pixel shifting based on the
4 horizontal position of a pixel?

5 A So this equation gives me at any H, what is the
6 Delta H.

7 Q Let me ask my question again. Did you
8 understand this as an example of the non-uniform pixel
9 shifting based on the horizontal position of a pixel as
10 claimed by the '413 patent?

11 MS. NGUYEN: Objection, form.

12 THE WITNESS: Yeah, this is a six-order equation in
13 H, and it gives me for a given H what's the relative
14 shift of a pixel.

15 MR. SCHMIDT: Q So this is an embodiment of the
16 invention; fair?

17 MS. NGUYEN: Objection, form.

18 THE WITNESS: Yeah, this is one example that's
19 presented in '413.

20 MR. SCHMIDT: Q In this example, the amount of
21 shifting in the horizontal dimension is going to differ
22 for every single pixel based on its position along the
23 horizontal axis; do you agree?

24 MS. NGUYEN: Objection, form.

1 THE WITNESS: Yes, this is an equation that I change
2 H on the right-hand side and I change HH on the
3 left-hand side.

4 MR. SCHMIDT: Q In this implementation, no two
5 pixels having different positions on the horizontal axis
6 are going to shift by the same amount, right?

7 A Again, I haven't analyzed this equation in my
8 declaration, and I would need more time to look into the
9 fine details. Yeah, Delta H is a function of H. If I
10 change H, Delta H would change.

11 Q It's not just that H changes as Delta H changes,
12 it's that every Delta H has a different value based on
13 different values of H, correct?

14 MS. NGUYEN: Objection, form.

15 THE WITNESS: Well, if I change H, Delta H changes,
16 right? That's what declaration says. Now, it's
17 conceivable that for different Hs I get the same Delta
18 H. I would need to analyze the six-order equation.

19 MR. SCHMIDT: Q You haven't done that as part of
20 your expert analysis?

21 A Yeah, I looked at the equation, but an analysis
22 of an equation is quite involved. It's clear it's a
23 function -- Delta H is a function of H, right?

24 Q Okay. And then beginning at line 15 there's an

1 equation for the vertical shifting, Delta V is a
2 function of V. Do you see that?

3 A Yes.

4 Q And those are also six-order polynomials,
5 correct?

6 A That's correct.

7 Q And would you agree those are examples of
8 non-uniform shifting of pixels in the vertical direction
9 based on the vertical position of those pixels?

10 A Yes, I agree.

11 Q Generally speaking, in the field of digital
12 image processing, do you agree that applying non-linear
13 transformations is more computationally intensive than
14 applying linear transformations?

15 A It depends on the non-linear transformation. If
16 it's a piecewise linear transformation, which makes it
17 non-linear, it's a straightforward linear
18 transformation.

19 Q Generally speaking though, non-linearities
20 are -- or introduce computational demands over and above
21 linear computations, correct?

22 MS. NGUYEN: Objection, asked and answered.

23 THE WITNESS: It depends on the form of the
24 non-linear function. In some cases a non-linear

1 function can be as -- portrayed as a linear function.
2 In some other cases, if it's an extremely complicated
3 non-linear function, it might take longer to implement.

4 MR. SCHMIDT: Q In your work in digital
5 processing, have you ever tried to do linear
6 transformations wherever possible and avoid non-linear
7 transformations?

8 A It's a hypothetical question. It depends on the
9 problem. If a linear transformation solves the problem,
10 so be it. If the linear transformation does not solve
11 the problem, then you resort to a non-linear one.

12 Q But do you ever resort to a linear approximation
13 in order to avoid the complexities of a non-linear
14 calculation?

15 MS. NGUYEN: Objection, form.

16 THE WITNESS: We're getting into a lot of
17 hypotheticals here. It's simply -- There are simple
18 non-linear transformations. There are very complicated
19 non-linear transformations. It all depends on the
20 transformation itself.

21 And, again, if a simple solution solves the
22 problem, a simple approach, then you follow the simple
23 approach, and if that doesn't cut it, you resort to
24 something more complicated.

1 MR. SCHMIDT: Q Okay. It actually wasn't a
2 hypothetical. I'm asking you, Doctor, as a person of
3 ordinary skill in the art, are you familiar with the
4 technique of applying a linear approximation in order to
5 avoid the complexities of a non-linear calculation? Are
6 you familiar with that notion?

7 A Yeah, that notion exists.

8 Q And isn't it true that in the field of digital
9 image processing people of ordinary skill in the art
10 will often undertake linear approximations in order to
11 avoid the computational demands of a non-linear
12 transformation?

13 MS. NGUYEN: Objection, form.

14 THE WITNESS: It all depends if you solve the
15 problem you're asked to solving. So everything --
16 Approximations have a place in computation, but the
17 overall objective is if you get a satisfactory solution
18 to what you are after.

19 MR. SCHMIDT: Q And if you could get a
20 satisfactory result with a linear approximation in the
21 field of digital image processing, you would pursue the
22 linear transformation over a non-linear; fair?

23 A It all depends. It depends on what -- you know,
24 the sources one has available. It depends on the

1 accuracy of the solution. It depends on a lot of
2 things. And I can have a non-linear solution with a
3 piecewise linear approach, right? So its computation is
4 indistinguishable from a linear approximation, but it
5 doesn't prevent a non-linear function.

6 Q Did you say piecewise linear is computationally
7 indistinguishable from a linear transformation?

8 A It's very similar. It's very similar.

9 Q And isn't it true that piecewise linear
10 transformations are recognized in the art as a way of
11 approximating a non-linear transformation?

12 A I'm not understanding.

13 Q Do you deny that it's recognized in the art that
14 a piecewise linear transformation is a way of
15 approximating a non-linear transformation?

16 A It depends on how fine this linear approximation
17 of a non-linear function is and so on, right? I mean,
18 there's so much -- there's so much detail in what we
19 tried to cover here, right?

20 Yeah, it's true I can take a non-linear
21 function and I can have my new linear stacks with this
22 integral different summation, but if you do huge linear
23 steps, they're not approximating, they're non-linear,
24 then I would consider it as an approximation of a linear

1 function. There's so much detail important, right, we
2 cover here.

3 Q If I understand your testimony, a piecewise
4 linear transformation will better approximate a
5 non-linear function if you have a larger number of
6 pieces; is that fair?

7 MS. NGUYEN: Objection, form.

8 THE WITNESS: Yeah, for an approximation -- It would
9 be an approximation. I have to have an acceptable
10 error. If this error is huge, then the linear
11 approximation is -- where it's linear is not a good
12 approximation to the non-linear function. So there's a
13 lot under the hood there to tell us if this is why it's
14 linear is an approximation, a good approximation, for a
15 non-linear function.

16 MR. SCHMIDT: Q And, generally speaking, the more
17 linear -- the more pieces of linear transformations you
18 do, the better approximation of the non-linear function
19 you'll get; is that fair?

20 MS. NGUYEN: Objection, form.

21 THE WITNESS: Yeah, for an approximation to be
22 considered an approximation, it would be defined as an
23 approximation which has to have an error. And if I want
24 to approximate a highly non-linear function with this

1 linear pieces, then I have to have a fine linear
2 approximation to approximate a non-linear function.
3 Otherwise, it's not an approximation.

4 MR. SCHMIDT: Q Do you agree that the image
5 processing resources are more limited on a handheld
6 device than they are on a desktop computer?

7 MS. NGUYEN: Objection, form.

8 THE WITNESS: There is a spectrum of handheld
9 devices, a spectrum of desktop computers, and you have
10 to look at specific examples, look what sources they
11 have and so on, right? So it's not -- may not always be
12 the case.

13 MR. SCHMIDT: Q In 2006, when Meulen was filed,
14 would you agree that handheld devices had fairly limited
15 image processing resources?

16 A I didn't do an analysis what the handheld
17 devices were capable of doing in 2006. Certainly had
18 fewer resources in 2006 that they have now days.

19 Q When you're doing digital image processing on a
20 handheld device, what are some of the resource
21 limitations that a person of ordinary skill in the art
22 would recognize?

23 MS. NGUYEN: Objection, form.

24 THE WITNESS: Yeah, one has to look at what

1 processor is used on the handheld device, what are the
2 storage capabilities. One has to look specifically at
3 the hardware capabilities of the handheld device.

4 MR. SCHMIDT: Q Battery limitations are a concern
5 on a handheld device doing digital image processing,
6 right?

7 MS. NGUYEN: Objection, form.

8 THE WITNESS: Yeah, again, one has to look at the
9 generation of the devices and see what again hardware is
10 used, what processors, what batteries, this and that,
11 right? Yeah, the handheld device is not like identical
12 time the same way a desktop computer is. But it doesn't
13 mean that it cannot perform simple image processing
14 operation with the handheld device.

15 MR. SCHMIDT: Q Did you consider the state of the
16 art of handheld devices in light of these constraints as
17 of the priority date of the '413 patent, 2013?

18 A I'm sorry, what's the question?

19 Q Did you consider the state of the art of
20 handheld devices in light of these constraints as of the
21 priority date of the '413 patent, which was in the
22 August 2013 timeframe?

23 A I have not done a detailed analysis of the state
24 of the art of handheld devices, and it's not something

1 that I considered in my declaration.

2 Q Okay. I want to turn to Meulen, which is
3 Exhibit 3, and I want to direct you back to column 5,
4 which is table 1. We spoke about this before. But
5 table 1 is an allocation of the display into five
6 regions, right?

7 I'm sorry, did you answer the question? I
8 didn't hear.

9 A Yes, I'm there.

10 Q Okay. Yeah, and just to orient us, table 1 is
11 allocating the display of Meulen into five regions. Do
12 you see that?

13 A Yes, I do.

14 Q Okay. And each one of those regions has a
15 compression ratio, correct?

16 A Correct.

17 Q For example, region 2 has a 2 to 1 compression
18 ratio. Do you see that?

19 A Yes, I do.

20 Q And what that means is that every single pixel
21 in region 2 is going to be compressed by the same 2 to 1
22 ratio; fair?

23 A Yeah, how exactly the compression is taking
24 place, it's not described by this table, but I compress

1 a hundred pixels into 50 pixels.

2 Q But for two pixels that are both within region
3 2, they're both going to have a 2 to 1 compression ratio
4 applied to them regardless of where they're located on
5 the vertical and horizontal axis of the display as a
6 whole, correct?

7 MS. NGUYEN: Objection, form.

8 THE WITNESS: Yeah, Meulen mentions different ways
9 to -- examples of ways to implement this compression,
10 but this is not an exhaustive list.

11 So what we know is that the hundred pixels
12 will become 50 pixels, but exactly how each and every
13 pixel the input image is created, it's not -- it's not
14 specified by table 1.

15 MR. SCHMIDT: Q Looking at the compression
16 methodology in table 1, would you characterize that as a
17 piecewise linear transformation that's applied between
18 the source image and the display image?

19 MS. NGUYEN: Objection, form.

20 THE WITNESS: That would be one way to interpret
21 this for every piecewise transformation that will carry
22 this out. But this may not be the only way to do it.

23 MR. SCHMIDT: Q Okay. The five regions that are
24 set forth in table 1 relate to vertical partitioning of

1 the screen in Meulen, correct?

2 A That's correct.

3 Q And the change in compression ratio for table 1
4 depends only on how far that region is horizontally from
5 the center, correct?

6 MS. NGUYEN: Objection, form.

7 THE WITNESS: This particular example, the further
8 away from region 3, excuse me, the higher the
9 compression ratio.

10 MR. SCHMIDT: Q The further away from region 3 in
11 the horizontal direction only, the higher the
12 compression ratio, correct?

13 A That's correct.

14 Q In other words, you could deviate across the
15 entire screen in the vertical direction and the
16 compression ratio would not change at all, correct?

17 MS. NGUYEN: Objection, form.

18 THE WITNESS: Yeah, in this particular embodiment
19 the compression ratio changes horizontally as we see in
20 table 1. And if we stay within one region and move
21 vertically, the compression ratio will -- would stay the
22 same. But this is just one embodiment of Meulen.

23 MR. SCHMIDT: Q That's actually the case for every
24 single embodiment in Meulen, correct?

1 MS. NGUYEN: Objection, form.

2 THE WITNESS: I'll have to go over the specification
3 here to see if this is the case, would be the case.

4 MR. SCHMIDT: Q Well, you don't recall seeing any
5 horizontal partitioning of the screen in Meulen in any
6 of its disclosed embodiments, do you?

7 A I'm not sure if I can point to any --

8 Q And -- I'm sorry.

9 A -- any specific drawing where there's a vertical
10 change in the compression ratio. But I would have to
11 look at all the details, if it's mentioned somewhere.

12 But even if there's no drawing that shows
13 changes vertically, it would have been obvious to apply
14 the same approach to the vertical direction.

15 Q Why do you say that?

16 MS. NGUYEN: Objection, form.

17 THE WITNESS: Yeah, for a person -- for a POSITA,
18 the horizontal and vertical dimensions of an image are
19 not different. In other words, whatever can be done in
20 the horizontal dimension direction could be done the
21 same way in the vertical direction. Very often in image
22 processing you just rotate the image 90 degrees and you
23 apply the same operation.

24 So to a POSITA the invention of Meulen can be

1 applied in a safer way to the vertical direction as
2 well.

3 MR. SCHMIDT: Q Let's talk about the compression
4 ratio. In the context of Meulen, a person of ordinary
5 skill in the art would understand that compression means
6 taking some number of source pixels and turning them
7 into some lesser number of pixels for display, correct?

8 A That's correct. Compression in the spatial
9 domain, yeah.

10 Q So there's actually a subtraction of pixels,
11 correct?

12 MS. NGUYEN: Objection, form.

13 THE WITNESS: There's a reduction in the output
14 number of pixels, yes.

15 MR. SCHMIDT: Q And that's why in Meulen every
16 change in aspect ratio is also accompanied by a
17 corresponding change in the resolution from source to
18 display, correct?

19 A Can you repeat that?

20 Q Sure. Because Meulen is discussing compressing
21 pixels, every single disclosure of changing an aspect
22 ratio in Meulen also involves a corresponding change in
23 resolution?

24 MS. NGUYEN: Objection, form.

1 THE WITNESS: By reducing the number of pixels, I
2 change the number of pixels in the X and Y direction,
3 and, therefore, I change aspect ratio.

4 MR. SCHMIDT: Q And in Meulen's implementation, the
5 way that you change the aspect ratio is by changing the
6 resolution of the image, correct?

7 A In long ways, if you change the aspect ratio,
8 you have to change the resolution in one of the
9 dimensions or both dimensions.

10 Q For example, in column 5 at line 62 of Meulen,
11 there's a discussion of a change from a 1 by 1 aspect
12 ratio -- I'm sorry, strike that.

13 In column 5 at line 62 there's a discussion of
14 a transformation from a source content having a 3 by 2
15 aspect ratio and a resolution of 480 by 320. Do you see
16 that?

17 A Yes.

18 Q And the transformation is to a display image
19 with an aspect ratio of 1 to 1, with a resolution of 320
20 by 320. Do you see that?

21 A Yes, I do.

22 Q And the change from a 3 by 2 to 1 to 1 aspect
23 ratio is accounted for by that change in number of
24 pixels, correct?

1 A Correct.

2 Q And in all of the tables of Meulen the aspect
3 ratio change is accompanied by a change in resolution to
4 achieve it, correct?

5 A This is not just Meulen. This is in all the
6 technology you're talking about. You have to change the
7 resolution to change the aspect ratio.

8 Q You agree with me Meulen is changing the aspect
9 ratio by effecting the resolution of the output display,
10 correct?

11 MS. NGUYEN: Objection, form.

12 THE WITNESS: I'm saying that's what one has to do
13 to change the aspect ratio. You have to change the
14 resolution.

15 MR. SCHMIDT: I'm about to go to a new topic. Do
16 you want to take another break?

17 THE WITNESS: Yes.

18 MR. SCHMIDT: Okay.

19 THE WITNESS: Thank you.

20 (Recess was taken.)

21 MR. SCHMIDT: Q Welcome back, Doctor.

22 A Thank you.

23 Q I want to turn to a new topic now. And I want
24 to direct you to paragraph 262 of your declaration,

1 Exhibit 2.

2 A Okay.

3 Q Okay. And in the last sentence of paragraph 262
4 you say, a POSITA, when faced with Meulen and having the
5 knowledge about scaling, would have been motivated to
6 turn to a prior art reference that discloses the details
7 of scaling. Do you see that?

8 A Yes, I do.

9 Q Okay. First of all, you agree that Meulen
10 doesn't disclose the details of pixel scaling, correct?

11 MS. NGUYEN: Objection, form.

12 THE WITNESS: Meulen uses compression and/or scaling
13 throughout the specification and provides more details
14 on how to perform compression.

15 MR. SCHMIDT: Q In the second-to-last sentence of
16 paragraph 262 you say, but Meulen does not disclose the
17 details of how to perform scaling. Do you see that?

18 A Yes, I do.

19 Q Okay. And that's your opinion?

20 A Yeah, my opinion is that there's no fine detail
21 of how to perform scaling. But it's not -- that is not
22 underlying what he's doing.

23 Q Okay. Because of that, in your invalidity
24 opinion you are relying on a combination of Meulen with

1 Chao in order to provide the details of how to perform
2 scaling; is that fair?

3 A Yes.

4 Q In paragraph 263 you write -- I actually want to
5 focus on the parenthetical there which relates to the
6 Meulen/Chao combination. You write, prior art elements
7 and known techniques applied to similar methods and
8 devices. Do you see that?

9 A Yes.

10 Q What are the similar methods and devices that
11 you're referring to?

12 A Well, Chao has -- he gives example or different
13 embodiments that have to do with, as an example, framing
14 applications and scaling images in a certain way so that
15 they meet some printing requirements. Techniques can be
16 applied to displaying images to -- or displaying device
17 that has a different aspect ratio.

18 Q Is that it?

19 MS. NGUYEN: Objection, form.

20 THE WITNESS: Yes.

21 MR. SCHMIDT: Q Okay. We spoke about this
22 earlier. The approach of Meulen is implemented on a
23 handheld wireless device. Do you recall that?

24 A Yeah, that's the example that Meulen brings up.

1 Q Okay. There's no handheld device disclosed in
2 Chao, correct?

3 A Without going through Chao line by line, this
4 might be the case. In printing application, again,
5 there was resized images, but it would be the specific
6 page.

7 Q Okay. And you mentioned that Chao is directed
8 to printing applications, correct?

9 A This is one of the main examples that Chao
10 brings up.

11 Q Specifically, Chao is directed to the problem of
12 using pre-designed borders for photos, newsletters,
13 greeting cards, and allowing those borders to be printed
14 on pages of different sizes and aspect ratios, correct?

15 A This seems to be one of the main applications
16 that Chao has in mind.

17 Q Chao is not discussing the resizing or
18 reconfiguration of an image within the physical confines
19 of a physical display, correct?

20 MS. NGUYEN: Objection, form.

21 THE WITNESS: Resizing an image to be printed or be
22 displayed wouldn't be a very different application in my
23 mind.

24 MR. SCHMIDT: Q Did you say it would be a very

1 different application or it would not --

2 A Would not be. Would not be a very different
3 application.

4 Q Okay. Well, except that a display has a fixed
5 number of pixels that you're operating with, correct?

6 MS. NGUYEN: Objection, form.

7 THE WITNESS: The display has a given number of
8 pixels, but so does the digital image. Its manipulation
9 of digital image is here. So before being printed it's
10 a digital image as well.

11 MR. SCHMIDT: Q Part of Chao is distinguishing
12 between what it calls foreground elements and background
13 elements, correct?

14 A That's correct.

15 Q Okay. And in Chao, a transformation is applied
16 to the background elements without regard to their
17 original aspect ratio; fair?

18 MS. NGUYEN: Objection, form.

19 THE WITNESS: Can you repeat the question please?

20 MR. SCHMIDT: Q In Chao, the transformation
21 applied to the background elements is made without
22 regard to the original aspect ratio of the background
23 element, correct?

24 A Chao resizes the background so as to meet the

1 specific aspect ratio. So the input aspect ratio is
2 taken into account as well.

3 Q But Chao allows for the background element to be
4 transformed in a way that will change the aspect ratio
5 of the background element itself, correct?

6 A That's correct. So it would take a square
7 background, for example, and map it into a rectangular
8 background, changing the aspect ratio.

9 Q But for the foreground elements in Chao, the
10 transformation is applied in a way that will preserve
11 the aspect ratio, correct?

12 A That's part of the consideration, the position
13 might change, but the individual aspect ratio of the
14 background object is preserved by and large.

15 Q Now, in Chao the background elements are not
16 necessarily at the edge of the image, correct?

17 MS. NGUYEN: Objection, form.

18 THE WITNESS: Well, there is an underlying
19 assumption that the foreground elements might be more in
20 the center and the background more at the edges. But
21 this is not a hard requirement.

22 MR. SCHMIDT: Q Let me just -- let me put Chao
23 into the record so you have that available to you.

24 (Document marked as Deposition

1 Exhibit 4 for identification.)

2 Q For the record, I've marked Exhibit 4 to the
3 deposition. Exhibit 4 is published U.S. Patent
4 Application 2008/0095470, which we'll refer to as Chao.

5 If you refresh your Exhibit Share, Doctor, you
6 should see that.

7 A Yes, I do see that.

8 Q Okay. And do you have a hard copy of Chao in
9 front of you?

10 A Yes, I do.

11 Q Can you just confirm that it's unannotated?

12 A Yes, it's a clean copy.

13 Q Okay. Thank you.

14 If you refer to figure 3 of Chao, figure 3 is
15 the algorithm for distinguishing between foreground and
16 background elements; is that correct?

17 A Yes.

18 Q And that determination is made based on things
19 like symmetry, size, and complexity, correct?

20 A Yes, that's what I read in the flowchart.

21 Q So it's possible to have a background image in
22 Chao that would be positioned in the center, right?

23 A You have to look at all the parameters that are
24 defined there in order to calculate the score. And

1 symmetry and sizing could be -- We have to see which of
2 these values might be position dependent.

3 Q But my question is, it's certainly possible in
4 Chao to have a background element located in the center;
5 isn't that right?

6 A You are going to see how the different values
7 are determined, the symmetry, size, and complexity, and
8 how the score is calculated. So if you can point me to
9 where these are described, then we should be able to
10 answer your question.

11 Q Paragraph 33 of Chao --

12 A Okay.

13 Q -- describes the method for distinguishing
14 between background and foreground elements.

15 A Thank you.

16 There are a number of calculations that take
17 place, you know, the symmetry value, the size value, the
18 complexity value within the four. And it's taken into
19 account where the image is located -- I'm sorry, the
20 background element is located with respect to the whole
21 frame.

22 So there are some comment of what tends to be
23 the case, like background elements tend to be
24 symmetrically placed on the page, the size is closer to

1 the dimension of the page, tend to be simpler. But this
2 does not exclude the possibility that background
3 elements can be -- Although, based on their experience,
4 they seem to be located at the boundaries of the image.
5 Since it's a mathematical calculation, it does not seem
6 to exclude the case that's how the background elements
7 might be just in central parts of the image as well.

8 Q Thank you. And it doesn't exclude the
9 possibility that the foreground elements will be at the
10 edge of the image, correct?

11 MS. NGUYEN: Objection, form.

12 THE WITNESS: You have to look at how the foreground
13 elements are determined.

14 MR. SCHMIDT: Q Well, figure 17, for example, is a
15 picture of foreground elements being manipulated
16 according to Chao, and those elements are located on the
17 peripheral edges of the image. Do you see that?

18 MS. NGUYEN: Objection, form.

19 THE WITNESS: I see figure 17. I'm looking for a
20 description of figure 17.

21 MR. SCHMIDT: Q Let me help you out. At paragraph
22 96 there's a description of figure 17. Do you see that?

23 A Thank you. Yes.

24 Q And in the second sentence it says, accordingly,

1 each of corner elements 35 prime, 36 prime, 37 prime,
2 and 38 prime are scaled by a factor of one-half, the
3 smaller of the vertical and horizontal scaling factors,
4 while still maintaining the original aspect ratio,
5 correct?

6 A Yes.

7 Q Okay. So those features in figure 17 are
8 foreground elements, right?

9 MS. NGUYEN: Objection, form.

10 THE WITNESS: Yes, this seems to be the case, that
11 figure 17 refers to foreground elements.

12 MR. SCHMIDT: Q Okay. Now, I want you to imagine
13 with me for a second an implementation where you took
14 what's shown in figure 17 of Chao and combined it with
15 the wireless display with the table A implementation of
16 Meulen. What's going to happen to those foreground
17 elements when you apply the compression ratios that are
18 set forth in table A of Meulen?

19 MS. NGUYEN: Objection, form.

20 THE WITNESS: To implement what's in figure 17, I
21 need to change the compression ratios in Meulen.

22 MR. SCHMIDT: Q Do you agree with me that table A
23 of Meulen is not compatible with the situation shown in
24 figure 17 of Chao, correct?

1 A Do you mean table 1?

2 Q Yes, thank you. Let me reask the question.

3 You agree with me that the pixel allocation
4 scheme in table 1 of Meulen is not compatible with the
5 situation shown in figure 17 of Chao, correct?

6 MS. NGUYEN: Objection, form.

7 THE WITNESS: I would not use table 1 from Meulen
8 for figure 17. I would use another table that
9 accommodates figure 17. I would just change the
10 compression ratios. Table 1 is just an example of an
11 implementation.

12 MR. SCHMIDT: Q What table would you use?

13 A I'll use a table that has no compression at the
14 edges and compression in the middle.

15 Q Do you see such a table in Meulen?

16 MS. NGUYEN: Objection, form.

17 THE WITNESS: Meulen just gave us some examples.
18 Meulen's disclosure is that I can implement any
19 compression ratio I want.

20 MR. SCHMIDT: Q The last sentence of the abstract
21 of Meulen reads, image compression and/or scaling may be
22 applied to media content that is to be displayed in one
23 or more of the lateral display regions based on
24 proximity of the lateral display region to the edge of

1 the display. Do you see that?

2 A Where are you reading?

3 Q The last sentence of the abstract. Do you see
4 that, Doctor?

5 A Yes, I see that in the abstract, and I want to
6 see what is in the claims. But the tables to me are
7 just examples of how things can be implemented. And by
8 changing the compression ratios this could be, you know,
9 accommodating. But the whole idea that I'm relying on
10 from Chao is how to scale the background in this
11 particular case.

12 Q But Meulen is teaching different compression
13 ratios, but it's teaching that compression generally
14 increases based on proximity of the lateral display
15 region to the edge of the display; isn't that right?

16 MS. NGUYEN: Objection, form.

17 THE WITNESS: I think we can utilize Meulen in
18 implementing figure 17, because what you see in figure
19 17 is this foreground objects at the corners that become
20 smaller -- they maintain their aspect ratio, but their
21 size is smaller. So, therefore, I can implement Meulen
22 directly and implement Meulen in the horizontal and
23 vertical direction and achieve what I see in figure 17.

24 MR. SCHMIDT: Q What do you mean implement Meulen

1 directly and implement in a horizontal and vertical
2 direction to achieve what you see in figure 17?

3 A Yeah, in figure 17 we see those four objects at
4 the corners. They maintain their aspect ratio, but
5 they're smaller in size. So implementing Meulen in the
6 horizontal and vertical direction that we discussed, it
7 should have been straightforward to do it in the
8 vertical direction as well, then I can achieve the
9 effect of what we see in figure 17.

10 Q And in this implementation that you're
11 hypothesizing, would that satisfy the claims of the '413
12 patent?

13 A Or ask me a specific question if Meulen can be
14 utilized to achieve the effect of figure 17.

15 Q Well, I'm asking you a new question.

16 A Okay.

17 Q In the implementation that you hypothesized for
18 me, would the implementation of Meulen to achieve figure
19 17, as you testified, satisfy the claims or not?

20 A Which claims are you referring to?

21 Q Claim 1.

22 A Okay. Meulen satisfies claim 1 and, therefore,
23 application of Meulen to achieve figure 17 satisfies
24 claim 1.

1 Q And help me understand in this combination that
2 you're opining about now what the compression ratio
3 would be for these elements at the corners of figure 17.

4 MS. NGUYEN: Objection, form.

5 THE WITNESS: Compression ratio is dictated by this
6 resizing we see here. So you have to look at the
7 example that describes -- the text that describes figure
8 17, and whatever compression ratio is applied to these
9 four objects, that's the compression ratio that could be
10 applied according to Meulen.

11 MR. SCHMIDT: Q And that compression ratio in your
12 mind would be applied both vertically and horizontally?

13 A Yes.

14 Q Does Meulen teach compressing images in the
15 vertical dimension?

16 A As we discussed earlier, my answer was yes. And
17 looking at claim 8 of Meulen, it says, the wireless
18 device of claim 4, said display controller to apply
19 compression in at least one of a horizontal direction, a
20 vertical direction.

21 Q At least one of a horizontal direction or a
22 vertical direction; is that how you interpret that?

23 A Well, I just read what the claim says.

24 Q Well, the claim says in at least one of a

1 horizontal direction, a vertical direction. It seems
2 like something is missing.

3 A The way I read it is that it can be the
4 horizontal, it can be the vertical direction. It can be
5 applied to either/or or both.

6 Q Turning back to Chao, isn't it true that Chao
7 only discloses scaling background and foreground
8 elements according to linear scaling factors?

9 MS. NGUYEN: Objection, form.

10 THE WITNESS: Chao teaches that the background --
11 I'm reading the abstract. So the method further
12 comprises creating resized background elements by
13 stretching or shrinking the background elements to fit
14 the dimensions of the resized image.

15 MR. SCHMIDT: Q Does stretching or shrinking tell
16 you whether or not the transformation is linear or
17 non-linear?

18 MS. NGUYEN: Objection, form.

19 THE WITNESS: The stretching -- I'm sorry.
20 Stretching or shrinking can be linear or non-linear.
21 Looking at some of the figures in Chao, it displays that
22 the stretching or shrinking of the background is done in
23 a non-linear fashion.

24 MR. SCHMIDT: Q What figures do you think show

1 stretching or shrinking in a non-linear fashion?

2 A Figure 9, for example.

3 Q Okay. What is it about figure 9 that makes you
4 think that the stretching or shrinking is being done in
5 a non-linear transformation?

6 A The border seems to be the same size in the
7 original and scale versions and, therefore, there has to
8 be a non-linear transformation.

9 Q Well, that could be achieved just by applying a
10 linear scaling factor in one dimension, right?

11 MS. NGUYEN: Objection, form.

12 THE WITNESS: It would have to be piecewise linear.
13 Like it's in the -- like going from 2A to 2A prime we
14 stretch in the horizontal direction. So I think if the
15 boundaries are the same size, then it has to be a
16 piecewise linear, therefore, non-linear.

17 MR. SCHMIDT: Q Figure 9 involves a background
18 element, correct?

19 A I believe so.

20 Q And Chao discloses scaling background elements
21 by a constant factor in the horizontal and vertical
22 directions. That's what it teaches, right?

23 MS. NGUYEN: Objection, form.

24 THE WITNESS: It teaches that in obtaining WT prime,

1 for example, it just stretches scale by SV. And all the
2 other widths there shown are also multiplied by SV.
3 However, the center part of the image there, it was
4 stretched by a factor greater than 1. Therefore, I
5 cannot just multiply the center part by the same as V.

6 MR. SCHMIDT: Q But the background element is
7 being multiplied by a constant scaling factor, which
8 makes it linear, right?

9 A Yeah, the way I understand this figure, it's
10 just the -- those border part is multiplied by the
11 scaling factor as V, but the center part, you cannot
12 multiply by the same factor.

13 Q Isn't it true that there's no disclosure in Chao
14 of resizing an element according to a non-linear scaling
15 function?

16 MS. NGUYEN: Objection, form.

17 THE WITNESS: The main idea of Chao is that by
18 separating foreground and background and processing them
19 separately, the net effect is a non-linear
20 transformation of the input image.

21 The fact that it's able to maintain the aspect
22 ratio of the foreground objects while resizing, changing
23 the aspect ratio of the original image, implies that
24 the -- not implies -- it makes certain that the overall

1 effect is a non-linear transformation of the input
2 image.

3 MR. SCHMIDT: Q So I get that that's your opinion.
4 But my question is, with respect to either a background
5 element or a foreground element, you agree with me that
6 those elements are being scaled only by linear
7 transformations, correct?

8 MS. NGUYEN: Objection, form.

9 THE WITNESS: My statement is not my opinion. It's
10 a fact, that if you look at the input and output, you
11 might see similarly a transformation with this input and
12 output. It's a fact. It's not a personal opinion.

13 Now, how it is implemented is a different
14 story, right? And it's implemented by separating
15 background, foreground. And whether it's a linear
16 transformation supplied to both, I'm not certain,
17 because in maintaining the position of the foreground
18 elements -- I'm sorry, maintaining the aspect ratio, the
19 position changes.

20 So if we take the composite processing within
21 the foreground, it's a non-linear transformation. And,
22 again, the overall, if you take the transformation
23 applied to foreground and background, it indeed is a
24 fact a non-linear transformation.

1 MR. SCHMIDT: Q Okay. Let's turn to paragraph 273
2 of your sworn declaration.

3 A Okay.

4 Q You write in paragraph 273, Chao discloses
5 applying a, quote, uniform scaling factor. Do you see
6 that?

7 A Yes.

8 Q Figure 14 below shows, quote, page 30h is taller
9 than page 30h, but the same width. Accordingly, the
10 scaling factor is, and then you have a bracket 1, which
11 reflects the horizontal scaling factor. Do you see
12 that?

13 A Yes.

14 Q And figure 14 is discussing the scaling of a
15 foreground element, correct?

16 MS. NGUYEN: Objection, form.

17 MR. SCHMIDT: Q It's the ducks that you rely on on
18 the next page. But that's a foreground element, right?

19 MS. NGUYEN: Objection, form.

20 THE WITNESS: Yes, what we state here -- state here
21 is that, yeah, the scaling parameter is 1, so scaling
22 the vertical direction. So, yeah, the foreground here
23 in this example is scaled linearly.

24 MR. SCHMIDT: Q In fact, every single disclosure

1 of scaling a foreground or background element in all of
2 Chao is done by a linear function, right?

3 MS. NGUYEN: Objection, form.

4 THE WITNESS: What we see here is that the
5 foreground hasn't -- has not changed aspect ratio. So
6 if I -- had I applied a linear transformation, like
7 going from the green to the blue rectangles there, the
8 ducks would have been taller, but the ducks stayed the
9 same.

10 So the linear transformation is applied to the
11 background, which here is an empty background. But
12 you'll see the size of the ducks is the same. The size
13 of the train is the same. So this implies that there's
14 not a linear transformation applied to the foreground.

15 MR. SCHMIDT: Q You write in paragraph 273 that
16 it's a uniform scaling factor, right?

17 A But to the foreground and the background?

18 Q The foreground.

19 MS. NGUYEN: Objection, form.

20 MR. SCHMIDT: Q And that's a direct quote from
21 Chao at paragraph 90.

22 And then you write in the last sentence of
23 paragraph 273, a POSITA would have understood that a
24 scaling factor greater than 1 is applied to uniformly

1 link, stretch, the image along the vertical direction to
2 make page 30h taller than page 30h. Do you see that?

3 A Yes. This means the background is stretched,
4 right?

5 Q Well, you tell me. Is that what you're writing
6 here?

7 MS. NGUYEN: Objection, form.

8 THE WITNESS: Yeah, 30h double prime is the
9 background. But, I mean, what we see here visually,
10 right, from going from 30h to 30h double prime is that
11 the ducks and the train haven't changed size in the
12 horizontal or vertical direction, but the background
13 changed size. Therefore, I could not have applied the
14 linear transformation to the ducks and the train to
15 change the sizes either in vertical or horizontal
16 direction.

17 MR. SCHMIDT: Q Okay. In the first sentence of
18 paragraph 273 you write, Chao discloses applying a
19 uniform scaling factor. Do you see that?

20 A Yes, I do.

21 Q What were you referring to there? Background,
22 foreground, or just in general?

23 MS. NGUYEN: Objection, form.

24 THE WITNESS: The thinking of Chao is to maintain

1 the aspect ratio of the foreground objects. So back to
2 figure 14, if I'm to -- We see that going from 30h to
3 30h prime I allocate horizontally. Going from 30h to
4 30h double prime I allocate vertically.

5 However, the aspect ratio of the foreground
6 objects is preserved. Therefore, I could not have
7 preserved the aspect ratio of the foreground objects by
8 just scaling in only one dimension.

9 MR. SCHMIDT: Q When you write Chao discloses
10 applying a uniform scaling factor in the first sentence
11 of paragraph 273, what were you referring to?

12 A I'm looking at paragraph 90, and the important
13 element there is that the elements are then scaled
14 maintaining the original aspect ratio and repositioned.

15 Q But it's a uniform scaling factor, right?

16 A I cannot achieve the results shown in figure 12
17 by applying -- agreeing for a scaling factor to the
18 foreground object just in one dimension. I have to do
19 something additional.

20 Q I'm not asking about two dimensions. Whether
21 you do it in one dimension, two dimension, that's not
22 part of my question. My question is, isn't it true that
23 Chao only discloses scaling by a linear function?
24 Whether horizontal, vertical, background, foreground, it

1 only discloses linear, right?

2 MS. NGUYEN: Objection, form.

3 THE WITNESS: It's a rather involved process here
4 that Chao describes for foreground elements that's in
5 figure 12. And, you know, an element, if it's top or
6 bottom, left or right, there's the repositioning of the
7 element and so on. So if we take this as a whole,
8 there's a non-linear processing taking place there.

9 MS. NGUYEN: Counsel, can we break for lunch soon?

10 MR. SCHMIDT: Q Yes. Let me wrap this up.

11 Turn back to your declaration. We've been
12 looking at your analysis of claim element 3A, which
13 requires a scaling function to uniformly stretch or
14 compress the input image along the first axis. Do you
15 see that?

16 A Yes.

17 Q And that's what you cite figure 14 with the
18 ducks for, correct?

19 A Yes, I see 3A, but I thought 3A is displaying
20 this display.

21 Q You cite figure 14 with the ducks for claim
22 element 3A in your sworn declaration, right?

23 A Yes.

24 Q Okay. And then claim element 3B requires a

1 warping function to non-uniformly warp the image, input
2 image, along the second axis. Do you see that?

3 A Yes, I do.

4 Q Okay. And the only analysis you have of Chao
5 for that limitation is in paragraph 276 where you write
6 Chao discloses non-uniformly scaling by scaling the
7 foreground and background elements differently. Do you
8 see that?

9 A Yes, I do.

10 Q Okay. So the only non-linearity that you opine
11 about in Chao is the difference in scaling factor
12 between the background and the foreground elements;
13 isn't that right?

14 MS. NGUYEN: Objection, form.

15 THE WITNESS: That is not exact. As I already
16 mentioned, it's a rather complicated algorithm that
17 takes care and processes foreground and background. And
18 it's not as straightforward as applying scaling to the
19 foreground or applying scaling to the background and
20 just add them up and I'm done. There are additional
21 operations that make the whole process non-uniform.

22 MR. SCHMIDT: Q And in this declaration you
23 haven't cited to a single disclosure from Chao that
24 applies a non-uniform scaling factor to either a

1 foreground element or a background element in isolation,
2 correct?

3 MS. NGUYEN: Objection, form.

4 THE WITNESS: It's more than clear with the examples
5 that Chao offers in the various embodiments, such as
6 figure 14.

7 MR. SCHMIDT: Q You write in paragraph 276 that
8 Chao discloses non-uniformly scaling by scaling the
9 foreground and background elements differently. Do you
10 see that?

11 A I do.

12 Q Is it your opinion that if you apply a linear
13 scaling factor to a background element and a different
14 linear scaling factor to a foreground element, that that
15 results in non-uniform scaling?

16 MS. NGUYEN: Objection, form.

17 THE WITNESS: If I apply different scaling factors
18 to background and foreground, and those include the
19 shifting that takes place, then this results in a
20 non-linear transformation of the input image.

21 MR. SCHMIDT: Q Okay. You changed my question.
22 So let's focus on my question now.

23 Is it your opinion that if you apply a uniform
24 or a linear transformation to a background element and a

1 different uniform or linear transformation to a
2 foreground element, then the net result of that is a
3 non-uniform transformation?

4 MS. NGUYEN: Objection, form.

5 THE WITNESS: If I have X equals F plus B and I have
6 a linear transformation of F and a linear transformation
7 of B, foreground, background, then the overall
8 transformation cannot be then as a linear transformation
9 of X, in other words, a non-linear transformation.

10 MR. SCHMIDT: Q So two different linear
11 transformations in the same image results in a
12 non-linear transformation in your opinion?

13 A It's not on the same image. It is on component
14 of the same image. It's not that they took X and they
15 took -- I separated the images.

16 Q Okay. Let me reask the question like that then.
17 It's your opinion that two different linear scaling
18 transformations to two different components within an
19 image results in a non-linear scaling transformation?

20 MS. NGUYEN: Objection, form.

21 THE WITNESS: Yeah, there's a lot in the question.
22 The first question is what is the forward or
23 decomposition model? Is it -- Like where there's a
24 background element, do I have a hole in the -- I'm

1 sorry, where there's a foreground element, do I have a
2 hole in the background element or not?

3 So is it exactly additive to decomposition or
4 is it more than that? It seems like the idea is just
5 that I can have one image as the background and then I
6 add the foreground, but I have to replace the background
7 values by the foreground values. It's not really
8 additive -- affect the additive. Am I making sense in
9 what I'm saying?

10 MR. SCHMIDT: Q I'm not sure that I follow. I
11 mean --

12 A I'm trying to answer your question.

13 Q What I'm really trying to understand is your
14 opinion in paragraph 276 where you opine that claim
15 element 3B is satisfied by Chao, and you write, Chao
16 discloses non-uniformly scaling by scaling the
17 foreground and background elements differently.

18 How does scaling the foreground and background
19 elements differently in Chao disclose non-uniform
20 scaling?

21 A Well, the -- with the shifting operations as
22 well, right? So inconclusive of the six, it discloses
23 this, but discloses the shifting as well, which that
24 introduces non-linearity. But if we assume it. And

1 then, yes, scaling is you multiply by a constant.

2 Linear operation, you can have a -- plus a
3 shift. Like Y equals AX plus B , that's a linear
4 transformation. Y plus AX , it's linear, but it's just
5 simple scaling. So the line goes through the origin.

6 So, including the shift then, assuming a
7 perfectly additive decomposition of the image, like if
8 the image is foreground, plus background, then applying
9 linear transformations to background and foreground
10 differently in transformation, that is -- results in a
11 non-linear transformation of the whole image.

12 Q What do you mean when you say including the
13 shift?

14 MS. NGUYEN: Objection, form.

15 THE WITNESS: Well, if you look at figure 14, it
16 says scale plus shift.

17 MS. NGUYEN: Counsel, we've been going for almost an
18 hour-and-a-half. Can we take a break for lunch please?

19 MR. SCHMIDT: I don't think that's right. I think
20 we've been going for 30 minutes. I'm trying to wrap up
21 this line of questioning and then we can take a break.

22 MS. NGUYEN: Well, we haven't been going for 30
23 minutes, but if you could wrap it up please so we can
24 take a lunch break.

1 MR. SCHMIDT: Q Doctor, what do you mean by shift?

2 A Yeah, in almost all the figures of Chao it's
3 scale plus shift. Look at figure 14 or 17 that we were
4 talking about earlier.

5 So there is this element of repositioning the
6 foreground elements using references like top edge or
7 side edge and things of that nature. There's quite a
8 bit of logic in how exactly they do it.

9 Q Okay. So you're referring to the scale plus
10 shift that's annotated on the figure?

11 A Yes, and also in figure 12 where they have the
12 block diagram of how to identify foreground elements.

13 Q Okay. And it's your opinion now that scale plus
14 shift results in a non-linear scaling?

15 A Yes.

16 MR. SCHMIDT: Okay. Let's take a lunch break.

17 MS. NGUYEN: 30 minutes sound good?

18 MR. SCHMIDT: Yep.

19 THE WITNESS: Thank you.

20 (Lunch recess was taken.)

21 MR. SCHMIDT: Q Let's go back on the record
22 please.

23 Welcome back, Doctor.

24 A Thank you.

1 Q Did you discuss the substance of your testimony
2 with counsel during the break?

3 A No, I did not.

4 Q Before the break we were talking about Chao and
5 how in figure 14 the word shift appears. Do you recall
6 that?

7 A Yes.

8 Q In your view, what is the plain and ordinary
9 meaning to a person of ordinary skill in the art of the
10 word shift in this context?

11 A Shift is a common word. Maybe it's like moving
12 something from one place to another.

13 Q And in this context it would be moving pixels
14 from one place to another?

15 A Pixels or objects, foreground objects.

16 Q And in this context can shifting be done
17 linearly or non-linearly?

18 MS. NGUYEN: Objection, form.

19 THE WITNESS: Within linear and non-linear, in the
20 picture, if you consider more than one pixels a group of
21 pixels if they move linearly or non-linearly. One
22 pixel -- If I only move one pixel or one object as a
23 whole, then the linear, non-linear doesn't seem to
24 apply. But considering more than one, yes, it can be

1 linear or non-linear.

2 MR. SCHMIDT: Q And would a person of ordinary
3 skill in the art in this context recognize that shifting
4 and scaling are two different things?

5 A I would think so. They have a different
6 meaning. But, yes, scaling -- If we look at the
7 transformation, then, you know, the transformation
8 involves shifting. So the transformation is doing the
9 scaling. It's a matter of the definition of scaling, if
10 scaling is just multiplying by a number or if it's
11 subjecting to a transformation.

12 Q What's the plain and ordinary meaning of scaling
13 to a person of skill in the art in this context?

14 MS. NGUYEN: Objection, form.

15 THE WITNESS: It might mean different things to
16 different people. Again, I could define scaling as just
17 multiplying a value by another number or it could also
18 be interpreted as applying a transformation to a set of
19 data to map them into an output domain, and that's --
20 that could be thought of by some people as scaling as
21 well.

22 MR. SCHMIDT: Q Isn't it true that in the field of
23 digital image processing scaling refers to changing the
24 range of the data without changing its shape or

1 distribution?

2 MS. NGUYEN: Objection, form.

3 THE WITNESS: Can you repeat the definition?

4 Scaling is -- I'm sorry, would you please repeat the
5 question?

6 MR. SCHMIDT: Q Changing the range of data rather
7 than changing its shape or distribution.

8 MS. NGUYEN: Objection, form.

9 THE WITNESS: So if I multiply the data by a
10 constant, then the distribution is -- right, the
11 distribution is how many elements have a given value.
12 So the range would become larger. But then, yeah, the
13 shape might need to be straightened. But it seems like
14 what you are mentioning implies just the multiplying a
15 value by a constant. That's the definition you're using
16 of scaling.

17 MR. SCHMIDT: Q But my question to you, is that
18 consistent with your understanding of the plain and
19 ordinary meaning of scaling in this context of digital
20 image processing?

21 MS. NGUYEN: Objection, form.

22 MR. SCHMIDT: Q Or do you have a different
23 determination?

24 MS. NGUYEN: Same objection.

1 THE WITNESS: Yeah, my answer was that it might be
2 subject to slight variations of the definition. Yeah.
3 So if take a number and multiply it by a constant,
4 that's scaling. But if it's a linear transformation,
5 you introduce a shift as well, people can call that
6 scaling as well. And then the other thing is I could
7 apply a more general transformation and still call it
8 scaling.

9 But I don't disagree that multiplying a number
10 by -- a distribution by a constant is -- refers as
11 scaling. But all I'm bringing to the table is that some
12 people in the field might have a broader definition of
13 scaling.

14 MR. SCHMIDT: Q Now, in the context of the '413
15 patent, you're aware that the '413 patent uses the terms
16 scaling and warping, right? In claim 3, for example,
17 which is discussed in paragraph 273 of your declaration.

18 A Yes, I see claim 3. Yes.

19 Q In the context of the '413 patent, how would a
20 person of ordinary skill in the art interpret the
21 difference between scaling and warping?

22 A You have to look at the specification of '413 to
23 see how warping is defined. I seem to recall there
24 is -- there is a definition somewhere in the

1 specification of '413 of warping. Do you happen to know
2 where it is defined?

3 Q I don't have a cite off the top of my head. I'm
4 just looking for your interpretation as a person of
5 ordinary skill in the art.

6 A Yeah, warping can mean a lot of things. And not
7 find transformation is referred as warping very often.
8 So the transformation includes scaling and shifting, but
9 there might be additional interpretations of warping.
10 But, yeah, a non-linear transformation is -- this is
11 warping.

12 So in 3 the scaling might include shifting,
13 warping. It says non-uniformly warp the input image.
14 So it seems to imply a non-linear transformation applied
15 to the image.

16 Q I wanted to turn to Chao quickly. In paragraph
17 2 of Chao the disclosure is discussing the prior art of
18 image resizing programs at that time. Do you see that?

19 A I see paragraph 2, yes.

20 Q And in the second sentence Chao describes figure
21 1 as depicting an original image 10 that has been
22 resized from an original 4 by 5 template size to a 4 by
23 10 template size at 12. Do you see that?

24 A Yes, I do.

1 Q And in the next sentence the disclosure reads,
2 as shown, the ducks that are used as upper border
3 elements 31 have been stretched to fit the width of the
4 image size, distorting the original proportions and
5 overall look of the ducks. Do you see that?

6 A Yes, I do.

7 Q And then if you turn to figure 1, we can see a
8 visual illustration of that distortion that's introduced
9 as a result of the resizing that's described. Do you
10 see that?

11 A Yes, I do.

12 Q Okay. And Chao describes that sort of
13 distortion as undesirable. Do you agree?

14 A Where does it say undesirable in Chao?

15 Q Well, I don't know if he uses the word
16 desirable. But paragraph 2 is discussing the
17 limitations of the prior art, right?

18 A Uh-huh.

19 Q So would you agree with me that the purpose of
20 Chao is to avoid the types of distortion that is shown
21 for the ducks in figure 1?

22 MS. NGUYEN: Objection, form.

23 THE WITNESS: It says that the ducks can be
24 stretched, distorting the original proportions in the

1 look of the ducks, and I agree with that.

2 MR. SCHMIDT: Q And if you compare figure 1 to
3 figure 14, figure 14 describes an approach that avoids
4 that sort of distortion of the ducks. Do you see that?

5 A I see figure 14, yes.

6 Q And do you agree that figure 14 is describing a
7 scaling and shifting approach that avoids the sort of
8 distortion that was introduced by the prior art approach
9 of figure 1?

10 MS. NGUYEN: Objection, form.

11 THE WITNESS: Right, a distortion -- or the change
12 in the aspect ratio due to the linear resizing.

13 MR. SCHMIDT: Q So isn't it true, Doctor, that the
14 pixel shifting taught by Chao is an approach to avoid
15 the types of distortion effects that would normally
16 appear at the edges of an image during an aspect ratio
17 conversion?

18 MS. NGUYEN: Objection, form.

19 THE WITNESS: Can you repeat the question?

20 MR. SCHMIDT: Q Isn't it true that the pixel
21 shifting taught by Chao is an approach that is intended
22 to avoid the types of distortion effects that would
23 appear at the edges of images during aspect ratio
24 conversion processes in the prior art?

1 MS. NGUYEN: Same objection.

2 THE WITNESS: The objective of Chao is indeed to go
3 from figure 1 to figure 14 where the aspect ratio of the
4 foreground objects or of the objects should have been
5 preserved. But how this is accomplished is not just the
6 shifting. It's accomplished through a number of steps.

7 MR. SCHMIDT: Q But the shifting is part of the
8 approach in Chao to avoid the distortion effects we see
9 in figure 1; fair?

10 A I have to look at the details. The shifting is
11 one element of how this aspect ratio conversion is
12 taking place. But separating foreground and background
13 is an important step in what they're doing. And the
14 shifting, we have to see exactly how it is presented.
15 This is the repositioning part from the diagram.

16 Q Do you agree that in the field of digital image
17 processing, as of 2013 there was a general desire in the
18 field to avoid introducing distortion to images?

19 MS. NGUYEN: Objection, form.

20 THE WITNESS: Well, this is a general question. It
21 is not a matter of -- If one has to choose distortion or
22 non-distortion, one probably would choose the
23 non-distortion option.

24 However, '413 is not about that. '413 is

1 about the fact that we cannot avoid distortion. We
2 don't have a choice. We cannot do something that would
3 introduce no distortion. But it's a matter of how one
4 distributes this distortion in an image so that some
5 desirable effects are achieved or produced.

6 MR. SCHMIDT: Q Understood. But you would agree
7 that in the 2013 timeframe at least distortion was
8 generally viewed as undesirable in digital image
9 processing?

10 MS. NGUYEN: Objection, form.

11 THE WITNESS: Well, I answered the question. My
12 answer is that it's not relevant to the '413, your
13 question.

14 MR. SCHMIDT: Q Okay. Well, I'm asking a
15 different question now. And it is, would you agree that
16 in the 2013 timeframe at least distortion was generally
17 viewed as undesirable in the field of digital image
18 processing?

19 MS. NGUYEN: Objection, asked and answered.

20 THE WITNESS: Well, the one answer is that this is
21 not relevant to the '413. The second answer is that
22 there might be cases where introducing some distortion
23 in an image might be beneficial or desirable. It just
24 depends on what the purpose and the overall objective of

1 the image processing task is.

2 MR. SCHMIDT: Q Okay. In 2013, in what context
3 was introducing distortion desirable?

4 A Well, there's a process of dithering, how to
5 represent binary numbers in order to bring them and so
6 on, and it is known in the field. But by adding noise
7 to the image, which is distortion, an undesirable effect
8 you might say, by adding noise, it results in -- better
9 results in dithering. So it's all a matter of context.

10 Q You said there's a process of something, and I
11 don't think it was caught. Can you tell -- What was the
12 process you referred to?

13 A It's called dithering, D-I-T-H-E-R-I-N-G.

14 Q Dithering?

15 A Yes.

16 Q And you said that dithering is a process to
17 represent binary numbers?

18 A Yeah, to quantize binary images in order to
19 print them or display them and so on. It's just one
20 example of introducing distortion might help you. The
21 other is special effects. You might want to distort an
22 image so that it generates desirable emotions and
23 effects.

24 Q Do you know of any examples of distortion being

1 introduced for those purposes prior to August of 2013?

2 A Well, warping distortions might be just applied
3 on an image to create effects or special effects.

4 But the most important answer is that this
5 is -- I don't consider this relevant to the '413 patent,
6 because in what '413 teaches, and the other patents you
7 are looking at here, there's no choice not to have
8 distortion. You have to deal with distortion. So it's
9 like having said that, given you have to deal with
10 distortion, how do you deal with it.

11 Q You said that there were situations prior to
12 August of 2013 where it may be desirable to
13 intentionally introduce distortion into an image. Do
14 you have any specific evidence sitting here today that
15 that was done in the field?

16 A The whole field of morphing, like just using
17 non-linear transformations in a phase, for example, then
18 in another phase.

19 Q Do you have any specific examples or evidence
20 that you can point to other than pointing to the field
21 of morphing?

22 A I haven't considered this question specifically
23 for my declaration because, again, I thought it's not
24 related to the '413 patent, and, therefore, I have not

1 spent time considering it.

2 MR. SCHMIDT: Okay. I want to thank you for your
3 time today. I have no further questions. I'll pass the
4 witness.

5 MS. NGUYEN: Okay. We'd like to take a break.

6 THE WITNESS: Thank you.

7 (Recess was taken.)

8 MS. NGUYEN: We have no questions. Thank you, Dr.
9 Katsaggelos.

10 THE WITNESS: Thank you.

11 MR. SCHMIDT: Okay. Thank you.

12 (Whereupon, the deposition concluded
13 at 1:51 p.m. Central Daylight Time.)

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1 STATE OF ILLINOIS)

) SS:

2 COUNTY OF C O O K)

3 The within and foregoing deposition of the
4 aforementioned witness was taken before NADINE J.
5 WATTS, CSR, RPR, and Notary Public, at the place, date
6 and time aforementioned.

7 There were present during the taking of the
8 deposition the previously named counsel.

9 The said witness was first duly sworn and was
10 then examined upon oral interrogatories; the questions
11 and answers were taken down in shorthand by the
12 undersigned, acting as stenographer and Notary Public;
13 and the within and foregoing is a true, accurate and
14 complete record of all of the questions asked of and
15 answers made by the forementioned witness, at the time
16 and place hereinabove referred to.

17 Before completion of the deposition, review of
18 the transcript { } was {X} was not requested. If
19 requested, any changes made by the deponent (and
20 provided to the reporter) during the period allowed are
21 appended hereto.

22 The undersigned is not interested in the
23 within case, nor of kin or counsel to any of the
24 parties.

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Witness my official signature and seal as
Notary Public in and for Cook County, Illinois on the
2nd day of April, 2025.

Nadine J Watts

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April 2, 2025

RE: Arashi Vision Inc. v. Gopro Inc.

3/28/2025, Dr. Aggelos Katsaggelos, (#7277871).

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8 the deposition or provided by the Federal Rules.
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10 requested before the completion of the deposition.

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[aspect - cameras]

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[capabilities - combination]

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Federal Rules of Civil Procedure

Rule 30

(e) Review By the Witness; Changes.

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

(A) to review the transcript or recording; and

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

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

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