

1 UNITED STATES PATENT AND TRADEMARK OFFICE
2 BEFORE THE PATENT TRIAL AND APPEAL BOARD
3

4 TVISION INSIGHTS, INC.,)
5 Petitioner,)
6 v.) Case IPR2023-01014
7) Patent No. 11,470,243
8 THE NIELSEN COMPANY (US),)
9 LLC,)
10 Patent Owner.)
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14 VIDEOCONFERENCE DEPOSITION OF DAVID SCOTT DOERMANN, PhD
15 Taken on Behalf of Patent Owner
16 April 25, 2024
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14 _____)

15 VIDEOCONFERENCE DEPOSITION OF DAVID SCOTT
16 DOERMANN, PhD, produced, sworn and examined on
17 April 25, 2024, between the hours of 8:03 a.m. and
18 10:12 a.m. of that day, at before Connie McCarthy,
19 CCR, CSR, RMR, CRR.
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Connie McCarthy, RMR, CRR
MO CCR #1435
CA CSR #13173

1 Thursday, April 25, 2024

8:03 a.m.

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DAVID SCOTT DOERMANN, PhD,
called as a witness by the Patent Owner, having
been duly sworn, testified as follows:

EXAMINATION

BY MR. SNADER:

Q. For the record, can you state your full
name?

A. Dr. David Scott Doermann.

Q. And your address?

A. University of Buffalo, Buffalo, New York
14226.

Q. All right. And the University of Buffalo
is also your employer?

A. Yes, it is. That's the physical location
where I am right now.

Q. All right. And your occupation?

A. I'm a professor in the department of
computer science and engineering.

Q. Okay. Have you ever had your deposition
taken before, Dr. Doermann?

A. Yes, I have.

Q. About how many times?

1 **A. I believe four times.**

2 Q. Okay. So you're generally familiar, but
3 I'm going to go over the ground rules just so we're
4 all on the same page here. First, the court reporter
5 is taking everything down so that we can have a clear
6 record. I'll ask that you let me finish my question
7 and then I'll let you finish your answer.

8 I'll ask that you answer yes or no rather
9 than uh-huh or huh-uh. Again, just so we have a
10 clear record. Agreed?

11 **A. Uh-huh. Yes.**

12 Q. I'll do my best to ask good questions.
13 I'll probably ask some bad ones. If you don't
14 understand my question, I'd ask that you ask me to
15 clarify or repeat it. If you don't ask me to clarify
16 or restate a question, I'm going to assume that you
17 understand the question; is that fair?

18 **A. Yes.**

19 Q. All right. We can take a break at any time
20 as long as there's not a question pending. If there
21 is a question pending, I'll ask that you finish up
22 that question before we go to a break. Is that
23 clear?

24 **A. Yes.**

25 Q. Is there any reason that would prevent you

1 from testifying accurately and truthfully today?

2 A. No.

3 Q. Any medical issues?

4 A. No.

5 Q. Any medication, any alcohol?

6 A. No.

7 Q. Do you understand why you're being deposed
8 today?

9 A. Yes, I do.

10 Q. We're here to discuss your opinions with
11 respect to IPR 2023-01014 of U.S. Patent 11,470,273?

12 A. Yes.

13 Q. We're going to have a lot of names and
14 numbers on some of the names are going to repeat
15 today, so for the sake of clarity, I'm going to call
16 U.S. Patent 11,470,243, Nielsen '243. Is that fair?

17 A. Yes.

18 Q. And if I say Nielsen '273, you'll
19 understand that I'm talking about U.S. Patent
20 11,470,243?

21 A. You keep saying 273. But yes, it's '243.

22 Q. '243, yes.

23 A. Yes.

24 Q. Did you prepare for today's deposition,
25 Dr. Doermann?

1 **A. I did.**

2 Q. About how long?

3 **A. I'd say about 20 hours, probably.**

4 Q. Did you look at any documents in
5 preparation for this deposition?

6 **A. Yes, I did.**

7 Q. What documents did you look at?

8 **A. Well, of course, I went over my previous**
9 **declaration. I went over the patent. I went over**
10 **the primary prior art: The Tian reference; the**
11 **previous Lu reference, and things that were**
12 **incorporated by reference there; Steinberg reference.**
13 **I went over previous replies. I looked briefly at**
14 **the history -- the history of the patent**
15 **prosecution. And then where I had questions, I**
16 **believe I probably went to other -- other documents**
17 **just briefly, but not in their entirety.**

18 Q. Did you talk to anybody as part of your
19 preparation for this deposition?

20 **A. Yes. Of course, yes.**

21 Q. Who did you speak to?

22 **A. I spoke to the attorneys, Harper Batts and**
23 **Fred Qiu.**

24 Q. And what did you discuss?

25 **A. Just --**

1 MR. BATTS: I want to caution the witness
2 not to reveal attorney/client communication. I'll
3 instruct you actually not to answer that particular
4 question. I'm sure he can ask something different,
5 but not that one.

6 BY MR. SNADER:

7 Q. Okay. You mentioned that you reviewed your
8 previous declaration as part of your preparation.
9 That's the declaration that is the -- that you
10 submitted under oath; is that correct?

11 A. That's correct.

12 Q. And that declaration was truthful when you
13 signed it, correct?

14 A. Correct.

15 Q. And is still truthful today?

16 A. Yes.

17 Q. And that declaration contains all of the
18 opinions in this IPR?

19 A. Yes.

20 Q. Just for the record, do you have any
21 documents in front of you right now?

22 A. I have a folder with all of the exhibits in
23 them. I don't have anything open right now.

24 Q. Okay.

25 A. I think you have a hard copy of everything.

1 Q. Okay. So you have a hard copy of all of
2 the documents in front of you, and a folder on your
3 computer containing all the documents?

4 A. Yes.

5 Q. I'd like to talk about what's been
6 premarked as deposition Exhibit 1005.

7 (Whereupon, Exhibit No. 1005 was designated
8 for identification)

9 BY MR. SNADER:

10 Q. For the record, that is Evaluation of Face
11 Resolution for Expression Analysis by Ying-Li Tian.
12 I'm going to call that Tian. If I say Tian, will you
13 understand that I'm referring to Exhibit 1005?

14 A. Yes. May I open that up?

15 Q. Yes. Please take a moment to refamiliarize
16 yourself with that document.

17 A. Yes. I have it open, and I'm familiar with
18 this document.

19 Q. This is a document that you reviewed and
20 relied on in connection with your opinions; is that
21 correct?

22 A. Yes.

23 Q. I'd like you to look at the section of
24 Tian that's in Section 1, the second paragraph of
25 Section 1 that begins, Face acquisition. Can you

1 review that paragraph?

2 A. Yes. Give me one minute, please.

3 Okay.

4 Q. So in that paragraph, Tian describes a
5 process for face acquisition. Do you see that?

6 A. Yes.

7 Q. And that face acquisition process can
8 include a face detector in each frame, or face
9 tracking. Do you agree with that?

10 A. Yes.

11 Q. And then in the next sentence, Tian goes on
12 to talk about some additional processes for handling
13 large head motion. Do you see that?

14 A. Yes.

15 Q. And those processes include like head
16 finding and head tracking. Do you agree with that?

17 A. Yes.

18 Q. So you'd agree that Tian describes face
19 detection as being separate from head detection?

20 A. The -- in the process, these are all part
21 of the same objective, to find the head and then
22 eventually find the face. So I think I'd consider
23 them all together.

24 Q. So you don't believe that head tracking is
25 the same as face tracking?

1 MR. BATTS: Objection. Mischaracterizes
2 prior testimony.

3 THE WITNESS: No. In fact, they are the
4 same. They both go towards being able to analyze
5 features on the face, so you can track the head, you
6 can track the face, you can track ears. But they're
7 the same.

8 BY MR. SNADER:

9 Q. I'd like you to look at Figure 1 of Tian,
10 at the top of the next column. Do you see that?

11 A. Yes.

12 Q. Do you see this green bubble that's labeled
13 Face Acquisition?

14 A. I do.

15 Q. Do you see the two substeps depending from
16 that bubble that are labeled Face Detection and Head
17 Pose Estimation?

18 A. Yes.

19 Q. Turning back to the second paragraph of
20 Section 1, do you see that head pose estimation or
21 pose estimation is listed as being part of those
22 additional processes we discussed a moment ago?

23 MR. BATTS: Objection, vague and ambiguous.

24 THE WITNESS: Could you repeat the
25 question, please?

1 BY MR. SNADER:

2 Q. Tian includes the sentence, In order to
3 handle large head motion, head finding, head tracking
4 and pose estimation can be applied to a facial
5 impression analysis system.

6 Do you see that?

7 A. Yes.

8 Q. Is pose estimation in the sentence I just
9 read you the same as head pose estimation in
10 Figure 1?

11 A. Yes.

12 Q. Is head pose estimation in Figure 1
13 separate from face detection in Figure 1?

14 A. Yes, it is.

15 Q. So the three things that are grouped under
16 large head motion, i.e., head finding, head tracking,
17 and pose estimation, are different than the three
18 things that are listed under face detection in the
19 previous sentence; is that correct?

20 A. They are different processes going towards
21 the same part of identifying where the face is, yes.

22 Q. So if we call that large process face
23 acquisition, as it's called in Figure 1, then it has
24 two substeps, one of which includes face detection,
25 and one of which includes head detection; is that

1 correct?

2 **A. Well, face detection, if you detect a**
3 **faces, then you're detecting the head. So I don't**
4 **see them as mutually exclusive.**

5 Q. Given, quote, large head motion, is head
6 detection necessary?

7 **A. It's not necessary if you can detect the**
8 **face. These are all options for dealing with these**
9 **types of -- all of these different types of problems**
10 **that you run into.**

11 Q. Does Tian state that head detection is
12 performed in order to handle large head motion?

13 **A. One of the options, yes.**

14 Q. If the head is not located, can the face be
15 located?

16 MR. BATTS: Objection, incomplete
17 hypothetical.

18 **THE WITNESS: That's not clear, because**
19 **yes, if the face is recognized or if the face is**
20 **detected, then by default the head is detected. They**
21 **don't both have to be done in sequence or in**
22 **parallel. One can be the result of the other.**

23 BY MR. SNADER:

24 Q. Given Tian's Figure 1, which separates
25 steps of face detection and head pose estimation, do

1 you understand the two sentences of the second
2 paragraph of Section 1 as describing separate
3 processes?

4 MR. BATTIS: Objection, mischaracterizes the
5 document.

6 THE WITNESS: I see -- if we consider
7 Figure 1, I see the goal as being face acquisition.
8 The face detection piece, obviously, you need to be
9 able to detect the face. The head pose estimation
10 piece is there in order to acquire the best face.

11 BY MR. SNADER:

12 Q. And those two are separate processes; is
13 that correct?

14 MR. BATTIS: Asked and answered.

15 THE WITNESS: Can be, yes.

16 BY MR. SNADER:

17 Q. I'd like to turn to what's been premarked
18 as Exhibit 1001.

19 (Whereupon, Exhibit No. 1001 was designated
20 for identification)

21 BY MR. SNADER:

22 Q. For the record, this is the Nielsen '243
23 patent. Go ahead that pull that up.

24 A. Okay. I have Nielsen '243 patent on my
25 screen.

1 Q. Can you turn to the first numbered column,
2 Column 1?

3 A. Yes.

4 Q. The section labeled Field of the
5 Disclosure, can you read that sentence?

6 A. Okay. This disclosure relates generally to
7 audience measurement and, more practically, the
8 methods and apparatus to capture images.

9 I'm sorry, did you want me to read it out
10 loud or just to read it?

11 Q. Well, I was going to ask you, according to
12 this, what is Nielsen '243's disclosure generally
13 related to? So you would agree that Nielsen '243's
14 disclosure is generally related to audience
15 measurement?

16 A. I would say, more accurately, it's related
17 to the media analysis piece of that audience
18 measurement. Talking about how to capture the images
19 and process them.

20 Q. Does Nielsen '243 include the words "media
21 analysis"?

22 A. It talks about various image processing and
23 audio processing tasks, which a person of ordinary
24 skill would have -- would have associated with media
25 analysis, yes.

1 Q. I'm going to ask the question again. Does
2 Nielsen '243 include the phrase "media analysis"?

3 A. I can search for it.

4 Q. Please do.

5 A. Not specifically those words.

6 Q. So Nielsen '243 does not include the phrase
7 "media analysis"?

8 A. Correct, yes.

9 Q. And according to Nielsen '243, the
10 disclosure relates to audience measurement; is that
11 correct?

12 A. Audience measurement. And it says, more
13 particularly, in methods and apparatus to capture
14 images, yes.

15 Q. So, two things Nielsen '243 relates to:
16 One, audience measurement; and two, methods and
17 apparatus to capture images, correct?

18 A. Correct.

19 Q. Okay. Let's turn briefly to the petition.
20 Do you have that in front of you?

21 A. Can you provide me with the reference
22 number to make sure I have the right one?

23 Q. It's not labeled as an exhibit. It's just
24 the petition that was filed.

25 A. I have one labeled 002, or numbered 002.

1 **Is that the correct document?**

2 MR. BATTS: That might be it. Take a look,
3 because I think 1002 is the prosecution history, so I
4 suspect 002 is probably the petition.

5 **THE WITNESS: Yeah, it says Petition for**
6 **Inter Partes Review of Patent No. 243.**

7 BY MR. SNADER:

8 Q. Okay. And if I need to go back to that,
9 I'll just refer to that as the petition, and you'll
10 understand what I mean?

11 A. Yes.

12 Q. This is a document you reviewed as part of
13 forming your opinions; is that correct?

14 A. **I believe I did, yes.**

15 Q. Can you turn to the internally numbered
16 Page 3 of the petition, which includes Roman
17 Section III?

18 A. Yes.

19 Q. Do you see the grounds listed under the
20 Identification of Challenge, Grounds 1, 2, 3?

21 A. **I do.**

22 Q. There are four prior art references, total,
23 listed under those three grounds; is that correct?

24 A. **That's correct.**

25 Q. Just for clarity, those four prior art

1 references are identified at Lu '577, Tian, Nielsen
2 '372, and Steinberg; is that correct?

3 **A. That's correct.**

4 Q. I'd like to go through those one at a time.
5 So let's turn first to Exhibit 1004, if you can pull
6 that up.

7 (Whereupon, Exhibit No. 1004 was designated
8 for identification)

9 BY MR. SNADER:

10 Q. For the record, this is U.S. Patent
11 Application Publication Number 200/2 -- strike.
12 2002/0059577, to Lu, et al.?

13 **A. Okay, I have that.**

14 Q. I'm going to refer to this document as
15 Lu '577. Is that okay?

16 **A. Yes.**

17 Q. And if I refer to Lu '577, you'll
18 understand I'm talking about this document?

19 **A. Yes.**

20 Q. And was this a document you relied on and
21 reviewed in connection with making your opinions?

22 **A. Yes.**

23 Q. Can you turn for me to Paragraph 001 of
24 Lu '577?

25 **A. Can you give me that number again, please?**

1 Q. 0001. First paragraph.

2 A. Okay.

3 Q. You can read that to yourself.

4 A. Yes.

5 Q. According to Lu '577, what does the present
6 invention relate to?

7 A. It's an audio measurement system that
8 discusses how to measure and extract measurements
9 from audience.

10 Q. According to Paragraph 0001, what does the
11 present invention of Lu '577 relate to?

12 A. The measurement of audiences of digitally
13 broadcast television programming. And the
14 measurement of usage of information services provided
15 to audiences.

16 Q. Does Lu '577 include the phrase "media
17 analysis"?

18 A. It includes measurement of the usage.

19 Q. Does Lu '577 include the phrase "media
20 analysis"?

21 A. Not the phrase, exactly, no.

22 Q. I'd like to turn to Exhibit 1005. This is,
23 again, Tian.

24 A. Okay.

25 Q. And can you turn for me to Page 6 of Tian?

1 **A. Is this the internal numbering Page 6 or**
2 **the --**

3 Q. This is Bates Page 6, the page with
4 Section 4.

5 **A. Okay.**

6 Q. And at the top of the column, there's a
7 sentence that begins, The goal. Do you see that
8 sentence?

9 **A. The second column, yes.**

10 Q. Can you read that sentence to yourself?

11 **A. The goal was to help understand question:**
12 **how do we recognize facial expressions in real life?**

13 Q. So according to that sentence you just
14 read, what was the goal of Tian?

15 **A. To understand how we recognize facial**
16 **expressions.**

17 Q. Does Tian include the phrase "media
18 analysis"?

19 **A. I can search for it.**

20 Q. Please do.

21 **A. No, it does not appear to.**

22 Q. I'd like to turn to Exhibit 1006.

23 (Whereupon, Exhibit No. 1006 was designated
24 for identification)

25 //

1 BY MR. SNADER:

2 Q. For the record, this is U.S. Patent
3 Application Publication Number 2010/0274372, to
4 Nielsen, et al.?

5 A. **Correct, that's what I have.**

6 Q. I'm going to call this Nielsen '372, if
7 that's okay with you.

8 A. **Yes.**

9 Q. If I say Nielsen '372, you'll understand
10 that I'm referring to Exhibit 1006?

11 A. **Yes.**

12 Q. I'd like you to turn to Paragraph 2, 0002,
13 of Nielsen '372?

14 A. **0002?**

15 Q. Yes.

16 A. **Yep.**

17 Q. Can you read that -- that sentence to
18 yourself?

19 A. **yes.**

20 Q. According to the sentence you just read to
21 yourself, what is the disclosure of Nielsen '372
22 generally relating to?

23 A. **In general, it's related to audio**
24 **measurement and a display device on/off detection**
25 **method.**

1 Q. I just want a quick point of clarification
2 there. It sounded like you said audio measurement.
3 The word is audience measurement? Is that --

4 A. **It's audience measurement.**

5 Q. Okay. Does Nielsen '372 include the phrase
6 "media analysis"?

7 A. **No, it does not appear to.**

8 Q. I'd like to turn to Exhibit 1007.

9 (Whereupon, Exhibit No. 1007 was designated
10 for identification)

11 BY MR. SNADER:

12 Q. For the record, this is U.S. Patent
13 Application Publication Number 2010/0066822, to
14 Steinberg, et al.?

15 A. **Yes.**

16 Q. Do you have that document up?

17 A. **I do.**

18 Q. Can you turn for me to Paragraph 0003 of
19 Steinberg? Read that to yourself.

20 A. **Okay.**

21 Q. According to the paragraph you just read,
22 what is the invention of Steinberg related to?

23 A. **Taking a set of images and processing them**
24 **to do classification, and -- based on faces, and the**
25 **recognition of those faces.**

1 Q. Does the phrase "media analysis" appear in
2 Steinberg?

3 A. No, it does not appear.

4 Q. So we have gone through the four references
5 that are identified as prior art in the petition and
6 the challenged patent; is that correct?

7 A. Yes.

8 Q. And "media analysis" isn't from the
9 challenged patent; is that correct -- the phrase
10 "media analysis"?

11 A. The phrase is never appearing in there, but
12 as I say in my declaration, this is the general area
13 of all of the claims when they try to do face
14 recognition, pose estimation, any kind of audio
15 analysis. Those are widely known and would have been
16 known at the time as media analysis. If I would have
17 used the term media analysis, they would have
18 understand that we're analyzing an image or we're
19 analyzing an audio sequence.

20 Q. I'm going to ask my question again.

21 The phrase "media analysis" does not appear
22 in the challenged patent; is that correct?

23 A. The phrase is --

24 MR. BATTS: Object --

25 THE WITNESS: -- not here, correct.

1 BY MR. SNADER:

2 Q. I'm sorry, there was a little bit of cross
3 talk there. Can you repeat your answer?

4 MR. BATTS: I'll just object. Asked and
5 answered.

6 **THE WITNESS: The phrase does not appear in**
7 **the patent, as I said before, or any of the four**
8 **specific references that we -- that I used.**

9 BY MR. SNADER:

10 Q. Perfect.

11 If we think back to Tian, you said that the
12 goal of Tian was to determine how we identify facial
13 expressions in real life; is that correct?

14 **A. Is this a particular part of the -- of the**
15 **document that you're referring to?**

16 Q. Yes. This is the part that we just read on
17 Page 6. I can point you to Tian Page 6, top of
18 Column 2 again, if that would help.

19 **A. That is the -- one of the ultimate goals of**
20 **this, but it includes a lot of other teachings as**
21 **well. As I described in my declaration.**

22 Q. Does the challenged patent include the
23 phrase "facial expressions"?

24 **A. I can go back to the patent. But the**
25 **teachings of Tian do refer to common things that are**

1 in the patent. Let me go back to the patent and I'll
2 search for that.

3 No, it does not appear to.

4 Q. And Nielsen '372 -- I'm sorry, Nielsen '243
5 does not discuss facial expressions; is that correct?

6 A. No, it does not.

7 Q. Okay. Do you still have Tian open?

8 A. I do. Let me make sure I get to the right
9 one. Yes.

10 Q. Okay. And do you still have the challenged
11 patent open, Exhibit 1001?

12 A. I do.

13 Q. Okay. Let's start with Exhibit 1001. And
14 I'd like you to turn to the claims, specifically
15 Claims 1 and 4.

16 A. Okay, I'm at the claims listing.

17 Q. You opined on Claims 1 and 4, correct?

18 A. I did.

19 Q. And you understand that Claim 4 depends
20 from Claim 1, and includes all the limitations of
21 Claim 1?

22 A. That's my understanding, yes.

23 Q. Claim 1 requires machine readable
24 instructions; is that correct?

25 A. That's correct.

1 Q. Specifically, the claim uses the words
2 "machine readable instructions"?

3 A. Yes.

4 Q. And Claim 1 requires circuitry; is that
5 correct?

6 A. That's correct.

7 Q. Specifically the claim uses the words
8 "processor circuitry to execute the machine readable
9 instructions"; is that correct?

10 A. Yes.

11 Q. And Claim 4 requires that the processor
12 circuitry is to reduce a resolution; is that correct?

13 A. Yes.

14 Q. Okay. So turning back to Tian,
15 Exhibit 1005, does Tian include the word "circuitry"?

16 A. A person of ordinary skill in the art would
17 know that these different types of processing is --
18 are there. The circuitry piece is something that you
19 need in order to do any type of image processing.
20 The term "circuitry", I'll check to see if that....

21 "Circuitry" does not appear in Tian.

22 Q. So, just to clarify, Tian does not include
23 any disclosure of circuitry; is that correct?

24 MR. BATTS: Objection. Mischaracterizes
25 prior testimony, mischaracterizes the document, and

1 asked and answered.

2 **THE WITNESS:** So this -- in this particular
3 reference, there's a lot of ways to do these types of
4 things. And the term "circuitry" is not in there,
5 but as I explain in my declaration, one who has prior
6 knowledge of this area would know how to do things
7 such as the reduce resolution, or any of these
8 processing, you'd know that this is done
9 automatically with the computer. So those -- a
10 computer, for example, has circuitry. And one would
11 know that they do those types of things. You
12 don't -- it would be silly, at this point, pretty
13 obvious, that any of these kinds of computer
14 processes require a computer. So they don't talk
15 about the actual hardware, or they don't actually
16 talk about the actual things in research papers.
17 This is something you just wouldn't do unless it
18 really made a difference.

19 BY MR. SNADER:

20 Q. You said that Tian does not talk about the
21 hardware; is that correct?

22 A. It does not choose a particular hardware in
23 order to do this processing.

24 Q. And Tian does not talk about any particular
25 computer readable instructions; is that correct?

1 **A. It talks about an algorithm, which again,**
2 **any person of ordinary skill would know is**
3 **implemented as a computer algorithm in the**
4 **constructions.**

5 Q. Is an algorithm computer readable?

6 MR. BATTS: Incomplete hypothetical.

7 **THE WITNESS: When you say an algorithm,**
8 **are you talking about --**

9 BY MR. SNADER:

10 Q. I'm talking about the algorithm
11 specifically disclosed in Tian. You just said Tian
12 discloses an algorithm. Is that algorithm computer
13 readable?

14 **A. Tian discloses algorithms, many different**
15 **algorithms, for doing these processing. But if you**
16 **implement them, which obviously they did because they**
17 **have, for example, different resolutions of the**
18 **images, they have results. So the implementation of**
19 **any of the general algorithms that they -- they**
20 **discuss here were implemented because they have**
21 **results, they produce results in their image. So**
22 **those algorithms, when implemented, yes, would be**
23 **computer readable.**

24 Q. Just for clarity, I'm not talking about the
25 computer that's sitting on Ying-Li Tian's desk. I'm

1 not talking about anything that's outside of the four
2 corners of the document that's sitting in front of
3 you. Is there computer readable instructions in that
4 document?

5 MR. BATTS: Asked and answered.

6 THE WITNESS: Again, I have answered that.
7 That in this document, the document is a research
8 paper. It provides the algorithm which a reader can
9 take and, based on their prior knowledge, whatever
10 computer programming language that they have, they
11 can take these algorithms, they can implement them,
12 and they can get essentially the same results.

13 BY MR. SNADER:

14 Q. But the paper itself in its four corners
15 does not include an algorithm that is implemented in
16 computer readable instructions; is that correct?

17 MR. BATTS: Objection.

18 THE WITNESS: Again, I've answered that.
19 That the algorithms here are an abstraction of the
20 implementation that surely would have been done in
21 order to get the results. So that part of the paper
22 is computer code that obviously they ran in order to
23 get the results that they display in the later
24 sections.

25 //

1 BY MR. SNADER:

2 Q. Let me turn to one particular example here
3 real quick. Can you turn to specifically Page 2 of
4 Tian, the last full paragraph?

5 A. **This is Bates, too?**

6 Q. Yes.

7 A. **Yes.**

8 Q. Talks about the Cohn-Kanade AU-Coded Face
9 Expression Image Database? About halfway through
10 that paragraph.

11 A. **I'm sorry, maybe I'm at the wrong place.**

12 **Oh, I'm sorry, I was in the wrong column. Yes.**

13 Q. And that AU-Coded Face Expression, that's
14 not computer code, correct?

15 A. **Correct. That's data.**

16 Q. You said earlier that a person of ordinary
17 skill in the art reading Tian would understand how to
18 translate its disclosures into code and implement
19 that code on a computer. Am I fairly characterizing
20 your testimony?

21 A. **Could you repeat that one more time,**
22 **please?**

23 Q. You said that a person of ordinary skill in
24 the art reading Tian would find it obvious -- I
25 believe were the words you used -- to take the

1 disclosures of Tian and implement them in computer
2 readable code and run that code on a computer.

3 **A. Yes, I believe that's accurate.**

4 Q. Looking at the four corners of Tian,
5 there's no specific device, no specific hardware
6 disclosed; is that correct? It would be up to the
7 reader to pick a hardware device?

8 MR. BATTS: Objection. Compound and asked
9 and answered.

10 **THE WITNESS: As I said before, it would be**
11 **up to and anyone of ordinary skill would have the**
12 **ability to choose what programming language and what**
13 **hardware to run these -- these tasks on. Any time**
14 **they have a step of facial analysis or dealing with**
15 **any of these things that Tian teaches, a person of**
16 **ordinary skill would have that skill to choose the --**
17 **both the software and the hardware approach for these**
18 **algorithms.**

19 BY MR. SNADER:

20 Q. Can you turn back to Section 1 of Tian?

21 **A. Okay.**

22 Q. Talking about this second paragraph of
23 Section 1 that we discussed earlier, what does face
24 tracking entail?

25 **A. Can you give me a little bit more of the**

1 specific? Are you talking about face tracking just
2 in the context of this -- of the algorithm or this
3 discussion here?

4 Q. In the context of Tian, as you relied on in
5 your opinions, you said that Tian discloses face
6 tracking and that a person would be -- would find it
7 obvious to implement face tracking to modify the
8 system of either Lu '577 or Nielsen as previously
9 modified by Steinberg.

10 In that context, the context of your
11 opinions, what does face tracking entail?

12 A. Well, face tracking in general is a method
13 to keep track of where the face is, so in the general
14 concept of computer vision, image processing, media
15 analysis, detecting the face in the image can be very
16 inefficient because you have to detect the face over
17 a large number of pixels. If you have a thousand by
18 a thousand image, you have to look for the face
19 everywhere. The idea of face tracking is once you
20 have detected the face, then you make an assumption
21 that the face does not move very far, and you can
22 search in a local area for that face. So you can do
23 it either by a redetecting in a particular area and
24 getting a new region for that face, or you can do it
25 by just trying to identify very specific features in

1 the face.

2 There's a lot of different ways to
3 implement that, but the general idea is you have a
4 region in one frame or in one image, and then in a
5 subsequent frame, under the assumption that the face
6 don't move very far, you identify a region in those
7 next images where the face is. So if you do this
8 repeatedly over a long time, whether the camera's
9 moving, whether the person, the face themselves is
10 moving, you get a series of regions where the face
11 occurs.

12 Q. So if I can summarize that statement, just
13 briefly, you process each frame based on the previous
14 frame to update the location of the face in the
15 current frame. Is that a fair summary?

16 A. I think that's maybe a bit too specific.
17 You don't have to process every frame. Again,
18 assumptions about, you know, if the person's moving,
19 you might have the advantage of processing every 10th
20 frame. So you process subsequent frames at some rate
21 in order to keep identifying where that face is.

22 Q. And what does head tracking entail, in the
23 same context you've just been discussing?

24 A. That could be very similar. So obviously,
25 if you have the back of someone's head, it doesn't

1 have a face, or, you know, you only see the ear,
2 you're making an assumption that the head has a --
3 an -- that the head has a face. So head finding,
4 head tracking, is more -- is more general.

5 Q. And to perform head tracking, you
6 similarly -- and I'm trying to make sure I include
7 the generalization you include in your previous
8 answer -- process a frame based on a previous frame
9 to update the location of the head in the current
10 frame?

11 A. I believe that would be accurate, yes.

12 Q. Turning to Page 2 of Tian, first column,
13 first full paragraph.

14 A. Okay.

15 Q. About the, what is that, the sixth line
16 down starts with, Head motion? Can you read that
17 sentence to yourself?

18 A. Yes.

19 Q. Tian, in this sentence you just read to
20 yourself, describes head motion as a challenge for
21 facial analysis; is that correct?

22 A. Yes, it can be.

23 Q. And Tian contemplates head tracking to
24 handle head motion between frames; isn't that
25 correct?

1 **A. Well, if you're talking about head motion**
2 **in this context, it could be head tracking, but it**
3 **could also be pose estimations. You can have head**
4 **motion where the head moves outside of the position**
5 **that it was in the previous frame, which would**
6 **require head tracking. But also head motion, imagine**
7 **a head turning around, which would require a pose**
8 **estimation or a head pose estimation algorithm.**

9 Q. Turning back to the paragraph we discussed
10 before this one, it contemplates head motion as being
11 one solution -- head tracking, I'm sorry -- as one
12 solution to the problem of head motion; is that
13 correct?

14 **A. In the previous -- yeah, large head motion,**
15 **yes. It uses head finding, tracking, and pose**
16 **estimation. All of those three for different types**
17 **of head motion are relevant. They use all three**
18 **terms, head finding, head tracking, and pose**
19 **estimation.**

20 Q. And Tian, once it has updated the face
21 location, once it has updated the head location, as
22 you described, updates the facial feature locations
23 for the remainder of the video sequence after the
24 face is located; is that correct?

25 **A. After an appropriate face is located, then**

1 **they can extract features, correct.**

2 Q. Tian updates the eye and brow location
3 based on their positions in the last frame? If the
4 face is in full frontal view; is that correct?

5 A. **If the face is visible and the features are**
6 **extractable, yes, it updates those features.**

7 Q. And the -- if the face is not in full
8 frontal view, it must be reacquired, right?

9 A. They talk about three different -- well,
10 going back to the -- this is taking this particular
11 reference in -- only in its context about what the
12 goal of this particular paper was. But their goal
13 here is to acquire these images and to identify those
14 facial features. It doesn't give exact parameters on
15 what it means to be fully frontal or near frontal or
16 side or -- view. It -- you know, they make those
17 judgments, and those are, in their algorithms, those
18 are parameters that they would have to identify. In
19 fact, I think they say in several places, you know,
20 as long as it meets a certain threshold, then they
21 would do it.

22 So I wouldn't say that it has to be fully
23 frontal, because the definition of fully frontal is a
24 little bit ambiguous in general. But as long as all
25 the features are there, then they try to do these

1 processes.

2 Q. So based on some set of parameters that are
3 not explicitly present in Tian, Tian determines
4 whether the face is in full view, frontal view; is
5 that correct?

6 MR. BATTS: Objection. Mischaracterizes
7 Tian and prior testimony.

8 THE WITNESS: It -- it gives these examples
9 of poses, I believe, looking through Tian in Table 2.
10 But the -- anyone doing these types of processing, it
11 may not just be determining the original pose. The
12 poses that they talk about here, being frontal or
13 side view, are primarily for being able to
14 characterize the results. So they typically will go
15 through and they will attempt to do these. What this
16 whole paper is about is about evaluation of face, of
17 resolution, for -- and pose estimation, for facial
18 expression analysis. So what they are doing is they
19 are running their whole algorithm, even on classes of
20 images that have -- would be considered not ideal, so
21 that they can measure the response and they can
22 measure the accuracy of these algorithms.

23 So the goal here is to explore and cover
24 the space, not to have a particular threshold and
25 say, Oh, we should never look at any of these images

1 because they are side view, for example. What
2 they're trying to do is understand, based on the
3 view, whether it's frontal, whether it's side view,
4 whether it's other -- in the case of Table 2 -- how
5 well these algorithms work on those. Obviously,
6 someone who is looking at this, I mean, even someone
7 that's not skilled in the art, would know that if
8 you're trying to identify somebody smiling, for
9 example, and you were looking at the back of their
10 head, then it can't be done. Nevertheless, they're
11 running these algorithms and they'll show that, you
12 know, these algorithms won't work on those particular
13 configurations.

14 BY MR. SNADER:

15 Q. I would like to return to the context of
16 face tracking as it's discussed in this paragraph,
17 and also throughout the discussion of Tian.

18 So Tian updates the facial feature position
19 locations for each frame, for each successive frame,
20 based on the previous frames; is that correct?

21 A. Yes.

22 Q. Okay. I'd like to change gears here a
23 little bit and turn to your declaration. That's
24 Exhibit 1003.

25 //

1 (Whereupon, Exhibit No. 1003 was designated
2 for identification)

3 **THE WITNESS: Correct. Okay. I have that**
4 **open.**

5 BY MR. SNADER:

6 Q. And just for the record, I mean, I called
7 this your declaration. If I say your declaration,
8 you'll understand that I'm talking about
9 Exhibit 1003?

10 **A. Yes, I will.**

11 Q. So can you turn to Paragraph 15 of your
12 declaration for me?

13 **A. Okay, I'm there.**

14 Q. Can you read that paragraph to yourself and
15 refresh it in your mind?

16 **A. I'm sorry, you said 16, correct?**

17 Q. 15. One-five.

18 **A. Okay, one-five. Yes.**

19 Q. You mention in that paragraph various forms
20 of interpolation for reducing your resolution; is
21 that correct?

22 **A. That's correct.**

23 Q. Linear interpolation is one of those
24 various forms of interpolation; is that correct?

25 **A. That is correct.**

1 Q. Okay. And bilinear interpolation is one of
2 those forms of interpolation; is that correct?

3 A. That's correct.

4 Q. And that's a -- bilinear interpolation is a
5 variation that's commonly used in image scaling; is
6 that correct?

7 A. That's correct.

8 Q. Bilinear interpolation generally requires
9 calculations for each pixel; is that correct?

10 A. Yes.

11 Q. Floating point calculations, correct?

12 A. Not necessarily. Pixels are often -- if
13 you have any bit image, for example, then those are
14 integers between zero and 255 for a gray scale. If
15 you have color, you simply have three -- three
16 images, one for red, one for blue, one for green.
17 And all of those can be done in integer -- integer
18 computation.

19 Q. In the general case, bilinear interpolation
20 requires floating point calculations; is that
21 correct?

22 MR. BATTS: Objection, incomplete
23 hypothetical. And asked and answered.

24 THE WITNESS: I'm not sure what you're --
25 where you're asking. So, you know, it depends on a

1 lot of things. For example, when you're taking the
2 image, if you want to do bilinear interpolation and
3 you have a large image and you're reducing each of
4 the two dimensions by half, for example, then the
5 bilinear interpolation is very easy. You're
6 basically going to get an image that's a quarter the
7 scale, and you can do all of that without any type of
8 resolution, any kind of floating point algorithms.

9 If you have a binary image, it's a completely
10 different set of constraints that you have on there.

11 So I wouldn't say that there is a general
12 case. There are cases where you might need floating
13 point algorithms, but there are also a variety of
14 different constraints on the image where you can do
15 it extremely efficiently.

16 Q. In the case of digital video, say
17 MPEG-encoded digital video, and for the sake of not
18 being an incomplete hypothetical, digital video as
19 contemplated by the '243 patent, interpolation would
20 require floating point calculations; is that correct?

21 A. Again, not necessarily. In this particular
22 video sequence, they're processing individual frames,
23 so let's assume -- well, I don't want to assume, but
24 the -- you would have to have some way of
25 decompressing the image into individual frames. And

1 again, based on the size, based on what type of video
2 it is. We could have images that are color. We
3 could have images that are binary, meaning it could
4 be this type of image. Might not be visible light,
5 so it might have just a detection mechanism from IR,
6 for example. Those are all images, those are all
7 possible videos. So it's -- the question you're
8 asking requires a lot more specific constraints.

9 Q. Does the '243 patent talks about binary
10 images?

11 A. It talks about video in general, which is a
12 very broad term.

13 Q. Does the '243 patent talk specifically
14 about binary video, binary images?

15 A. Doesn't constrain the algorithms to binary
16 images.

17 Q. I'm going to ask again: Does the '243
18 patent talk about binary images?

19 A. Not specifically, no.

20 Q. Thank you.

21 We've been going for, looks like about an
22 hour now. Take like a 10-minute break?

23 A. That would be okay with me, yep.

24 Q. All right. Go off the record for like 10
25 minutes?

1 **A. Okay. Thank you.**

2 COURT REPORTER: Off the record.

3 (Recess)

4 BY MR. SNADER:

5 Q. Dr. Doermann, I'd like to return to
6 Paragraph 15 of your declaration, if that's okay.

7 **A. Yes, I still have that up.**

8 Q. We talked about interpolation. I'd like to
9 talk briefly about subsampling. You used the term
10 subsampling in your declaration; is that correct?

11 **A. Yes.**

12 Q. And aliasing is a form of distortion
13 artifact that occurs when subsampling; is that
14 correct?

15 **A. Yes, that's correct. It can occur.**

16 Q. And in order to avoid aliasing, the input
17 signal has to be band-limited; is that correct?

18 **A. It depends on the resolution of the image
19 and how much you're down-sampling.**

20 Q. In order to avoid aliasing, the band width
21 of the image has to be below a specific threshold; is
22 that correct?

23 **A. Not necessarily. If we're taking and we're
24 reducing the image by half, for example, then you can
25 drop every other pixel without any problem in being**

1 **able to experience aliasing.**

2 Q. Dr. Doermann, I'm going to show you what's
3 been premarked as Exhibit 2014.

4 (Whereupon, Exhibit No. 2014 was designated
5 for identification)

6 BY MR. SNADER:

7 Q. That should be coming across on the screen
8 right now. For the record, this is an excerpt from a
9 textbook called Discrete-Time Signal Processing by
10 Alan V. Oppenheim and Ronald W. Schafer.

11 A. **Yes, I see.**

12 Q. Are you familiar with this textbook,
13 Dr. Doermann?

14 A. **No, I don't believe I've seen this one**
15 **before.**

16 Q. Would you view this textbook as generally
17 being credible?

18 A. **I have no reason not to view it as being**
19 **credible.**

20 MR. BATTS: Have you emailed a copy of this
21 around so we can all have a copy?

22 MR. SNADER: Yeah, we're taking care of
23 that now.

24 MS. REDMOND: Just give me a second.

25 MR. BATTS: Okay.

1 **THE WITNESS: I don't have my email open.**

2 **Is that going to come to me also?**

3 MS. REDMOND: Yes, I can. I don't have
4 your -- I apologize, I don't have -- I don't have
5 your email. Can you throw that in the Chat really
6 fast for me?

7 **THE WITNESS: Well, I'd rather not have my**
8 **email open. I'd rather have it, you know, in a**
9 **Dropbox or somewhere that I can do this without**
10 **risking other people. I do get a lot of emails and I**
11 **don't want to distract anyone. So if you could do it**
12 **in a Dropbox, I would appreciate that. That would be**
13 **more efficient for me.**

14 BY MR. SNADER:

15 Q. Are you comfortable just looking at the
16 material that's on the screen?

17 A. I am, but this is obviously an entire --
18 well, you have a chapter, I guess, of this textbook.
19 So if there's any questions that require context, I
20 won't be able to answer those, or I won't be able to
21 fully answer them.

22 Q. That's fair. And to be clear, you'll have
23 a copy of this exhibit ultimately, it just may not be
24 right now since you don't want to receive it via
25 email.

1 We're sending it to Harper right now, and
2 Harper can share it to you in whatever way your team
3 feels most efficient.

4 **A. Okay.**

5 MR. BATTS: Just dump it into the Chat box?
6 That's what I've seen people do in other depositions.
7 They just dump it in the Chat box, and he can click
8 on it and open it on his desktop. I mean, we can try
9 to proceed; I don't want to hold up the whole thing.
10 I want a copy. This looks like a one-page document.
11 But if you want ask him specific questions and if he
12 needs context, he can say, I need to see the whole
13 thing. But I just figure the easiest way is if we
14 can dump it into the Chat.

15 MS. REDMOND: Hold on.

16 (Pause in proceedings)

17 MS. REDMOND: It's not letting me drag it
18 over, the whole document.

19 I've sent the link to Harper with the
20 Dropbox link so you have it.

21 MR. BATTS: It looks like it's just an
22 image on my email. Instead of being a link, it's
23 just an image of a folder.

24 (Pause in proceedings)

25 MS. REDMOND: It works for me on my end.

1 MR. BATTS: Maybe just send a PDF to me?
2 We can do it piecemeal, at least, and keep it moving.

3 MS. REDMOND: Yeah.

4 MR. SNADER: Harper, you should have a PDF
5 in your email.

6 MR. BATTS: Okay, I've got a PDF. Let's
7 see if I can just share it onto the Zoom real quick.

8 MR. SNADER: We'll go ahead and just share
9 a screen on Zoom.

10 MR. BATTS: I shared it on the Zoom link.

11 **THE WITNESS: Yeah, I have it now. But**
12 **please go ahead and share it on the Zoom as well.**

13 BY MR. SNADER:

14 Q. So just for the record, you have in front
15 have you Exhibit 2014, which is Chapter 4 of
16 Oppenheim. Can you go to Page 206, internal
17 numbering?

18 MS. REDMOND: Internal numbering.

19 MR. SNADER: That's 180. 206.

20 **THE WITNESS: The one that she sent doesn't**
21 **have internal numbering, but -- okay, yeah. Okay.**

22 BY MR. SNADER:

23 Q. You see Section 4.8.1 there at the top,
24 Dr. Doermann?

25 **A. Yes.**

1 Q. Can you just review for yourself the first
2 paragraph of that section?

3 A. Okay.

4 Q. So turning to the last third of that
5 paragraph, do you see the sentence that begins, If we
6 wish?

7 A. Yes.

8 Q. That sentence says, If we wish to avoid
9 aliasing, the input signal must be forced to be
10 bandlimited to frequencies below one-half the desired
11 sampling rate.

12 Is that correct?

13 A. Yes.

14 Q. So that this textbook says that in order to
15 avoid aliasing, the input signal must be bandlimited,
16 correct?

17 A. I want to point out, though, that this is
18 processing analog signals. There's nothing to
19 suggest that the -- when you take an image, take a
20 video, and you process it from a camera and you store
21 it -- you used the term MPEG, for example. That's a
22 digital signal. So in a digital signal, you already
23 have pixels, you have -- you don't have the concept
24 of having different bandwidths in those signals. So
25 in the context of this particular document that

1 you're talking about here, this is analog, analog
2 signals. And so, yes, you have things like hertz,
3 you have different ranges of these signals. But in
4 something like MPEG, for example, you already have a
5 discrete set of -- of pixels. And the problem with
6 aliasing that you were talking about before is, for
7 example, if you removed or you rotated a -- an image
8 and it doesn't align with the bins of the pixel, so
9 that's where bilinear interpolation, those types of
10 interpolation, typically are used.

11 In a digital format, you take and you, you
12 know, downsample by a factor of two, you downsample
13 by a factor of four, even other, you know,
14 specific -- you know, you could downsample by a
15 third. You can simply add the pixels together, take
16 an average. You can take the highest pixel; you can
17 take the lowest pixel. Lots of different ways to do
18 it. But this idea of low frequency bandwidths don't
19 apply to non-analog filtering.

20 Q. You talked about digital video. Would you
21 agree that in digital video, a low-pass filter is
22 often applied to filter the high resolution image
23 before subsampling in order to eliminate aliasing?

24 A. Again, aliasing is a visual artifact
25 that's -- that's used. It has nothing to do with the

1 downsampling. It's just the quality of the
2 downsampling. So in some cases that require very
3 specific detail, you want to have an image, for
4 example, that's very high quality, image of a
5 landscape, something like that, that type of
6 processing can be done, but it has nothing to do with
7 these -- the frequencies here.

8 Q. You said that filtering using a low-pass
9 filter has nothing to do with the frequencies?

10 A. Basically, what it's doing is it's
11 taking -- and that's how you're doing a low
12 resolution image. So you filter the image -- take a
13 digital image, you filter out the low frequency
14 images -- low frequency components. I'm sorry, you
15 filter out the high frequency components because
16 that's basically what you're going to eliminate as
17 you downsample. And then you can use anything,
18 dropping pixels in anything, and it makes an image
19 that looks better, visually.

20 There's no indication, however, that that's
21 really necessary as part of a downsampling or a
22 resolution -- a resolution reduction method.

23 Again, a lot of ways to do it. I say that
24 specifically in the paragraph that we were just
25 talking about. And depending on what your goal is in

1 your image, you can -- you know, there's many, many
2 different ways to do it. In fact, you listed a
3 number of specific ways that I hadn't listed in my
4 declaration, and those types of things are a part of
5 the process that you could use. I agreed with that.
6 Bilinear interpolation is something that we would do
7 nowadays. But, you know, depending on how it was
8 implemented, it could be implemented in a number of
9 different ways.

10 Q. So you said that when you're reducing the
11 resolution, you first applied the prefilter, and then
12 you can reduce the resolution in whatever way you
13 want to, and that's what's called downsampling?

14 A. No, I did not say that. I said that there
15 are a lot of different ways to do downsampling. If
16 you -- you gave a hypothetical that you could apply a
17 low-pass filter, and what it means by a low-pass
18 filter, you can use -- think of the word "pass".
19 You're letting the low -- the low frequency
20 components, the things that are less detailed, go
21 through and you're filtering out the high components.
22 You gave a hypothetical about using that, and then
23 doing downsampling. I said, yes, that is one way to
24 do it. But I did not say that that is downsampling.
25 Downsampling can be as simple as dropping every other

1 pixel. In some cases, that's perfectly legitimate.
2 In some cases, it might not be the best thing to do.
3 For example, if I had a binary image or I had a
4 grayscale image, it affects things differently. If I
5 dropped every other pixel in a color image and it's
6 supposed to be a piece of art, or I rotate the image
7 in order to -- and downsample it at the same time, I
8 might get artifacts.

9 So what you were describing as
10 prefiltering, plus some form of reducing the
11 dimension of the pixels, might be applicable to a
12 particular scenario, and I would need to know what
13 scenario that is. But I can vehemently say that that
14 is not the definition of downsampling. That's one
15 way of doing downsampling. And if I would ask my
16 students to give me a way of doing downsampling and
17 they produced what you just said, I would say, Yes,
18 that's a way of doing downsampling. If I would give
19 them a particular scenario of what type of image we
20 had, you know, what the resolution was, what the goal
21 of the downsampling was, and then asked them for a
22 particular type of downsampling, then in that case I
23 might be able to say, No, that's not the best way to
24 do it, or there's another, better way to do it.

25 Or in the case of this particular

1 paragraph, you know, this is a general hypothetical
2 on an arbitrary image, and it says right there in the
3 very first sentence, In processing of analog signals.
4 Because there is a challenge when you're processing
5 analog signals. But in -- even back in 2011, most
6 cameras that did this did not have analog signals
7 coming out of the camera. Maybe some surveillance
8 things do, but then you would need a discrete
9 transform, you'd need a box, basically, to convert
10 to -- the analog signal to a discrete signal. Cell
11 phones, any type of web camera, anything, all that's
12 done on a chip inside the camera, and what's coming
13 out is a digital signal set of pixels. Compressed or
14 not. But it's a digital pixels, and so this type of
15 prefiltering doesn't apply.

16 Q. So you're saying that a low-pass filter
17 does not apply to digital video?

18 A. No, I did not say that. You gave me a
19 scenario where you asked if you can apply low-pass
20 filtering, and then apply some type of downsampling,
21 and I say, yes, you can. You can do that. It's not
22 required. There's not a requirement for that. I
23 gave you some examples of dropping every other pixel
24 where you don't need to do that, and depending on the
25 application, you might get good or bad results, but

1 the definition of downsampling does not require some
2 type of low-pass filter.

3 Now, if you're an image analyst and you
4 want to make sure that you have the most pretty image
5 and you have this scenario and you can give me all of
6 those different parameters, I might say that having
7 some low-pass filter is -- is appropriate. There
8 are -- I'm sure you can come up with 100 examples in
9 the literature of places where they suggest that you
10 do low-pass filtering first for a reason. And I
11 would say, you know, most of the time, if those are
12 experts in this field and they say you should do it,
13 then you probably should, because they probably have
14 good reason for it. They wouldn't do it by default
15 if all they're worrying about is getting a low
16 resolution and the low resolution is usable.

17 Q. Let me clarify my question. Perhaps
18 there's some confusion here. I'm asking about the
19 definition of the term "downsampling". Does the
20 definition of the term "downsampling" include any
21 necessary prefiltering steps?

22 A. No, it does not.

23 MR. BATTS: Objection, vague and ambiguous.

24 BY MR. SNADER:

25 Q. Can you go to Page 180 in this one? Right

1 there. You see Section 4.6.1 on your screen,
2 Dr. Doermann?

3 A. Yes.

4 Q. Can you read for me the last sentence in
5 the first paragraph of Section 4.6.1 that starts, In
6 general? Read it out loud?

7 A. I'm sorry, I'm not -- I don't see the, In
8 general.

9 Q. The paragraph is broken up by the equation.

10 A. This is the piece that you want me to read?

11 Q. Yes.

12 A. In general, the operation of reducing the
13 sampling rate, including any prefiltering, is called
14 downsampling.

15 Q. Thank you.

16 You talked about a lot of different
17 contexts for image processing. I'd like to talk
18 specifically about digital videos, since that's the
19 subject of the '243 patent that we're talking about
20 today. In the context of digital video, would a
21 low-pass filter be used for prefiltering?

22 A. Again, this is a -- you know, there's a lot
23 of different forms. You can think of a digital video
24 as being a sequence of -- as being a sequence of
25 frames. And depending on what's in that frame and

1 what your goal is in the end, it may or may not
2 include prefiltering. Doesn't say that it requires
3 that, but remember, this is a -- the way I'm viewing
4 this is a document that I haven't seen before. My
5 understanding is that it's a handbook; is that
6 correct?

7 Q. It's a textbook, yes.

8 A. It's a textbook. So it's teaching ways of
9 doing things. You know, the sampling rate reduction
10 by an integer factor. You know, there might be cases
11 where you want to reduce the sampling rate error,
12 depending on what type of images you have, what your
13 goals are. I think I talk about this extensively in
14 my declaration, that depending on what your goals
15 are, there's a lot of different ways to implement
16 these things. This is one example, but there are --
17 if your goal is, for example, to reduce computation,
18 there are ways of doing this that don't require any
19 type of prefiltering.

20 And in fact, filtering, when you have a
21 digital image, if you run a three-by-three filter,
22 that can be done in constant time. So it's very --
23 it's very ambiguous here, what you're saying is
24 prefiltering. But if you look at the, you know,
25 where this is in this particular chapter, apparently,

1 they have a problem here with sampling, you know, to
2 do the sampling rate reduction, and they want to
3 sample in this way in order to satisfy some criteria
4 about the image.

5 Q. You said that a very simple way to reduce
6 the resolution of an image would be to just pick
7 every other pixel; is that correct?

8 A. If it was every other pixel, that would
9 reduce the size of the image by a factor of four,
10 yes.

11 Q. So that would be sampling rate reduction by
12 an integer factor?

13 A. Well, specifically, by a factor of two.

14 Q. Okay. And the heading of Section 4.6.1 is
15 Sampling Rate Reduction by an Integer Factor?

16 A. Correct. But if you have an integer that's
17 three or five or something that's not a factor that
18 you have to, for example, do something at the
19 boundaries because the image is not the right size,
20 then you're splitting pixels. And then in that case,
21 I would say that I would probably look to do some
22 type of smoothing. But it's not required.

23 Q. Dr. Doermann, I'm going to show you what's
24 been premarked as deposition Exhibit 2015.

25 //

1 (Whereupon, Exhibit No. 2015 was designated
2 for identification)

3 MR. SNADER: Harper, you should have that
4 in your in-box.

5 MR. BATTS: I'll have them ready.

6 BY MR. SNADER:

7 Q. And Dr. Doermann, can you see the title
8 page of this document?

9 A. No, I can't. Right now it's just
10 Exhibit 2015, unless that's what's you're calling the
11 title page. Okay, yeah.

12 Q. Are you familiar with this document?

13 A. Oh, yes, uh-huh.

14 Q. Can you go to Section 3?

15 This is a paper on which you're listed as a
16 co-author, correct?

17 A. Yes.

18 Q. So this paper reflects, as of the time of
19 the paper, your opinions; is that correct?

20 A. It's one particular application that we
21 were dealing with at the time. It's -- you have to
22 look at the entire context. This is digital image, I
23 believe, of looking at a text in digital video. So
24 for example, text that might occur as a subtitle in a
25 newscast, or it might be, you know, the name of a

1 player on their shirt, or it might be a text that
2 might appear on a sign in protests.

3 But yes, in general, that this is a -- a
4 one particular application.

5 Q. Can you see read for me the first sentence
6 of the second paragraph of Section 3? You can read
7 it out loud.

8 A. In digital video, a low-pass filter is
9 often applied to filter the high resolution image
10 before subsampling in order to eliminate aliasing.

11 Q. Can we turn back to Exhibit 1001? And
12 that's the '243 patent.

13 A. Would you like me to be looking at the --
14 that image myself? Or as displayed on the screen?

15 Q. Yes.

16 A. Okay.

17 Q. Can you turn to Figure 1 of that patent?
18 Just let me know when you have it up in front of you.

19 A. Yes, I have it.

20 Q. Would you agree that Figure 1 is an example
21 of a media exposure environment?

22 A. That's how they have it labeled in the
23 patent, yes.

24 Q. And those kind of circles in that figure
25 are the heads of the audience members?

1 **A. That's what I would interpret it as, yes.**

2 Q. Then I'd like to jump back to Exhibit 1005.
3 That's Tian.

4 **A. Okay.**

5 Q. Can you look at Table 1 for me.

6 **A. Yes.**

7 Q. So the caption of Table 1 says, An example
8 in five different resolutions from the Cohn-Kanade
9 database. The lower resolution images are
10 downsampled from the originals.

11 **A. Yes.**

12 Q. Tian's downsample images are otherwise
13 identical; is that correct?

14 **A. I'm not sure what you mean by they're
15 identical.**

16 Q. The only thing that's changed in these
17 images is the resolution? Same person, same
18 expression, same pose, same size, same contrast, same
19 everything?

20 **A. No -- I mean, they are the same person, and
21 the -- at the same instance in time, but I wouldn't
22 say they have the same contrast. They wouldn't
23 have -- you know, the pixels aren't going to align.
24 There's obviously the resolution difference. The
25 only thing we can say is that it was the same**

1 original picture that was used to do the
2 downsampling. It says it right there in the caption
3 of the table.

4 Q. Is Tian trying to perform a fair comparison
5 of expression analysis at different resolutions?

6 MR. BATTS: Objection. Vague, ambiguous.

7 THE WITNESS: In this case -- we're talking
8 about this table right now?

9 BY MR. SNADER:

10 Q. In general, of which Table 1 is an example.

11 A. Can you repeat the question? I think you
12 used the word "fair".

13 Q. Apples to apples. Tian is trying to
14 isolate the effects of resolution and examine only
15 the effects of resolution on expression analysis?

16 A. I don't know if they're successful at doing
17 only that. But yes, the goal of this paper was to
18 look at different things, not only facial expression,
19 but head pose and things, as a function of the
20 resolution downsampling that they were -- that they
21 did.

22 You look at this particular case, this is a
23 prime example of what we were talking about before.
24 They -- although they don't say exactly what the
25 effects are, you'll notice that this is downsampling

1 **by a factor of two each time.**

2 Q. Looking at Table 3 of Tian, we see the same
3 faces appear in some analysis of the aggregated
4 results; is that correct?

5 A. **I assume those are the same faces, yes.**

6 Q. So Tian is looking at, for example, the
7 ability to evaluate the basic expression on a face at
8 280-by-384, as compared to 144-by-192, as compared to
9 72-by-96, and so forth?

10 A. **Yes.**

11 Q. Would it make sense to compare the ability
12 to extract an expression from a first image at a
13 first resolution to a different resolution at the
14 lower image?

15 A. **Could you repeat that, please?**

16 Q. I'll clarify. The different resolution
17 images at the top of that table correspond to the
18 same person at the same moment in time, as you
19 indicated, correct?

20 A. **Correct.**

21 Q. To provide an accurate comparison, an
22 accurate evaluation of the ability to determine
23 resolution, the effects of resolution, on facial
24 expression analysis, it would be beneficial to
25 examine images that were identical but for

1 resolution; is that correct?

2 A. That's what the assumption of this paper
3 would be. And it's for feature extraction, it's for
4 pose estimation, for detection, all of these
5 different things. They're looking at the effects of
6 resolution.

7 Q. Facial expression analysis systems are
8 designed to work with very high resolution images; is
9 that correct?

10 A. Again, I don't know what you mean by very
11 high resolution images. There are cases where we
12 want to do it at lower resolution, whether to save
13 computation, especially back at this time where we
14 didn't have quite as powerful of machines, or in
15 cases perhaps where a high resolution image is not
16 available, we still want to be able to do it. But
17 you know, the goal of this paper was to analyze how
18 far we can push the state of the art in terms of
19 reduced resolution.

20 Q. Can you turn to the abstract of Tian for
21 me, Dr. Doermann?

22 A. Uh-huh.

23 Q. Can you read that very first sentence?

24 A. Most automatic facial expression analysis
25 systems attempt to recognize facial expressions from

1 data collected in a highly controlled environment
2 with high resolution frontal faces.

3 And it gives an example of what -- in this
4 case, what high resolution is.

5 Q. So based on that statement and using the
6 example of very high resolution from Tian, would you
7 agree that facial and analysis systems are designed
8 to work with very high resolution images?

9 A. It's talking about most automatic ones are,
10 yes.

11 Q. Would you agree that Tian describes low
12 resolution images as a challenge for facial analysis?

13 A. Again, which type of facial analysis? We
14 have -- in Table 3, Tian describes at least five
15 different things. One is face detection, which is
16 facial analysis. One is head pose estimation. One
17 is feature extraction. One is these facial
18 attributes that are defined, raising eyebrows, things
19 like that. And then the basic expressions, which is
20 like smiling or frowning and things like that. So
21 there's a variety of things here. For some of them,
22 yes, you can see in the table that as you get to
23 much, much lower resolutions, there are challenges
24 with those. But things like head pose estimation,
25 you're basically getting the same accuracy. Face

1 **detection, face acquisition, you're basically getting**
2 **the same accuracy over the entire range of images.**

3 **So yes, some of them have challenges, and**
4 **some of them don't.**

5 Q. Can you turn to Page 2 of Tian for me? I
6 think we've looked at this sentence before, but it's
7 the sentence that begins, Head motion, about six
8 lines down.

9 MR. BATTS: Left column?

10 BY MR. SNADER:

11 Q. Left column, yes.

12 A. **Okay.**

13 Q. Read that sentence to yourself.

14 A. **Yes.**

15 Q. Based on that sentence, would you agree
16 that Tian describes low resolution images as a
17 challenge for facial expression analysis?

18 MR. BATTS: Objection. Mischaracterizes
19 the document.

20 BY MR. SNADER:

21 Q. Can you repeat your answer, Dr. Doermann?

22 A. **From just the context of this sentence,**
23 **that low resolution images are factors that**
24 **complicate it, it doesn't say whether you can do it**
25 **or not. And it doesn't say anything about the**

1 accuracy of which it can be done. It just makes it
2 more complicated.

3 Q. It's a challenge, correct?

4 A. All of computer vision is a challenge, but
5 yes, facial expression analysis -- even, you know,
6 for -- as it says there, you know, absence of a
7 neutral face, any of those things are -- make it
8 challenging, this problem challenging. That's why
9 they have a whole paper on it. Or a whole field
10 that's dedicated to this.

11 Q. Super resolution is a technique for
12 combining multiple low resolution images into a
13 single high resolution image, correct?

14 A. There are techniques that use -- at the
15 time of this invention, I would say most of the
16 techniques that were doing, using this, did use
17 multiple images. Today, and, in fact, there are a
18 number of -- well, not even today, probably even at
19 that time -- were techniques that tried to
20 essentially build the features by replicating them.
21 For example, if they weren't looking directly at the
22 camera, or giving general aspects of high resolution
23 images to try to interpolate between those pixels.
24 So one technique is to take multiple images and to
25 get corresponding pixels within those images and then

1 use that to try to essentially add more information.

2 And other, you know, even earlier
3 techniques for super resolution would look at the
4 individual image itself and try to interpolate
5 between those to get a higher resolution image.

6 So there are a lot of different techniques
7 to do it, but super resolution among multiple images,
8 yes, is one technique that you could use.

9 Q. And Tian discusses the use of super
10 resolution to enhance facial analysis by obtaining
11 higher resolution images from lower resolution
12 images; is that correct?

13 A. Are you -- you're referring to a particular
14 part of Tian? I remember the term being used, but I
15 don't remember what context it is. Would you like me
16 to go to that part?

17 Q. Sure. Tian, Page 6, Bates Page 6. The
18 third full paragraph of the right-most column. About
19 halfway down.

20 A. Yep. I'm not familiar necessarily with
21 that reference. Actually, let me see.

22 Yeah, Takeo Kanade is well-known in the
23 area. So yes, he says that there are techniques that
24 do it, but I don't believe that he discusses them.
25 So that would be my limitation. He just says that

1 there are techniques that use multiple low resolution
2 images. He probably could have come up with a series
3 of references that talk about lots of different
4 things for doing super resolution.

5 Q. And Tian would get the advantages of --
6 contemplate the benefits of super resolution to
7 obtain a higher resolution because a low resolution
8 image is a challenge in the context of facial
9 expression analysis; is that correct?

10 A. Well, if we could do super resolution on
11 these things, this particular document's from CMU.
12 Talks about super resolution and talks about the
13 limits. So it was well-known at the time that super
14 resolution was not necessarily a very useful thing.

15 So if we -- for example, if we -- if you
16 ever watch any of the FBI shows where they take an
17 image or they take a video that has, you know,
18 absolutely no way to recognize the person and all of
19 a sudden you know, 10 seconds later, you have a high
20 resolution image, that's fiction. That type of thing
21 doesn't exist.

22 So this is talking about, you know,
23 different types of things. But whether that would
24 help in a particular context or not, you would need
25 to do experiments on that.

1 Q. If you had the magic FBI super resolution
2 technique you just described and you could upsample
3 images perfectly in microseconds, as you said, would
4 that be useful in the context of facial expression
5 analysis?

6 A. Are there any other constraints on that
7 problem? For example, how big are the images? How
8 much compute power I have? All of those things. If
9 there are no constraints and I had a magic wand, you
10 know, having higher resolution can benefit.

11 If I would find that for a facial
12 recognition, for example, if I go from the first
13 version of the original image that was from the Cohn
14 database to a second, lower resolution, and I'm
15 getting just about the same accuracy in my
16 application, I wouldn't do it, because it's a complex
17 process. In fact, you can destroy an image with
18 super resolution. You don't always get a better one.

19 So again, I would have to know what
20 application this is, and how to -- how it gets
21 applied. Lots of papers out there that will claim
22 that it works in "N" percent of the time, so it would
23 definitely be something I would explore. It wouldn't
24 be something that I would necessarily build into my
25 system because of the complexities of it.

1 Q. But again, if you had a magical system, or
2 FBI system that you alluded to earlier, required no
3 computational resources, required -- had perfect
4 accuracy, and required no processing time, that would
5 be a no-brainer, it would be desirable?

6 A. And it would improve my -- yes. And it
7 would improve my results. I mean, there's an outside
8 chance that it could reduce the results, but in
9 general, I would try it. Of course.

10 Q. Okay. I'd like to turn back to your
11 declaration, briefly, Dr. Doermann.

12 A. Just a second. I've got too many things
13 open here. Move them back over for one second.

14 Okay, I have 1003.

15 Q. Paragraph 63. Six-three.

16 A. 62. 63. Yes.

17 Q. The sentence of that -- first sentence of
18 that paragraph says -- describes the modification,
19 such that when the television audience measurement
20 system processes a sequence of images, it determines
21 a face or head location in the first image and uses
22 the determined location for subsequent images.

23 Is that correct?

24 A. Yes.

25 Q. Going to Paragraph 64.

1 **A. Okay.**

2 Q. The last sentence of that paragraph says,
3 this approach has the benefit of saving processing
4 resources and time by reducing the number of times
5 face detection needs to be applied.

6 Is that correct?

7 **A. That's part of the sentence, yes, uh-huh.**

8 Q. So the benefit of the modification you're
9 proposing is that you would not need to perform face
10 detection over the entire image?

11 **A. That's one of the benefits, yes.**

12 Q. Can you turn to Exhibit 1006? That's
13 Nielsen.

14 **A. '372.**

15 Q. '372.

16 **A. Yep.**

17 Q. And Paragraph 3 of that reference?

18 **A. Yes.**

19 Q. Nielsen '372 relates to audience
20 measurement; is that correct?

21 **A. Yes.**

22 Q. And Nielsen '372 is the reference you're
23 proposing to modify using the teachings of Tian in
24 order to avoid having to do face detection over the
25 entire image as described in Paragraphs 63 and 64 of

1 your declaration; is that correct?

2 **A. Let me go back to my declaration, please.**

3 Q. You might actually look at Paragraph 285 of
4 your declaration. It is specific to Nielsen '372.

5 **A. Okay, but you were saying that this is, in**
6 **64, this is just general, 64 -- 63, 64 is talking**
7 **about Lu.**

8 Q. 63 is describing modifying Lu to
9 incorporate the teachings of head tracking. 285 is
10 talking about modifying Nielsen '372 to incorporate
11 head tracking. Correct?

12 **A. Okay. So let's go to that -- 385? I'm**
13 **sorry.**

14 Q. 285.

15 **A. I'm sorry, did you say 285?**

16 Q. 285.

17 **A. Okay.**

18 **Okay, yes. Now going back to 1006,**
19 **Paragraph 3. Okay, I'm there.**

20 Q. You agreed that Nielsen is an audience
21 measurement system, correct?

22 **A. Yes, it's an audience measurement system**
23 **that also does things like detecting the audio**
24 **channel. It looks at the -- the system itself, looks**
25 **at the program to try to tell whether the program is,**

1 tries to -- it has a method for identifying when
2 somebody's actually watching the program. Those
3 types of audience analysis.

4 Q. Does '372 track the number of people
5 watching a television program?

6 A. I'd have to go back and look at it exactly,
7 but I believe that it has what's called a people
8 meter, which I understood as a way of telling, for
9 somebody to say that they're looking at this, so that
10 I assume that they have those.

11 I should probably go back and look at my
12 declaration to see if each person has their own
13 people meter. I don't recall that.

14 Q. I'll point you to the second to last
15 sentence of Paragraph 3 of Nielsen '372. Starts,
16 As another example?

17 A. Okay.

18 Q. Do you see that it says that it tracks the
19 number of persons presently viewing programs
20 displayed on the television?

21 A. Yes, I see that now. Yes.

22 Q. Okay. Can you turn to Exhibit 1010?

23 (Whereupon, Exhibit No. 1010 was designated
24 for identification)

25 //

1 BY MR. SNADER:

2 Q. For the record, this is United States
3 Patent Application Publication 2011/0081052, to
4 Bigioi.

5 A. Yes.

6 Q. Can you turn to Paragraph 3 of Bigioi?

7 A. **It's spreading out on my....**

8 **Paragraph 3, yes.**

9 Q. Would you agree that Bigioi characterizes
10 it as still desirable and necessary to scan the
11 entire image even when faces are tracked in order to
12 identify new participants entering the scene?

13 A. **Was this from a particular part of my**
14 **declaration?**

15 Q. This is Paragraph 3 of Bigioi, about
16 halfway down, the sentence that starts with, Note.

17 A. **Give me a second to read it, please.**

18 **Okay, can you repeat your question, please?**

19 Q. Do you agree that performing face detection
20 over other portions of image would still be necessary
21 if you wanted detect new faces entering the field of
22 view of the camera?

23 A. **That's the opinion of this patent, yes,**
24 **that it's desirable to do that. It's not saying that**
25 **there aren't other ways to do it, but this is one way**

1 **that you could do it.**

2 Q. Can you -- well, the previous sentence,
3 just for definition purposes, says, The located face
4 is said to be face-locked by the face tracker. Do
5 you see that?

6 A. **Yes.**

7 Q. Do you see the last sentence that says that
8 face lock may also be lost due to sudden changes in
9 illumination conditions?

10 A. **Yes.**

11 Q. Like, for example, face lock might be lost
12 due to turning on an illumination source?

13 A. **Yes.**

14 Q. If the face lock is lost, face detection
15 would need to be rerun; is that correct?

16 A. **It would need to be rerun on some portion**
17 **of the image, perhaps. That's one way of doing it,**
18 **yes.**

19 Q. Okay.

20 All right. We've been going for about an
21 hour, but we're almost done here. So unless you need
22 a break, I think we can probably wrap up in another
23 five, 10 minutes.

24 A. **That would be fine with me.**

25 Q. All right. Returning to your declaration,

1 Paragraph 61.

2 A. I'm sorry, it's a long document. It's
3 jumping around really quick here. Trying to scroll.

4 MR. BATTS: What was that?

5 MR. SNADER: 61.

6 THE WITNESS: Yep.

7 BY MR. SNADER:

8 Q. In Paragraph 61, you state that, the
9 accuracy of identifying a person can be improved by
10 analyzing multiple images including the same person
11 and aggregating the analysis results from multiple
12 images.

13 Is that correct?

14 A. I'm looking for that particular sentence.

15 Q. It starts with, As contemporaneous writings
16 recognize.

17 A. Yes.

18 Q. And that that would be desirable in order
19 to achieve a higher confidence level for the
20 identification of a single image?

21 A. If you have that ability, yes, that is
22 something that anyone would have looked to to find
23 either just -- you know, multiple images, to find the
24 best image. Or trying to aggregate features. Some
25 features might be in some images while some features

1 might be in other images. But, you know, in general,
2 it's not saying necessarily that you're aggregating
3 the -- you know, like voting on who it is. But it
4 could be at the feature level. It could be a, using
5 those -- analyzing those multiple images to, you
6 know, pick the best one. Lots of different reasons
7 to do it. I think I cited a particular example.

8 But yes, in general, looking at multiple
9 instances, it's almost like if you're walking down
10 the street and you're looking around, you know, you
11 just blink really quick and look at somebody, you
12 might think you know who it is, but then looking at
13 them over time can help you increase your confidence
14 that that's who you're really looking at.

15 So yes, in general, analyzing more images
16 would typically improve the results.

17 Q. Okay. I think, let's take a quick break
18 here, and then maybe just come back and make sure
19 there's nothing else I have to touch on. Like maybe
20 just five minutes? Off the record.

21 A. Okay, I'll watch for you to come back on.
22 Thank you.

23 COURT REPORTER: Off the record.

24 (Pause in proceedings)

25 MR. SNADER: I don't think I have anything

1 more. Thank you, Dr. Doermann, for your time.

2 Appreciate you talking with me today.

3 **THE WITNESS: Okay. Thank you very much.**

4 **MR. BATTS: No questions here. So, thank**
5 **you.**

6 (Adjourned at 10:12 a.m.)

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REPORTER'S CERTIFICATION

I, CONNIE MCCARTHY, a Certified Court Reporter, hereby certify that the witness in the foregoing deposition was by me duly sworn to tell the truth, the whole truth, and nothing but the truth in the within-entitled cause;

That said deposition was taken down in shorthand by me, a disinterested person, at the time and place therein stated, and that the testimony of the said witness was thereafter reduced to typewriting, by computer, under my direction and supervision;

I further certify that I am not of counsel or attorney for either or any of the parties to the said deposition, nor in any way interested in the events of this cause, and that I am not related to any of the parties hereto.

DATED: April 30, 2024



Connie McCarthy, RMR, CRR
MO CCR 1435

Exhibits			
163405 Doermann PhD, David042524 EX 1	0002 22:12,14	16 40:16	3
001 2:8 15:18,19 26:11,13 60:11	0003 23:18	180 48:19 55:25	3 18:16,20 59:14 60:6 63:2 65:14 72:17 73:19 74:15 75:6,8,15
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