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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MOBILEYE GLOBAL, INC.,

Petitioner,

v.

FACET TECHNOLOGY CORP.,

Patent Owner.

Case IPR2024-01111

Patent No. 9,671,328 B2

REMOTE DEPOSITION OF NIKOLAOS

PAPANIKOLOPOULOS, PH.D.

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1 A P P E A R A N C E S

2 (All appeared remotely via videoconference)

3

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1 C O N T E N T S

2 WITNESS PAGE

3 By Mr. High: 4

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5 Reporter's cert page 73

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7 E X H I B I T S R E F E R R E D T O

8 LABEL PAGE

9 Facet Exhibit 2023 Declaration of Dr. 11
Papanikolopoulos in IPR2024-01111

10

11 Mobileye Exhibit 1001 U.S. Patent No. 9,671,328 ..20
B (Retterath)12 Mobileye Exhibit 1005 U.S. Patent No. 38
2002/0063638 A1 (Gallagher)

13

14 Mobileye Exhibit 1006 U.S. Patent No. 5,796,094 ..56
(Schofield)

15

16

17 REPORTER'S NOTE: All quotations from exhibits are
18 reflected in the manner in which they were read into
the record and do not necessarily reflect exact
19 quotes from the source documents nor necessarily
match punctuation.

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1 P R O C E E D I N G S

2 EXAMINATION BY COUNSEL FOR THE PETITIONER

3 BY MR. HIGH:

4 Q Good morning, Dr. Nikos. Is it okay if I
5 call you Dr. Nikos?

6 A Yes, sir.

7 Q And can you just state your full name for
8 the record?

9 A My name is Nikolaos Papanikolopoulos.

10 Q And where are you located today?

11 A I'm located in Minneapolis, Minnesota.

12 Q Is there anybody else in the room with
13 you?

14 A No.

15 Q We're here for IPR2024-01111. You
16 submitted a declaration for that IPR, right?

17 A Yes, I did.

18 Q And do you understand that you're under
19 oath today?

20 A I do.

21 Q Is there anything that may impact your
22 ability to give true and honest testimony today?

23 A To the best of my knowledge, no.

24 Q How many times have you served as an
25 expert in a patent case before?

1 **A Just a clarification. Have I deposed or**
2 **have I filed declarations, so on and so forth?**

3 Q Oh. About how many times have you been
4 deposed for a patent case?

5 **A More than ten times excluding one ITC**
6 **deposition.**

7 Q And about how many times have you been
8 deposed in an IPR?

9 **A Around ten, I believe, to the best of my**
10 **recollection.**

11 Q I'm sure your counsel has gone over some
12 general ground rules but I'll just go over them for
13 the sake of the record today. So this is a remote
14 deposition so I ask that you give audible answers,
15 speak into the microphone to aid the court reporter.
16 Do you understand?

17 **A I do.**

18 Q And I will try my best not to talk over
19 you. I ask that you do the same with me.

20 **A Sure.**

21 Q If at any point a question is unclear to
22 you please let me know. If you answer I'll assume
23 that you understood my question. Is that okay?

24 **A Yes.**

25 Q Your counsel may object from time to time.

1 That's okay. Feel free to let them object. But then
2 you will still answer after an objection unless your
3 counsel instructs you otherwise. Do you understand?

4 **A I understand.**

5 Q I'll attempt to take a break about every
6 hour or so but if you need a break sooner than that
7 just let me know. I just ask that you finish
8 whatever answer you're giving before we do that.

9 **A Sure.**

10 Q Do you have any chat windows or email
11 programs or other messaging programs up on your
12 computer besides this Zoom link for the call?

13 **A I have -- and I can close it. I have my**
14 **Yahoo account and I have my Brave browser. So do you**
15 **want me to close all this?**

16 Q Let's go ahead and -- you can keep the
17 link open for the exhibits in case you need to access
18 that, but otherwise let's close any other programs
19 you have running on your computer.

20 **A Sure. It's just I have email with the**
21 **link in case I need to reconnect. So let me close**
22 **the rest.**

23 **Yeah. So everything else is just the**
24 **exhibits and I have the browsers that they have the**
25 **links to the share files in case something happens.**

1 Q Okay. Well, just to clarify, do you have
2 your email open?

3 A **I have -- and I can share with you. I**
4 **have the email open that has the links.**

5 Q Is it okay if you close out your email?

6 A **Sure.**

7 Q You can copy the links into a Word
8 document if you prefer, something like that.

9 A **Just give me a minute so I can save them.**

10 Q Sure.

11 A **Bear with me one minute. I also have**
12 **clear hard copies that the counselor sent me as a**
13 **backup. Is this okay with you?**

14 Q That's fine. So you have hard copies of
15 your declaration and the exhibits?

16 A **Yeah. I can show you. I don't know if**
17 **you can see.**

18 Q Okay. And they're clean copies, no notes?

19 A **Clean and marked.**

20 Q Okay. Do you have any other documents
21 with you besides the declaration and exhibits?

22 A **No.**

23 Q Do you have any notes with you?

24 A **No. Let me save the file so I can close**
25 **this. I'm done.**

1 Q Thank you. So what did you do to prepare
2 for the deposition today?

3 A **I reviewed my declaration, the prior art,**
4 **the patent and I also I talked to the counsel.**

5 Q When you say you talked to counsel are you
6 referring to Dr. Saunders?

7 A **Yes.**

8 Q Did you talk to anybody else to prepare
9 for your deposition?

10 A **No.**

11 Q About how many times did you meet with
12 Mr. Saunders?

13 A **Are you meaning general or just for the**
14 **preparation of this particular --**

15 Q For the preparation of this deposition.

16 A **Two times, I believe.**

17 Q And about how long did you meet each time?

18 A **I don't recall the exact -- probably total**
19 **eight hours.**

20 Q Other than your declaration and the prior
21 art and the patent did you review any other documents
22 to prepare for your deposition?

23 A **I looked at parts -- mainly I used my**
24 **declaration as a guiding force and then I looked at**
25 **some of the documents that I'm referencing in my**

1 **declaration, but my declaration was the main**
2 **document.**

3 Q Did you look at any documents that you
4 didn't cite in your declaration?

5 A **To the best of my recollection, no.**

6 Q And about when did Facet initially retain
7 you as an expert?

8 A **Sometime in the spring 2025. Middle**
9 **spring. I don't have the exact date.**

10 Q So maybe April?

11 A **Somewhere like that.**

12 Q Somewhere around April 2025?

13 A **Yeah.**

14 Q And when did you first get involved in
15 this IPR?

16 A **Sometime in May.**

17 Q May 2025?

18 A **Mm-hmm. Yes.**

19 Q In preparing your declaration you reviewed
20 the '328 patent, correct?

21 A **Yes.**

22 Q And you understand that the '328 patent is
23 the patent that's the subject of this IPR, right?

24 A **That's correct.**

25 Q And I reviewed the IPR petition, right?

1 **A Yes.**

2 Q You reviewed the exhibits that were
3 attached to the IPR petition?

4 **A As they were relevant. Basically as they**
5 **are relevant to the theories raised in the petition.**

6 Q How did you decide which exhibits were
7 relevant?

8 **A I looked at the grounds and I tried to**
9 **address in my declaration the grounds. And also I**
10 **considered the opinions surrender by Dr. Thorpe who's**
11 **the expert for the other side.**

12 Q Are you familiar with Dr. Thorpe
13 professionally?

14 **A Yes.**

15 Q Have the two of you worked together
16 before?

17 **A We were at the same U, had some overlap at**
18 **the Carnegie Mellon University, and also I see him in**
19 **meetings, professional meetings.**

20 Q So when you were reviewing the exhibits
21 attached to the petition you reviewed the exhibits
22 that formed the grounds of the IPR and the
23 declaration of Dr. Thorpe; is that right?

24 **A Will you please repeat?**

25 Q So when you were reviewing the exhibits to

1 prepare your declaration you reviewed the exhibits
2 that formed the grounds of the IPR and the
3 declaration of Dr. Thorpe; is that right?

4 **A That's correct.**

5 Q Aside from the patent, Dr. Thorpe's
6 declaration and the exhibits that formed the grounds
7 of the IPR did you review any other exhibits attached
8 to the petition?

9 **A Yeah. I think I looked at some other --**
10 **like there was a document, there was an exhibit,**
11 **about the test lab performance or something like**
12 **that. I looked at some other documents that the**
13 **patent owner supplied as exhibits.**

14 Q And you have a copy of your declaration,
15 right?

16 **A Yes. Let me retrieve it. Do you want me**
17 **to retrieve it or --**

18 Q Sure.

19 **A Just give me a minute. Yes. I have it in**
20 **front of me.**

21 Q And your materials considered section
22 starts in paragraph 20 if you want to turn to that.

23 **A Did I hear paragraph 20 or --**

24 Q Yes.

25 **A Sure. Let me go there. Yes.**

1 Q And then in the second sentence of
2 paragraph 20 you list several of things that you
3 considered in formulating your opinions. What do you
4 mean by considered in that instance?

5 A **At that time I looked at them in order to**
6 **formulate my opinion.**

7 Q Okay. So you looked at the patent owner
8 preliminary response?

9 A **Yes. We're talking about springtime.**

10 Q And you looked at the petitioner's
11 preliminary reply?

12 A **Yes.**

13 Q And patent owner's preliminary surreply?

14 A **Yes.**

15 Q And the board's decision on institution?

16 A **Yes, as stated in the document.**

17 Q The patent owner's director review
18 request?

19 A **I looked at this but it has been quite**
20 **some time and my memory is pretty --**

21 Q At one point -- sorry. I didn't mean to
22 cut you off. At one point you considered these
23 documents?

24 A **Yeah. At one point, especially at the**
25 **beginning trying to form my opinions. But everything**

1 **I rely on is considered as an exhibit, the exhibits**
2 **that I mention here in my declaration.**

3 Q Did you consider any other information in
4 forming your opinions that aren't listed in paragraph
5 20?

6 A **To the best of my recollection that's it.**

7 Q Do you want to go to the next paragraph,
8 paragraph 21?

9 A **Sure.**

10 Q And this paragraph it starts off "In
11 particular I have reviewed patent owner Exhibit
12 Numbers 2027 to 2029 and 2031 to 2032." What did you
13 mean in this sentence by saying that in particular
14 you have reviewed those exhibits?

15 A **Just I spent more time reading through**
16 **them.**

17 Q Is that because they're more important?

18 A **I wouldn't characterize -- just I was**
19 **trying to get the grasp of the case.**

20 Q And so each of those exhibits was
21 important for you to you understand the grasp of the
22 case?

23 A **It was informative in order to iron out**
24 **some of my opinions.**

25 Q About how many hours did you spend

1 preparing your declaration?

2 **A** **Since I prepared the declaration for the**
3 **other case involving the '255 patent I would say a**
4 **little bit more than 50 hours total for both of them.**

5 **Q** Which portions of your declaration did you
6 draft personally?

7 **A** **I always have full control of the words.**
8 **If there are legal terms that I don't understand I**
9 **may use a template that the counsel provided, but I**
10 **have full control of every word in my declaration.**

11 **Q** Did you rely on counsel to put together
12 the first draft?

13 **A** **We talked together and we drafted. As I**
14 **mentioned, I suggested a general structure, I was**
15 **given the task of addressing the opinions expressed**
16 **in the petition and in the declaration of Dr. Thorpe,**
17 **and then I suggested how this response may look like**
18 **from a technical perspective and the counsel helped**
19 **me with the legal terms.**

20 **Q** Let's go on to paragraph 23 now.

21 **A** **Sure.**

22 **Q** And this is within your section that
23 you've titled understanding of legal principles and
24 specifically it's the claim construction subheading
25 of that section?

1 **A Yes.**

2 Q And in this paragraph you list your
3 understanding of legal principles related to claim
4 construction, right?

5 **A That's correct.**

6 Q One of the things you indicated you
7 understood is that both intrinsic and extrinsic
8 evidence can be used to assist in understanding the
9 meaning of a claim, right?

10 **A That's correct.**

11 Q And you provided your understanding of
12 what intrinsic evidence includes and extrinsic
13 evidence includes, right?

14 **A That's indeed the case.**

15 Q Do you think extrinsic evidence is
16 necessary to understand the claims in this case?

17 MR. SAUNDERS: Objection, form.

18 **A Can you please clarify?**

19 BY MR. HIGH:

20 Q What's unclear about my question?

21 **A I mean, I list some extrinsic evidence but**
22 **are you referring to some particular opinions that I**
23 **expressed or in general?**

24 Q So I guess specifically you've included a
25 claim construction section in your declaration for

1 particular terms in claims of 1 and 9, right?

2 **A That's correct. If you can remind me --**
3 **this is later in the document, am I right?**

4 **Q Right.**

5 **A Yes.**

6 **Q I believe that starts in paragraph 75.**

7 **A Give me a minute to go -- do you want me**
8 **to go there or you want to --**

9 **Q You're free if you want. I don't know if**
10 **you need to necessarily. My question is I guess**
11 **along those lines for the terms in that section do**
12 **you think extrinsic evidence is necessary to**
13 **understand those terms?**

14 **A Let me go -- if you don't mind let me go**
15 **to the claim construction because I want to be --**
16 **(reviewing document.) I had to look at the intrinsic**
17 **and extrinsic evidence because there were some**
18 **theories which were particularly unusual for a POSITA**
19 **at that time. So I had the need to -- before I**
20 **proceed to claim construction to look at the -- some**
21 **of these elements, including intrinsic and extrinsic**
22 **evidence.**

23 **Q Which claim terms did you need to consult**
24 **extrinsic evidence for?**

25 **A Mainly there were some issues with respect**

1 **to -- let me go to the particular --**

2 Q Why don't we just do it this way. Let's
3 take a look at your claim construction heading that
4 starts at the bottom of page 34.

5 A **Page 34 you mentioned?**

6 Q Yes.

7 A **Yes.**

8 Q Okay. So the term that you identify for
9 claim 1 starts "configured to detect objects of
10 interest within the field of view." Did you need to
11 consult extrinsic evidence to understand that term?

12 A **No.**

13 Q Next it says "and for each object of
14 interest." Did you need to consult extrinsic
15 evidence to understand that term?

16 A **No.**

17 Q And then it says "determine whether the
18 object of interest includes a reflective surface."
19 Did you need to consult extrinsic evidence to
20 understand that term?

21 A **If my memory serves me well I had to look**
22 **a little bit at the properties of a reflective**
23 **surface and how, for example, a road marker, the next**
24 **one, "determine." My argument here is that I felt**
25 **the need to explain that there's the object detection**

1 and based on the claim language for every -- after
2 each detection of each object of interest there is
3 the part which is the determine part which follows,
4 which is the step two, "determine whether the object
5 of interest includes a reflective surface and
6 determine whether the reflective surface is a road
7 marker."

8 Q So that argument isn't clear based on the
9 intrinsic evidence alone?

10 MR. SAUNDERS: Objection, form.

11 A Can you clarify what you mean? Because I
12 looked at the extrinsic evidence in general in order
13 to make sure that at the time of 2001 my opinion was
14 grounded, as many different sources, in order to
15 basically to be reflecting what the POSITA at that
16 time was understanding.

17 BY MR. HIGH:

18 Q Did you need to consult extrinsic evidence
19 to understand that term because that term isn't clear
20 from the intrinsic evidence alone?

21 MR. SAUNDERS: Objection, form.

22 A It's more that some of the theories and
23 combinations proposed by the petitioner and
24 Dr. Thorpe were way out of line of what is considered
25 object detection and object recognition. So as a

1 **verification I wanted to make sure -- so if there is**
2 **an element that I use, I state it. But elements that**
3 **I used just for verification of my opinions, it's**
4 **just I need to always check, avoid hindsight and try**
5 **to move at the period of 2001 in order to make sure**
6 **that I offer the best of my knowledge the best -- my**
7 **opinion as truthful as possible.**

8 BY MR. HIGH:

9 Q Let's go now to paragraph 83.

10 A **Sure. Yes. I'm there.**

11 Q And this is still in the claim
12 construction section?

13 A **That's correct.**

14 Q And in this paragraph you state that
15 you're describing a preferred embodiment of the '328
16 patent, right?

17 A **As described in column 7, row 67, till**
18 **column 8, row 6.**

19 Q You characterize this as a preferred
20 embodiment, right?

21 A **The patent says -- states that.**

22 Q So you're repeating the patent statement
23 that this is the preferred embodiment?

24 A **I'm trying to use the '328, the spec, in**
25 **order to form an opinion or basically to form my**

1 **arguments.**

2 Q If you're characterizing this -- you use
3 the term preferred embodiment in your declaration,
4 right?

5 A **Yes.**

6 Q So you're characterizing this embodiment
7 as the preferred embodiment?

8 A **If you don't mind, let me go -- just to be
9 truthful to the record, let me go to the '328 patent.
10 Is this okay with you?**

11 Q Sure. If you think you need to do that to
12 clarify your testimony.

13 A **Just -- I'm pretty sure it's there. I
14 just want to be truthful to the record. I don't have
15 word by word recollection of what is stated in these
16 lines.**

17 Q Right. I was just asking about your
18 characterization since you used the term preferred
19 embodiment.

20 A **Yeah. But I'm trying to say that -- I
21 just want to make sure that the patent
22 characterizes -- if my recollection is correct I used
23 the term from the '328 patent.**

24 Q Have you had a chance to find it yet?

25 A **Sorry. Do you want me to go there or --**

1 Q I thought you said you needed to check it
2 to verify. I was waiting for you.

3 A **Okay. Sorry. Bear with me. (Reviewing**
4 **document.) Yeah. If you go to 8, column 8, the**
5 **words preferably is used several times and so on and**
6 **so forth. So I believe that's why I used the term**
7 **preferred embodiment.**

8 Q And you state that "The preferred
9 embodiment of the '328 patent discloses a system
10 having a separate 'color image capture system 250'
11 and 'light intensity sensor 280,'" right? And just
12 to be clear, I read that from paragraph 83 of your
13 declaration.

14 A **Yes. This is what I stated.**

15 Q Claim 9 of the '328 patent does not
16 actually recite a color image capture system, does
17 it?

18 A **Let me refresh my memory. Is there an**
19 **opinion in my declaration?**

20 Q About claim 9 of the '328 patent?

21 A **Yeah. Is there a specific part in my**
22 **declaration that refers to claim 9?**

23 Q The section that we're in is talking about
24 claim 9.

25 A **We are in the spec language.**

1 Q This is in the claim construction section
2 involving a term --

3 A Yeah.

4 Q -- that is from claim 9.

5 A Give me a minute to -- yes. In paragraph
6 80 of my declaration I'm saying "Similarly in my
7 opinion a POSITA reading the text of claim 9 would
8 immediately envisage that the claims require a
9 computer configured to perform separate steps in a
10 particular sequence."

11 Q So I wasn't asking about that. I was
12 asking you does claim 9 recite a color image capture
13 system?

14 A Let me check. Give me a minute to refresh
15 my memory. In the context of your question, no, but
16 what I did in this case for both in the claim
17 construction for both claim 1 and claim 9 I tried to
18 show that there are two steps -- there is a two-step
19 process which involves an object detection and an
20 object recognition.

21 And in particular if you talk about
22 claim 9 I tried to basically address the claim
23 language, "a computer processing system operably
24 connected to the active light sensor and configured
25 to detect objects of interest within the field of

1 view and for each object of interest determine
2 whether the object of interest includes at least one
3 light intensity value associated with a reflective
4 surface of a road marker in the field of view and
5 analyze the at least one light intensity value to
6 determine an assessment of a discrete location of the
7 road marker within the field of view."

8 Q Objection, nonresponsive, everything after
9 in the context of your question, no.

10 Dr. Nikos, I ask that you just stick to
11 answering my questions. Is that okay?

12 A Sure. I tried to give you the context of
13 this paragraph.

14 Q Right. I was really just asking about
15 what is recited in claim 9. I'm not asking about
16 that paragraph.

17 A I just read you the paragraph -- the
18 claim~9.

19 Q I wasn't talking about the paragraph in
20 your declaration. I was talking about claim~9 in the
21 '328 patent.

22 A With all due respect I read you the
23 claim~9 and what was my focus regarding the claim
24 construction.

25 Q So in claim~9 the computer processor -- or

1 sorry. Let me start over.

2 In claim~9 it says that the computer
3 processing system is operably connected to the active
4 light sensor, but it does not specify that it's
5 operatively connected to anything else, right?

6 **A In the context of what the claim~9 states,**
7 **yes.**

8 Q So claim~9 does not require an image
9 capture system, right?

10 **A Can you please repeat the question?**

11 Q Claim 9 does not require an image capture
12 system, right?

13 **A I disagree because the POSITA will have**
14 **looked at the light sensor that measures a plurality**
15 **of light intensity values within a field of view**
16 **which includes at least a portion of a light sensor.**
17 **It's an imaging system. And we have to see that this**
18 **works with the next term in the claim, a computer**
19 **processing system operably connected to the active**
20 **light sensor and configured to detect objects of**
21 **interest within the field of view and each object of**
22 **interest.**

23 **So a POSITA will have read an imaging**
24 **sensor.**

25 Q In your declaration you referred to the

1 '328 patent disclosing an image capture system and a
2 separate light sensor, right?

3 MR. SAUNDERS: Objection, form.

4 A Are you -- to which paragraph are you
5 referring to?

6 BY MR. HIGH:

7 Q Paragraph 83. First sentence.

8 A As a preferred embodiment, yes.

9 Q And claim 1 recites both an image capture
10 system and a separate light intensity sensor, right?

11 MR. SAUNDERS: Objection, form.

12 A Let me read. Claim 1 recites "an image
13 capture system that captures images within a field of
14 view along the roadway, an active light sensor," but
15 here is the distinction. "A light sensor that
16 measures light intensity values within at least a
17 portion," where if you go to claim~9, "a light sensor
18 that measures a plurality of light intensity values."

19 So, again, I want to emphasize that this
20 analysis is part of the claim construction with
21 respect to claim 1 and claim 9 for the computer
22 processing system operably connected, a computer --
23 claim 1 says "a computer processing system operably
24 connected to the image capture system and the active
25 light sensor and configured to detect objects of

1 interest within the field of view and for each object
2 of interest determine whether the object of interest
3 includes a reflective surface."

4 The second one, claim~9 it says "a
5 computer processing system operably connected to the
6 active light sensor and configured to detect objects
7 of interest within the field of view and for each
8 object of interest determine whether." I'm trying
9 again to emphasize that there are two separate steps,
10 the object detection, step number one, and the object
11 recognition, step number two.

12 BY MR. HIGH:

13 Q So in claim 1 it specifies that the
14 computer processing system is operably connected to
15 the image capture system and the active light sensor,
16 right?

17 A Yes.

18 Q And the active light sensor includes a
19 light sensor that measures light intensity values?

20 A In claim 1, yes.

21 Q And so in claim 1 the computer processing
22 system is operably connected to two different things,
23 one, an image capture system, and two, an active
24 light sensor?

25 A The claim language states that the

1 **automated system comprising an image capture system**
2 **and an active light sensor. I think if you go to**
3 **figure 3 of the '328, some of these elements are**
4 **quite clear.**

5 Q So claim 1 requires the computer
6 processing system to be operably connected to both,
7 right? Both the image capture system and the active
8 light sensor, right?

9 A **Can you please repeat?**

10 Q Claim 1 requires that the computer
11 processing system be operably connected to both the
12 image capture system and the active light sensor,
13 right?

14 A **Just let me go there again. You are**
15 **referring to claim 1, right?**

16 Q Yes.

17 A **Claim 1 states the automated system**
18 **comprising an image capture system, an active light**
19 **sensor including a light source and a light sensor**
20 **And a computer processing system.**

21 Q So claim 1 requires that the computer
22 processing system be operably connected to both the
23 image capture system and the active light sensor,
24 right?

25 A **As it's stated, that's correct, because**

1 **there's an end.**

2 Q Claim 1 does not specify how the computer
3 processing system uses the images that the image
4 capture system captures, right?

5 MR. SAUNDERS: Objection, form.

6 **A Can you please repeat the question?**

7 BY MR. HIGH:

8 Q Claim 1 does not specify how the computer
9 processing system uses the images that the image
10 capture system captures, right?

11 MR. SAUNDERS: Same objection.

12 **A I disagree because I think there is not**
13 **only the terms in a claim language, but I think there**
14 **is enough in the specs to show, to support, that the**
15 **computer processing system is configured to detect**
16 **based on the sensor information to detect objects of**
17 **interest within the field of view, step number one,**
18 **and for each object of interest -- and I want to**
19 **underline each object of interest -- determine**
20 **whether the object of interest includes a reflective**
21 **surface based on the light intensity values,**
22 **determine whether the reflective surface is a road**
23 **marker based on an assessment of the reflective**
24 **surface.**

25 **And I think figure 3 explains this in**

1 **further detail in the spec.**

2 BY MR. HIGH:

3 Q The word images or image doesn't appear in
4 claim 1 after the words configured to, right?

5 A **The words per se, no, but all the**
6 **description in the claim and in the spec talks about**
7 **object detection and object recognition which are --**
8 **in 2001 a POSITA will recognize this to be**
9 **fundamental, important operations for computer vision**
10 **and image processing.**

11 Q Claim 1 doesn't say you have to use the
12 images from the image capture system to detect
13 objects of interest, does it?

14 A **I disagree. I think it's actually anyone**
15 **who will read "detect objects of interest within the**
16 **field of view" and for each object of interest will**
17 **look at this as a computer vision or image processing**
18 **operation.**

19 Q Okay. So you read "detect objects of
20 interest within the field of view" to require
21 detecting objects of interest within the field of
22 view using the images captured from the image capture
23 system?

24 A **Let me go to my declaration. Do you see**
25 **paragraph 8 of my declaration?**

1 Q Paragraph 8?

2 A Sorry. 8-0. 80.

3 Q Yes.

4 A So "Similarly in my opinion a POSITA
5 reading the text of claim~9 will immediately envisage
6 that the claims require a computer configured to
7 perform separate steps in a particular sequence. In
8 particular claim~9 recites 'detect objects of
9 interest within the field of view and for each object
10 of interest' followed by 'determine' and 'analyze'
11 steps, the first of which recites 'determine whether
12 the object of interest includes.'"

13 "Like claim~1, claim~9's recitation of two
14 different acts (detect and determine) and the
15 reference of the result of the first step (object of
16 interest) as the object of analysis in the second
17 step will immediately indicate to a POSITA a specific
18 step of object detection followed by a separate step
19 of determination performed on one of the previously
20 detected objects."

21 "Indeed" -- and I explain -- "in the field
22 of computer vision it is well understood that object
23 of detection is distinct from objects of
24 recognition."

25 And then in paragraph 82 I say "My

1 interpretation of this limitations is also consistent
2 with the specification of the '328 patent. In
3 particular the '328 patent recites that 'A computer
4 processor 450 identifies an object of interest 460 in
5 a portion of the intensity frame 420 and determines
6 the object of interest," and I continue saying
7 "generated by the color image capture system 250 in
8 the manner as taught by U.S. Patent Number 6,266,442.
9 Alternatively other techniques known in the art for
10 isolating an object of interest in a videostream can
11 be used."

12 And then I'm incorporating -- this is '328
13 patent, column 8, rows 31 to 40. And then I'm saying
14 "U.S. Patent 6,266,442 in turn describes 'Thus the
15 present invention transforms frames of digital video
16 depicting roadside scenes using a set of filters that
17 are logically combined together'" and continues and
18 says -- and I have in boldface -- "'Frequency and
19 spatial domain transformation, edge domain
20 transformation (Hough space), color transformation
21 typically from a 24-bit RGB color space to either
22 L*u*v* or LCH color space (using either fuzzy color
23 set tuning or neural network tuning for objects
24 displaying a differentiable color set) in addition to
25 morphology."

1 And it continues to say "is used to
2 determine whether an area of interest that contains
3 an object is actually a road sign. The aspect ratio
4 and size of a potential object of interest." This is
5 Exhibit 2030 at column 5, 10 to 26.

6 "Notably these techniques, particularly
7 various transformations including Hough
8 transformations, are techniques used in the field of
9 computer vision for object detection in an image.
10 They are a forms of object detection and are very
11 much unlike the types of determinations recited in
12 the 'determine' steps in claim 1 which are
13 determining properties of an already identified
14 object."

15 So I'm looking at the spec -- sorry to
16 interrupt. I'm looking at the spec in order to
17 justify the claim construction that I outline in
18 these paragraphs.

19 Q So in the portions of the claim language
20 that you quoted in those paragraphs you just read, it
21 doesn't say anything about doing the object detection
22 using the image capture system, right?

23 MR. SAUNDERS: Objection, form.

24 A It says -- if you look at 82, it says in
25 column -- I'm reciting what is in the '328 patent,

1 column 8, 31 to 40, "A computer processor identifies
2 an object of interest 460 in a portion of the
3 intensity frame 420 and determines the object of
4 interest attributes associated with that object of
5 interest." So it uses the term intensity frame.
6 "Preferably the objects of interest are identified
7 from the digital imagery stream." Preferably.

8 BY MR. HIGH:

9 Q Okay. So it's only preferably. It's not
10 required to identify the objects of interest from the
11 digital imagery stream generated by the color image
12 capture system, right?

13 A In this embodiment it states -- it uses
14 the word preferably.

15 MR. SAUNDERS: Are we about time to take a
16 break, Counsel?

17 A May I add something here which I think is
18 important in there is -- at the end of row 40 there
19 is also the "Alternatively other techniques known in
20 the art for isolating an object of interest can be
21 used."

22 MR. HIGH: Okay. That's a good time to
23 stop and take a break.

24 MR. SAUNDERS: Let's go off the record.

25 (Recess from 10:36 a.m. to 10:47 a.m.)

1 CST.)

2 BY MR. HIGH:

3 Q Before the break we were still looking at
4 paragraph 83.

5 A Let me go there. Just one minute.

6 Q Sure.

7 A Yes. I'm there.

8 Q Okay. So at the bottom of page 39 going
9 on to page 40 you include in your declaration a
10 sentence that says "In particular after an object of
11 interest is identified from the image data from the
12 'color image capture system 250' the 'computer
13 processor 450 correlates the portion of an image
14 frame from the digital imagery stream 290 with a
15 similar portion of the intensity frame 420 containing
16 the object of interest 460."

17 Do you see that?

18 A Yes.

19 Q So in that sentence the image frame comes
20 from the color image capture system, right?

21 A Yes.

22 Q And the intensity frame 420 comes from the
23 light intensity sensor 280, right?

24 A Which one -- can you please repeat?

25 Q The intensity frame 420 in that sentence

1 comes from the light intensity sensor 280, right?

2 **A Yes.**

3 **Q** And for that sentence you cite the '328
4 patent at column 8, lines 40 to 43. Do you want to
5 turn to that?

6 **A Do you want me to go to the patent?**

7 **Q** Yes.

8 **A Sure. Yes. I'm there.**

9 **Q** And that sentence that you're quoting, it
10 begins with the word preferably, right?

11 **A Yes.**

12 **Q** So that correlation between the image
13 frame and the intensity frame is preferred but not
14 required, right?

15 **A Yes. We have to also read one sentence**
16 **above which says "Alternatively other techniques**
17 **known in the art for isolating an object of interest**
18 **in a videostream can be used. Preferably a computer**
19 **processor."**

20 **Q** Right, so the computer processor
21 preferably correlates the two frames, but doesn't
22 have to, right?

23 **A Yeah. There are -- as stated here there**
24 **are other ways as well.**

25 **Q** Then going back to your declaration,

1 paragraph 83 --

2 **A Yes.**

3 **Q -- your next sentence starts however and**
4 **it says "However, 'Since most of the objects in the**
5 **scene are not reflective and due to the high setting**
6 **of the threshold range and the light intensity sensor**
7 **280 the reflected light intensity frames 420 will**
8 **actually show very few objects." Do you see that?**

9 **A Yes. This is from the spec at the column**
10 **10, 65 till column 11, line 1.**

11 **Q Not every light intensity value in the**
12 **light intensity frame will be from a reflective**
13 **object, right?**

14 **A Probably. It depends on the setting and**
15 **it depends on the environment and the constraints**
16 **that you have in the environment.**

17 **Q The light intensity frame might pick up**
18 **headlights from an oncoming car, for example?**

19 **A I need to speculate because you know**
20 **headlights come in all different shapes and forms.**
21 **Some of them are so dim, especially if we're talking**
22 **about an older car. Some may have missing or open**
23 **bulbs.**

24 **Q But there are at least some instances**
25 **where headlights might appear in a light intensity**

1 frame?

2 **A It's a possibility.**

3 Q Same thing with streetlights, for example?

4 Streetlights might appear in a light intensity frame?

5 **A It's a more remote possibility because**
6 **streetlights generally are dim and they have a**
7 **different geometry with respect to the car and the**
8 **sensors in the car.**

9 Q But it's still a possibility?

10 **A I would say it's a remote possibility.**
11 **Did I answer your question?**

12 Q I think so. So just to clarify I
13 understood correctly, you said it's a more
14 possibility?

15 **A It's a remote possibility.**

16 Q Remote possibility?

17 **A Yeah.**

18 Q Okay.

19 **A Or something that is less likely to**
20 **happen.**

21 Q Okay. It still that might happen but it's
22 less likely than headlights?

23 **A Yeah.**

24 Q Let's take a look at Gallagher now.

25 **A Do you want me to go to the Gallagher**

1 **paragraphs in my declaration or to Gallagher itself?**

2 Q Let's go to Gallagher itself. And that's
3 Exhibit 1005.

4 A **Give me a minute. I'm there.**

5 Q Gallagher discloses a vehicle that
6 measures the reflectivity of reflective road
7 markings, right?

8 A **I will answer -- because the answer is a
9 bit more specific I will read the first two sentences
10 from its abstract. "This invention relates to
11 reflectivity measuring apparatus. This invention
12 provides reflectivity measuring apparatus for
13 assessing the integrity of road markings including a
14 light source, a light sensor and a processing means."**

15 Q And the reflectivity measuring apparatus
16 in Gallagher is disclosed as being mounted on a
17 vehicle, right?

18 A **As the abstract states, yes.**

19 Q And then the vehicle is designed to drive
20 along a roadway with the reflectivity measuring
21 apparatus, right?

22 A **As stated in the abstract, yes.**

23 Q And as the vehicle drives along the
24 roadway the reflectivity measuring apparatus attached
25 to the vehicle measures the reflectivity of

1 reflective road markings, right?

2 **A Again, I want to emphasize that its**
3 **objective is to find the integrity of road markings.**
4 **In other words, do I have one, is it functional, is**
5 **it missing, is there a part missing based on the spec**
6 **of Gallagher.**

7 **Q So do you disagree with my question?**

8 MR. SAUNDERS: Objection, form.

9 **A I just tried to be very specific in my**
10 **answer based on the record of Gallagher. Sorry to**
11 **interrupt you.**

12 BY MR. HIGH:

13 **Q Yeah. So I just want to clarify, just to**
14 **make sure I'm understanding your reading of**
15 **Gallagher. So in Gallagher the vehicle drives along**
16 **the road, it's got the reflectivity measuring**
17 **apparatus attached to it. And as it drives along the**
18 **road it measures the reflectivity of road markers**
19 **along the road, right?**

20 **A It measures some reflectivity and then has**
21 **an algorithm of exclusion to say, okay, am I missing**
22 **something, am I missing a road marker or a road**
23 **marker may not -- because it's a system as stated in**
24 **the abstract to assess the integrity of road**
25 **markings.**

1 Q So part of that includes measuring the
2 reflectivity of the road markings, right?

3 A **As stated here, yes.**

4 Q And then after you measure the
5 reflectivity of the road markings you can compare the
6 reflectivity to the minimum required reflectivity for
7 that road marking, right?

8 A **But it includes several other steps. For**
9 **example, a calibration factor and then there is a**
10 **thresholding operation which takes place.**

11 Q Right. I'm not asking about other steps.
12 I was just asking about that ultimate step of -- you
13 know, you're pointing to the assessing the integrity.
14 It does that by measuring reflectivity and comparing
15 it to the required reflectivity as set by the
16 standard, right?

17 A **A standard that Gallagher defines through**
18 **several other steps as depicted in figure 4 of**
19 **Gallagher.**

20 Q Well, the standard it's compared to
21 ultimately to determine whether it's a good marker or
22 not is a standard set by the road authority, right?

23 A **That's correct.**

24 Q Let's turn to paragraph 2 of Gallagher.

25 A **Give me a minute. I'm there.**

1 Q This paragraph says that "Reflective road
2 markings are extensively used to demarcate vehicle
3 lanes and supply vital information to drivers about
4 sections of road," right?

5 A **That's correct, in paragraph 2.**

6 Q So one example is that reflective road
7 markings are designed to reflect a vehicle's
8 headlights back to the driver, right?

9 A **As stated in paragraph 2, yes.**

10 Q This paragraph says that "Road markings
11 include colored lines of varying compositions and
12 markers such as raised pavement markers," right?

13 A **That's correct, in paragraph 2.**

14 Q So if you're driving along a road both the
15 painted lines that form the boundaries of the lane
16 can be retroreflective? I'm sorry. Let me say that
17 again.

18 So if you're driving along a road, the
19 painted lines that form the boundaries of the lanes
20 can be retroreflective?

21 A **Yes.**

22 Q And the raised pavement markers along that
23 same boundary of the lanes can also be
24 retroreflective, right?

25 A **Yeah. Having this -- you know, these**

1 **grooves on the pavement as you cross them you may get**
2 **an audible signal from your tires going over them**
3 **among other things.**

4 Q Is that what you understand a raised
5 pavement marker to refer to, the grooves in a lane?

6 A **No, no. I just said that all these along**
7 **the grooves are just things to improve the road**
8 **safety as stated in the end of paragraph 2.**

9 Q Why is maintaining the reflectivity of the
10 road markings an important aspect of road safety?

11 A **Because you may have many more accidents**
12 **of vehicles getting off the road.**

13 Q Paragraph 3 says that "Road markings and
14 in particular raised pavement markers are
15 periodically tested to ensure they continue to meet
16 minimum standards of reflectivity/retroreflectivity."
17 Do you see that?

18 A **That's correct, as stated in paragraph 3.**

19 Q Why is it important to periodically test
20 the road markings?

21 A **In a state like Minnesota a snow plow may**
22 **destroy them.**

23 Q If the road markings get dirty will that
24 deteriorate their reflectivity?

25 A **Yes, possibly. It depends on how the dirt**

1 **is distributed.**

2 Q This paragraph refers to road authorities
3 stipulating a minimum acceptable reflectance value
4 for a raised pavement marker. Do you see that?

5 A **That's correct.**

6 Q Around the time of the priority date for
7 the '328 patent ASTM was one of the authorities that
8 provided a minimum acceptable reflectance value for
9 raised pavement markers; is that right?

10 A **I don't know for a fact, but they were**
11 **responsible for a lot of standards. It should be**
12 **noted, however, many states including California and**
13 **Minnesota may have their own requirements and**
14 **guidelines.**

15 Q So each road authority could specify a
16 different required minimum reflectivity for their
17 road markings?

18 A **If my memory serves me well at that time,**
19 **for example, California I believe was far stricter.**

20 Q And at least some of the road authorities
21 specified different minimum acceptable values for the
22 road markings depending upon the color of the road
23 marking, right?

24 A **The reflectivity, if you look at**
25 **retroreflectivity the properties associated with what**

1 we call the luminance. So color is one part but
2 basically the luminance is how the driver perceives
3 the light that is coming from the surface.

4 Q The standard values for those minimum
5 reflectivities set by the road authorities, they
6 often specified different values depending upon the
7 color of the road marker, right?

8 A It's a possibility, yes.

9 Q Do road authorities -- sorry. Or I guess
10 did road authorities at that time specify different
11 minimum acceptable reflectance levels for painted
12 lines and raised pavement markers?

13 A It will be speculation on my part. It
14 seems knowing the history and some of the work I know
15 of at the Minnesota Department of Transportation this
16 may be true. But I'm more familiar with some of the
17 rules of the DOT for the State of Minnesota.

18 Q Do you know whether the DOT for the State
19 of Minnesota specifies different minimum levels for
20 painted lines versus raised pavement markers?

21 A Now or then?

22 Q Either.

23 A Then I recall we did a vehicle-following
24 experiment in 1997. And I recall that we
25 capitalize -- you see, Minnesota is different because

1 **the snow may affect the appearance of these markers.**
2 **So I recall there were -- they have different rules**
3 **for the metro, if my memory serves me well, different**
4 **rules for rural areas.**

5 Q And then paragraph 5 of Gallagher towards
6 the end there it's talking about -- or I guess at the
7 beginning in paragraph 5 of Gallagher it says that
8 "The raised pavement markers are generally secured to
9 the center line or to lines separating lanes and have
10 two highly reflective surfaces to reflect light from
11 a vehicle's headlights back to its driver." Do you
12 see that?

13 A **I see the first sentence of paragraph 5.**

14 Q So let's take a look at figure 2 of
15 Gallagher.

16 A **Let me go there. Yes.**

17 Q In this figure the vehicle is labeled as
18 3, right?

19 A **Yeah. Let me go to the paragraph, if you**
20 **don't mind. Let me go to the paragraph that**
21 **describes. So paragraph 27 says "Figure 3**
22 **illustrates a top view of the reflectivity measuring**
23 **apparatus of figure 1." Yes.**

24 Q And the vehicle is labeled as 3, right?

25 A **That's correct.**

1 Q Area A refers to the test area for the
2 reflectivity measuring apparatus, right?

3 A Yeah. Let me find where the area A --
4 bear with me. Yeah. Paragraph 35 Gallagher says --
5 it says "The light source 4 is of relatively constant
6 and even intensity when a wide beam is projected
7 about 2.3 meters from a platform or unit 5 located at
8 the front of the vehicle 3 to cover a three meter by
9 0.5 meter area. Area A defines the test area for the
10 apparatus 1."

11 Q So looking at figure 2 the object that's
12 labeled 2 is a raised pavement marker, right?

13 A It says from the marker 2.

14 Q Yeah. So the object labeled 2 is a raised
15 pavement marker, right?

16 A He used the term marker, so --

17 Q So if you look at paragraph 33 --

18 A Yeah. Yes. Let me go there.

19 Q Do you see the sentence that says "For
20 simplicity"? It says "For simplicity the description
21 of the preferred embodiment of the invention will be
22 limited to raised pavement markers 2 (referred to
23 herein as markers)"?

24 A That's correct. Yes.

25 Q So the object in figure 2 that's labeled

1 as number 2 is a raised pavement, right?

2 **A According what you read, yes.**

3 **Q** And the -- to the left of that raised
4 pavement marker there are two lines. Do you see
5 that?

6 **A Yes.**

7 **Q** Those represent broken lines separating
8 the lanes, right?

9 **A There is no description. One could**
10 **speculate.**

11 **Q** Would that be your understanding of
12 figure 2 from looking at this picture?

13 **A Yeah. But something that is -- again, I**
14 **will expect this to be part of the lane marker. Do**
15 **you see what I mean? Item 2.**

16 **Q** Well, figure 2 shows the painted lines
17 separate from the raised pavement marker, right?

18 **A This is the way it depicts them.**

19 **Q** That's a relatively common way that roads
20 are instructed?

21 **A There are different ways based on the**
22 **standards we discussed. Let's say in Minnesota --**
23 **I'm trying to recall -- I think they are on the**
24 **markers, but I may be wrong.**

25 **Q** And at the very far left behind the two

1 lines there's another object that -- what you would
2 interpret as another raised pavement marker, right?

3 **A Possibly.**

4 **Q** It looks like basically the same as the
5 one that's labeled 2, right?

6 **A Yeah. It seems similar, although it's not**
7 **labeled.**

8 **Q** So at least along this road that the
9 vehicle 3 is driving along Gallagher's test area will
10 sometimes include a raised pavement marker and
11 sometimes include the painted lines separating the
12 lanes; is that right?

13 **A That's correct, but this depends if you**
14 **go -- it depends on the speed of the vehicle 5.**
15 **Sorry. Vehicle 3. And also it depends on the**
16 **placement of the whole system, which I believe --**
17 **give me a minute -- I believe is described -- give me**
18 **a minute to find it.**

19 **Also if you take a look at if you look at**
20 **paragraph 36 of Gallagher "The positioning of the**
21 **unit 5 is at a lower height than a normal vehicle**
22 **headlight to obtain the correct light source and**
23 **sensor angles. The incident angle between the angle**
24 **of the beam to road level is held constant over any**
25 **one test and is generally between 1 and 30 degrees,**

1 but preferably between about 13 and 17 degrees."

2 And it continues. I think there are a lot
3 of parameters that come into play. For example, you
4 may have just one chance of getting this particular
5 marker unless you go extremely slowly.

6 Q Wouldn't that also depend on your sampling
7 rate?

8 A This is another factor.

9 Q So in figure 2 your vehicle 3, would you
10 agree that the direction of motion is to the right
11 from the perspective of the figure?

12 A Let me go back. Given the description of
13 the vehicle and the placement of the sensor, and this
14 is a top view, I think this is a correct
15 characterization.

16 Q Okay. So assuming that vehicle has been
17 driving parallel to that lane boundary, that test
18 area A will have already traveled over the raised
19 pavement marker to the far left and then the two
20 painted lines in the middle, right?

21 A So can you repeat the question --

22 Q Sure.

23 A -- to make sure that I --

24 Q So assuming that the vehicle has been
25 driving parallel to that lane boundary in figure 2,

1 the test area A depicted in figure 2 will have
2 already traveled over the raised pavement marker to
3 the far left and then the two painted lines in the
4 middle, right?

5 **A That's correct under these assumptions**
6 **that we discussed earlier.**

7 **Q** And Gallagher describes both the raised
8 pavement marker 2 and the painted lines as
9 potentially reflective, right?

10 **A Can you remind me, because I don't recall**
11 **where it says this about the lane markers? Do you**
12 **have a paragraph?**

13 **Q** Sure. I think we read it in paragraph 2
14 and then paragraph 33, I think, would be two places
15 that you could look.

16 **A If I read 2 it depends if you assume that**
17 **the light reflective -- yeah. I think you are right.**
18 **In paragraph 2 -- let me read the paragraph 33.**
19 **That's correct.**

20 **Q** Let's look at figure 5 now of Gallagher.

21 **A Figure 5?**

22 **Q** Yes.

23 **A** Yes.

24 **Q** Figure 5 is the diagram of the reflectance
25 levels of raised pavement markers along a stretch of

1 road, right?

2 **A Just give me a minute. Yes. According**
3 **paragraph 30 figure 5 illustrates a diagram of the**
4 **reflectance levels of a number of road markings on a**
5 **stretch of a road.**

6 Q The X-axis in this figure refers to the
7 distance from the starting point of the test, right?

8 **A Let me go back. Yes. It's measuring**
9 **kilometers.**

10 Q And B along the Y-axis refers to the
11 minimum acceptable reflectance level for the raised
12 pavement markers being tested, right?

13 **A Let me check. Can you point me where it**
14 **defines B?**

15 Q Paragraph 79.

16 **A Thank you. The last sentence. Thank you.**
17 **Yeah.**

18 Q And along that Y-axis you've got -- the
19 positive values refer to the reflectance levels of
20 the front face of the road marker, right?

21 **A That's correct.**

22 Q And then the negative values refer to the
23 reflectance levels of the rear face of the road
24 marker?

25 **A That's correct.**

1 Q So just looking at figure 5 this figure is
2 depiction some reflectance levels as above the
3 minimum acceptable reflectance levels and some
4 reflectance levels as below the minimum acceptable
5 reflectance levels?

6 A Yes. And I think I have a whole
7 description in my declaration about this. I don't
8 know -- may I go there? Because I think I explain --

9 Q You can go there if you need to, but I
10 don't think I'm asking you what you said in your
11 declaration right now. I'm just asking you about
12 what figure 5 is disclosing.

13 A Yeah. Let me see if I have mention of
14 figure 5 in my declaration.

15 Q Okay. To be clear I'm not asking you to
16 read into the record what you said in your
17 declaration, but if you need to review your
18 declaration to refresh what you said to answer my
19 question, that's fine. Do you understand?

20 A Yes, I understand. It's just that I -- if
21 you go to paragraph 108 I'm analyzing figure 5 and I
22 say "Indeed this is shown in Gallagher's figure 5
23 which provides the data output of Gallagher and which
24 merely shows the 'location of each marker' as a
25 'distance traveled in kilometers from the start point

1 in the test run.' Thus Gallagher does not disclose
2 or suggest 'an assessment of a discrete location of
3 the road marker within the field of view.' Moreover,
4 even Gallagher did (it does not) Gallagher certainly
5 does not disclose making the assessment of the
6 location within the field of view based on an
7 intensity value."

8 MR. HIGH: Objection, move to strike.

9 MR. SAUNDERS: Please let the witness
10 finish his answer before you have your objection.

11 MR. HIGH: I thought he was done.

12 A Sorry. I just want to say I have
13 extensive analysis in certain parts of my declaration
14 about the importance of figure 5 in forming my
15 opinion. And this is one of the opinions. That's
16 why since we are talking about what is the X-axis I'm
17 saying that this is basically what the POSITA will
18 understand but doesn't disclose an assessment of the
19 discrete location of the road marker within the field
20 of view.

21 MR. HIGH: Objection, nonresponsive. Move
22 to strike.

23 BY MR. HIGH:

24 Q Dr. Nikos, I ask that you please only
25 answer my questions. Okay?

1 **A I tried to answer your question.**

2 Q So what -- in figure 5 what units does
3 Gallagher use for comparing the reflectance level of
4 the raised pavement marker to the minimum acceptable
5 reflectance level?

6 **A According to 79 the Y component represents**
7 **the reflectance levels of the front face of each**
8 **marker 2 in millicandela units.**

9 Q Millicandela per lux?

10 **A Per lux.**

11 Q Is that units of retroreflectivity?

12 **A Yes, they are.**

13 Q Doesn't reflectivity have an area
14 component to it?

15 MR. SAUNDERS: Objection, form.

16 **A If you look at lux, the definition is**
17 **lumen over area.**

18 BY MR. HIGH:

19 Q Right. But retroreflectivity is candelas
20 per lux per meter squared, right?

21 **A Can you repeat?**

22 Q Retroreflectivity is candelas per lux per
23 meter squared, right?

24 **A Yeah. I mean, you can do some**
25 **mathematical calculations there, but the area is**

1 **there.**

2 Q Figure 5 isn't depicting the reflectance
3 levels of any reflective painted lines, is it?

4 A **Give me some time to read the -- the**
5 **carrying outed paragraph 30, no. Or basically it**
6 **depends on how it defines -- if you look at paragraph**
7 **30 of Gallagher it says "Figure 5 illustrates a**
8 **diagram of reflectance levels of a number of road**
9 **markings on a stretch of a road."**

10 Q So if you look at paragraph 79 --

11 A **Yes. Let me go there. Yes. It says "The**
12 **X component represents the location of each marker 2**
13 **and the distance traveled in kilometers from the**
14 **start point in the test run."**

15 Q So marker 2 is refers to raised pavement
16 markers, right?

17 A **For simplicity as stated earlier.**

18 Q Yes. Put Gallagher aside for now and
19 let's look at Schofield.

20 A **Sorry. I didn't hear you.**

21 Q I said we can put Gallagher aside for now.

22 A **Sure. Do you want me to close it or do**
23 **you want me to just open Schofield as well?**

24 Q It's up to you.

25 MR. SAUNDERS: If we're going to kind of a

1 natural transition point maybe this makes sense for
2 doing the next break?

3 MR. HIGH: That's fine.

4 MR. SAUNDERS: Okay. Let's go off the
5 record.

6 (Recess from 11:36 a.m. to 11:46 a.m.
7 CST.)

8 BY MR. HIGH:

9 Q So let's turn to Schofield now, which is
10 Exhibit 1006.

11 A Give me a minute to open it. I'm there.

12 Q And you reviewed this in preparation of
13 your declaration, right?

14 A That's correct.

15 Q Let's turn to column 10.

16 A Give me a minute. Where in column 10 do
17 you want me to go?

18 Q And if you want to take a moment and just
19 read to yourself the paragraph at the very bottom
20 that starts at line 66, "pattern recognition may be
21 used," and just read the rest of that paragraph
22 through the top of column 11 and let me know when
23 you're done.

24 A Sure. Give me one minute. (Reviewing
25 document.) Yes. I'm ready.

1 Q Okay. So this paragraph says that
2 "Pattern recognition may be used to further assist in
3 the detection of headlights, taillights and other
4 objects of interest," right?

5 A **That's correct.**

6 Q And one of the examples that it gives is
7 in the context of headlights you can use the fact
8 that headlights and taillights usually occur in pairs
9 to decide whether or not a light source detected is
10 headlights or taillights or something else, right?

11 A **As an example it says "The fact that**
12 **headlights and taillights usually occur in pairs**
13 **could be used to assist in qualifying or**
14 **disqualifying objects as headlights and taillights."**

15 Q Right. So in that context Schofield is
16 talking about detecting objects and then looking for
17 patterns to try and decide whether those objects are
18 headlights or whether they're something else, right?

19 A **It gives a general description without**
20 **disclosing details that in his point dissection**
21 **because the way that it detects the headlights and**
22 **taillights it suggests without giving any details**
23 **that pattern recognition may be used in order to**
24 **disregard, for example, a flashlight which may be**
25 **close to a head lights and so on and so forth.**

1 Q Well, this paragraph says "qualify or
2 disqualify objects as headlights and taillights,"
3 right?

4 A **In the particular context of exclusionary,
5 limited to this point detection.**

6 Q So qualify would be affirmatively using
7 pattern recognition to decide that it is what you're
8 looking for, right?

9 A **Unfortunately computer vision and
10 generally in processing of -- in signal processing
11 there is nothing like affirmative. You may have
12 higher confidence or lower confidence. And, again,
13 it's very important it gives a general statement
14 about pattern recognition which is limited to point
15 detection; in other words, headlights and taillights.**

16 **So if we have let's say some noise or if
17 we have a model of the object it can filter erroneous
18 points that are detected or possibly may be detected.
19 And I have a whole paragraph in my declaration, set
20 of paragraphs, where I believe there is not
21 sufficient disclosure and also it doesn't meet, for
22 example, the 1A claim.**

23 Q Okay. So I'm not asking about the claims
24 right now. I'm just asking what Schofield is
25 disclosing. So Schofield, it says in that first

1 sentence, "headlights," taillights and other objects
2 of interest, right?

3 **A That's correct.**

4 Q So it's not just limited to headlights and
5 taillights, right?

6 **A Yeah. But it doesn't provide information**
7 **what are these other objects of interest or how it**
8 **does it.**

9 Q Well, in column 12 it talks about
10 utilizing the invention "to identify particular
11 traffic signs by their spectral signature as well as
12 their geometric organization," right?

13 **A It's correct but spectral signature is not**
14 **I would say -- I wouldn't characterize this as --**
15 **it's one of the features we can extract from the**
16 **signal processing as part of a filtering operation or**
17 **as part of a signal processing operation. But I**
18 **wouldn't say that this is the pattern recognition**
19 **that it basically refers to.**

20 Q Well, a pattern -- column 11, that very
21 first sentence line 1 says "Pattern recognition
22 identifies objects of interest based upon their
23 shape, reflectivity, luminance and spectral
24 characteristics." So in column 12 it's talking about
25 using shape and spectral characteristics, right?

1 A But general pattern recognition uses a
2 variety or a combination of these characteristics
3 that we call features, f-e-a-t-u-r-e-s, in order to
4 do this. So, for example, the spectral signature is
5 a very limited -- for example, a spectral signature,
6 it's a very limited signal processing. So in other
7 words it's just you process one dimensional data. It
8 is not basically the processing of two-dimensional or
9 three-dimensional data which is often done by pattern
10 recognition.

11 Q Well, the sentence that starts at column
12 12, line 3, it says "Red octogons may be identified
13 as stop signs, yellow triangles as caution signs and
14 the like." So Schofield is talking about using the
15 shape and color of an object to classify it as a road
16 sign in this situation, right?

17 A It's true. But the spectral signature is
18 the one that is important. Like, for example, it's
19 very important, if you say red octogons and red
20 triangles, it's not going to have -- it doesn't have
21 any disclosure on how it does that. So color of the
22 spectral signature is the differentiating component
23 in this processing.

24 And, again, I explain this in my report
25 and I can tell you the particular paragraph.

1 Q So you as a person of ordinary skill in
2 the art wouldn't know how to look for a red octogon
3 in an image?

4 MR. SAUNDERS: Objection, form.

5 A At that time? Now? I don't want to use
6 hindsight.

7 BY MR. HIGH:

8 Q I guess at this time when this was
9 published would you have known how to look for a red
10 octogon?

11 A Yeah. I would have used a variety of
12 features including the location. Think about a red
13 octogon. I would look if this object has an axis of
14 symmetry. I will look at the color of course. And I
15 will look on the placement. I wouldn't expect -- I
16 wouldn't expect the sign to appear in the middle of
17 the road.

18 So I will have used pattern recognition
19 based on all this information in order to make the
20 object -- to do the analysis of the object. But in
21 order to do the analysis of the object somehow we
22 need to detect it first and then comes the object
23 recognition. But I will have used all these
24 parameters.

25 So I think Schofield really mentions the

1 term first without disclosing any details and I think
2 by oversimplifying the problem, especially if one
3 considers the 2001 state of the art.

4 And something else I would like to
5 mention, if you look at Dr. Thorpe, I think I have a
6 statement that he said that doing -- moving at high
7 speeds at that time and doing analysis of traffic
8 signals and other things, it was extremely
9 challenging. And I have included -- so I think my
10 declaration contains a lot of elements regarding this
11 disclosure of Schofield.

12 Q But you agree that Schofield does disclose
13 using pattern recognition to detect objects of
14 interest, right?

15 A It uses the words pattern recognition but
16 I don't think there is any disclosure. First of all,
17 is this a valid use of the word pattern recognition.
18 There is no detail and the examples mentioned are
19 more one dimensional signal processing than pattern
20 recognition, as he says.

21 Q So you don't think that pattern
22 recognition includes objects of interest based upon
23 their shape, reflectivity, luminance and spectral
24 characteristics as giving details about pattern
25 recognition?

1 MR. SAUNDERS: Objection, form.

2 A I think -- what I'm saying is the
3 following. When there is a disclosure of pattern
4 recognition and it defines objects of interest based
5 upon their shape, reflectivity and luminance and
6 spectral characteristics, a POSITA will understand
7 that someone will look at all these features and make
8 the determination if this is a traffic sign or a road
9 sign or a road marker and so on and so forth.

10 It's not I will say predictable to use
11 just the spectral signature alone to do the object
12 determination that is required by the claims.

13 BY MR. HIGH:

14 Q So Schofield discloses using the spectral
15 signature in addition to the shape, reflectivity,
16 luminance and other features as well, right?

17 MR. SAUNDERS: Objection, form.

18 A He gives a very general statement on
19 column 12. He says "The invention may be utilized to
20 identify particular traffic signs by their spectral
21 signature." And since I think he understands that
22 spectral signature is not enough because we have many
23 red signals around, we may have many yellow signals
24 around, as well as their geometric organization. So
25 geometric organization is a very broad term. So

1 there is a question what are the models, what will be
2 the flowchart that he will have used in order to do
3 this.

4 And then he goes into a conclusory
5 statement as Dr. Thorpe has done in several of the
6 combinations and the statements that, "For example,
7 red octagons may be identified as stop signs, yellow
8 triangles as caution signs and the like."

9 But again, I think it's very important
10 there is no disclosure. Hindsight now we have a
11 better understanding and still we are struggling.
12 And I have a reference to a Tesla about the autopilot
13 system of Tesla and the problems and the lawsuits.
14 And this is 2021, I believe. Go back 20 years.
15 Imagine how challenging this will have been.

16 So a POSITA without -- with this
17 disclosure wouldn't have had now information to do
18 any of this stuff.

19 BY MR. HIGH:

20 Q Object detection doesn't have to be
21 perfect, does it?

22 MR. SAUNDERS: Objection, form.

23 A Based on my claim construction or in
24 general? I mean, based on -- are you accepting my
25 claim construction or do you want me to --

1 BY MR. HIGH:

2 Q I'm not sure what claim construction
3 you're referring to, but when it says detect objects
4 of interest, that's not requiring that it can't make
5 any errors ever, is it?

6 MR. SAUNDERS: Objection, form.

7 A You're asking me to speculate. I think
8 I -- for the object detection and the relationship
9 between object detection and object recognition I
10 express an opinion. Now, if you ask me at that time
11 errors were so omnipresent to the point that if you
12 look at the DARPA grand challenge in 2004 which
13 involved a lot of similar approaches, everybody
14 abandoned the race because pattern recognition was
15 not at the point that will do some of these tasks
16 that are hinted here.

17 BY MR. HIGH:

18 Q Schofield also discloses using temporal
19 processing, right?

20 A Can you point me where he says that?

21 Q It's paragraph you read at the very
22 bottom, column 11, line 9 or so. I guess a little
23 bit further up. Column 11, line 8.

24 A Line 8?

25 Q It says "Object recognition can be

1 enhanced by comparing identified objects over
2 successive frames. This temporal processing can
3 yield information on object motion and can be used to
4 assist in qualifying or disqualifying objects of
5 interest."

6 **A** And as a POSITA at that time I still have
7 a problem because still -- think of the discussion we
8 had about Gallagher. We said -- since we're talking
9 about combination of Gallagher and Schofield, if
10 Gallagher will show that this marker can be seen only
11 once probably at the speeds we are going. So how --
12 for example, given the computation resources and the
13 overall structure that we have, how can we have
14 enhancement if we don't have successive frames of the
15 same object?

16 **Q** Well, if you've got successive frames of
17 the same object you can figure out object motion.
18 That's what this is saying, right?

19 **A** So there are several statements here. If
20 you have -- there are several ifs. If you have and
21 even if you have if you ask me -- and this is
22 contained in my declaration. I have a paper I
23 believe in 2002 that has more than a thousand
24 citations why I explain that the temporal analysis in
25 order to do object detection and object recognition

1 can be extremely challenging.

2 So it's not only the "if" if you have
3 successive frames. Again, matching the features, the
4 structure, it's extremely challenging. And even
5 today, 20-plus years after, people are still
6 struggling with some of these issues.

7 Q So you agree that Schofield discloses
8 using pattern recognition to detect objects of
9 interest; you just disagree that at that time you
10 could detect objects of interest; is that right?

11 MR. SAUNDERS: Objection, form.

12 A What I said is actually pattern
13 recognition as a set of words appear in Schofield but
14 the spec is lacking. There is not disclosure and
15 context. Needless to say how, for example, this will
16 be combined with Gallagher, which is an array of
17 photodiodes to do whatever is contained in the
18 claims. This is where I have a problem. I mean, I
19 was a given the task of looking at the claims,
20 looking at the grounds of the petitioner and the
21 support provided by Dr. Thorpe.

22 And I think as I stated, for example, in
23 my -- for example, paragraph 114 of my declaration
24 I'm saying "In particular petitioner relies on the
25 'pattern recognition' teachings in Schofield in

1 **limitation 1A, but Schofield does not use 'pattern**
2 **recognition' to detect objects of interest or to make**
3 **a determination as to a reflective surface (indeed**
4 **Schofield does not mention measuring reflectivity or**
5 **any way of identifying a reflective nature among**
6 **various light sources)."**

7 **"But a POSITA would understand Schofield**
8 **as only disclosing pattern recognition as part of its**
9 **'spatial filtering' approach to identify that a**
10 **particular light source is one which may be ignored.**
11 **That is, to exclude already-detected light sources."**

12 BY MR. HIGH:

13 Q So Schofield at column 11, lines 1 to 3,
14 says that pattern recognition identifies objects
15 based on a number of things including reflectivity,
16 right? It uses those words?

17 A **Are you referring -- let me go.**

18 Q I didn't misread Schofield, did I?

19 A **Can you point me where it says that? I**
20 **missed it.**

21 Q Column 11, line 1 to 3. "Pattern
22 recognition identifies objects of interest based
23 upon," and it lists several things. One of them is
24 reflectivity, right?

25 A **That's correct, as a general statement**

1 **about what pattern recognition does.**

2 Q Yes. And then the next sentence that
3 starts at line 3 of column 11 says that "For example,
4 the fact that headlights and taillights usually occur
5 in pairs could be used to assist in qualifying or
6 disqualifying objects as headlights and taillights,"
7 right?

8 A **That's correct.**

9 Q So Schofield is saying you can use pattern
10 recognition to qualify objects as headlights and
11 taillights?

12 MR. SAUNDERS: Objection, form.

13 A **It doesn't say that. It says --**

14 BY MR. HIGH:

15 Q It says the word qualify, doesn't it?

16 MR. SAUNDERS: Let's the witness please
17 finish his answers.

18 A **Just to be accurate to the record and the**
19 **spec, it makes a general statement about pattern**
20 **recognition and it says, "For example, the fact that**
21 **headlights and taillights usually occur in pairs**
22 **could be used to assist in qualifying or**
23 **disqualifying objects as headlights and taillights."**
24 **So it states here that the fact that we have pairs in**
25 **general of headlights and taillights could be used.**

1 So a POSITA doesn't necessarily say that
2 this is pattern recognition or, moreover, I can use
3 point detection, pixel magnification or whatever in
4 order to say, okay, these are pairs or not. We call
5 this pattern recognition. This is not -- it's a very
6 nebulous and general statement.

7 BY MR. HIGH:

8 Q So even though the first sentence of
9 column 11 discusses what pattern recognition can
10 include and the second sentence starts for example
11 you don't think that second sentence is an example of
12 pattern recognition?

13 MR. SAUNDERS: Objection, form.

14 A It could be, but there is not enough
15 disclosure in order to know how -- for example, we
16 can detect pairs by using a symmetry axis. Is this
17 what it's doing or basically it's looking for the
18 pairs. Think about a car with the headlights on and
19 then there is a bicycle with a flashlight. Are we
20 going to say that we are going to disregard this
21 because we have three points of light?

22 So that's basically the problem that I
23 have. Saying that usually occur in pairs could be
24 used, it doesn't say how, it doesn't say how
25 predictable it is, and it just ties it to the

1 particular task which is headlights and taillights.

2 BY MR. HIGH:

3 Q So your dispute isn't that this is one way
4 to do object detection; your dispute is that you just
5 don't think it's a very accurate one?

6 MR. SAUNDERS: Objection, form.

7 A The accuracy statement is one -- is the
8 least of my worries. My worries in this -- in
9 Schofield and the combination with Gallagher is
10 actually we go from something that does some
11 thresholding -- it doesn't have anything about object
12 like the object detection and for each object
13 determine if this is a road sign -- to Schofield
14 which is interested in headlights and taillights.
15 And to add insult to the injury there is a claim of
16 pattern recognition but there's not further
17 disclosure of how this is done.

18 I mean, I have been detecting. The paper
19 that I published which is actually in my declaration,
20 I have worked on taillight detection at night in
21 order to track vehicles. I can tell you it's not --
22 and this paper was published in 2002, I believe. We
23 had such a tough time doing this. So in fact as a
24 POSITA I have a problem with the lack of disclosure
25 here.

1 MR. HIGH: All right. I'll pass the
2 witness.

3 MR. SAUNDERS: All right. Let's take ten
4 minutes or so and I'll see if I have any redirect.

5 MR. HIGH: Okay. Let's go off the record.

6 (Recess from 12:19 p.m. to 12:32 p.m.)

7 MR. SAUNDERS: I'll just say I have
8 nothing further for the witness. Does the court
9 reporter have any clarification we need from the
10 witness?

11 THE REPORTER: No. I think with the
12 exhibits I have everything I need.

13 MR. SAUNDERS: Okay. Great. All right.
14 Well, thank you everyone for your time.

15 MR. HIGH: Thank you. Thank you, Dr.
16 Nikos.

17 THE WITNESS: Thank you.

18 (Reading and signing reserved.)

19 (Whereupon, at 12:33 p.m. CST the remote
20 deposition concluded.)

21 * * * * *

22

23

24

25

1 REPORTER'S CERTIFICATE

2 STATE OF MINNESOTA)

3 COUNTY OF HENNEPIN)

4 ss.

5 I hereby certify that I reported the
6 remote deposition of Nikolaos Papanikolopoulos, Ph.D.
7 on September 3, 2025, in Bloomington, Minnesota, via
8 Veritext Virtual Videoconference, and that the
9 witness was by me first duly sworn to tell the whole
10 truth;

11 That the testimony was transcribed by me
12 and that this transcript is a true record of the
13 testimony of the witness;

14 That the cost of the original has been
15 charged to the party who noticed the deposition, and
16 that all parties who ordered copies have been charged
17 at the same rate for such copies;

18 That I am not a relative or employee or
19 attorney or counsel of any of the parties, or a
20 relative or employee of such attorney or counsel;

21 That I am not financially interested in
22 the action and have no contract with the parties,
23 attorneys, or persons with an interest in the action
24 that affects or has a substantial tendency to affect
25 my impartiality.

That the right to read and sign the
deposition by the witness was requested.

WITNESS MY HAND AND SEAL THIS 8th day of
September, 2025.

22
23 
24 **Jonathan Wonnell**

Notary Public, Hennepin County, Minnesota
My Commission expires January 31, 2027

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