1 UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD
2 CASE NO. IPR2023-01369
PATENT NO. 10,755,409
3
4
5 ALIGN TECHNOLOGY, INC.,
6 Petitioner,
7 vs.
8 DENTAL MONITORING SAS,
9 Patent Owner.
_____/
10
11
12 DEPOSITION OF
HASSAN FOROOSH, PhD
13
14 DAY
(Page 1 through 243)
15
16
May 17, 2024
17 9:04 a.m. - 4:59 p.m.
18
19
Celeste Hotel - Apollo Conference Room
20 4105 Alafaya Trail
Orlando, Florida 32826
21
22
23
Stenographically Reported By:
24 Tosha S. Seaney, RPR, CCR, GRL
25 REF: #SY009164

1 APPEARANCES:

2
On behalf of the Petitioner:
3

4 WILSON, SONSINI, GOODRICH & ROSATI
650 Page Mill Road
5 Palo Alto, California 94304-1050
650-493-9300
6 BY: MATTHEW A. ARGENTI, ESQUIRE
margenti@wsgr.com
7

8 WILSON, SONSINI, GOODRICH & ROSATI (Telephonically)
701 5th Avenue
9 Suite 5100
Seattle, Washington 98104
10 206-883-2500
BY: PATRICK MEDLEY, ESQUIRE
11 pmedley@wsgr.com

12
On behalf of the Patent Owner:
13

14 GIBSON, DUNN & CRUTCHER, LLP
3161 Michelson Drive
15 Suite 1200
Irvine, California 92612-4412
16 949-451-3926
BY: ANDREW BLYTHE, ESQUIRE
17 ablythe@gibsondunn.com

18
GIBSON, DUNN & CRUTCHER, LLP (Telephonically)
19 200 Park Avenue
New York, NY 10166
20 212-351-4000
BY: CHARLOTTE JACOBSEN, ESQUIRE
21 cjacobsen@gibsondunn.com

22

23

24

25

1 I N D E X

2 DESCRIPTION PAGE

3 WITNESS: HASSAN FOROOSH, PHD
Direct Examination by Mr. Blythe 4
4
Certificate of Oath 242
5 Certificate of Reporter 243
Acknowledgement of Witness 244
6 Errata Sheet 245

7

8 E X H I B I T S

9 (No exhibits were marked.)

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1 The following proceedings began at 9:04 a.m.:
2 THE STENOGRAPHER: Can I get you to raise
3 your right hand for me, please?
4 Do you solemnly swear or affirm the testimony
5 you are about to give in this cause will be the
6 truth, the whole truth, and nothing but the truth
7 so help you God?
8 THE WITNESS: I do.
9 THE STENOGRAPHER: Thank you, sir.
10 HASSAN FOROOSH, PHD,
11 having been first duly sworn or affirmed,
12 was examined and testified as follows:
13 DIRECT EXAMINATION
14 BY MR. BLYTHE:
15 Q. Good morning, Dr. Foroosh.
16 A. Good morning.
17 Q. Could you please state your full name for the
18 record?
19 A. Hassan Foroosh.
20 Q. Okay. Do you have any hard stops today on
21 your time?
22 A. I'm sorry, can you repeat the question?
23 Q. Do you have a hard stop day? Is there a
24 point where you'll need to depart?
25 A. No.

1 Q. Okay. You've been deposed before?
2 A. Yes.
3 Q. Approximately how many times?
4 A. Twice.
5 Q. Twice?
6 A. Yes.
7 Q. So you're probably familiar with this, but I
8 want to go over a few of the ground rules about how
9 the procedure's going to go. You understand that my
10 questions and your answers are being transcribed
11 today?
12 A. Yes.
13 Q. You understand that this transcript will be
14 submitted to the Patent Office, and that the Patent
15 Office may rely on this testimony?
16 A. Yes.
17 Q. Okay. You understand that you're under oath?
18 A. Yes.
19 Q. And obliged to tell the truth?
20 A. Yes.
21 Q. Is there anything that would prevent you from
22 testifying truthfully today?
23 A. No.
24 Q. You understand that your answers to my
25 question must be verbal so that the court reporter can

1 take them down?
2 A. Yes.
3 Q. So I'm going to do my best not to cut you
4 off. You're going to do your best for -- wait for me
5 to finish answering (sic) my questions; is that okay?
6 A. Yes.
7 Q. If I ever cut you off, and if you weren't
8 done answering, please just let me know, and --
9 otherwise, I will assume you were done answering the
10 question; is that okay?
11 A. Yes.
12 Q. Okay. Please also let me know if you want to
13 take a break at any point. We're going to try to take
14 them every so often, maybe every hour. So long as a
15 question isn't pending, we can pause, go off the
16 record. Does that work for you?
17 A. Sure.
18 Q. Okay. I also want to confirm, if you don't
19 understand one of my questions, you'll ask me to
20 clarify. And I can otherwise assume that you
21 understood my question; is that fair?
22 A. Yes.
23 Q. Okay. So I want to start by handing over
24 what has previously been marked as Exhibit 1002 in
25 this IPR. Do you recognize this as the declaration

1 you submitted in IPR 2023-01369 regarding US patent
2 number 10755409?
3 A. Yes.
4 Q. And if you can flip to -- near the back here,
5 on page 119. Do you recognize that as your signature?
6 A. Yes.
7 Q. Okay. You mentioned you've been deposed
8 twice before?
9 A. Yes.
10 Q. What proceedings were those depositions in?
11 A. I don't perfectly recall. It was some IPRs
12 much earlier, a few years back. I was working with
13 same counsel on behalf of Align.
14 Q. Sorry. What was that?
15 A. I was working on behalf of Align. I was
16 testifying on behalf of Align, and working with
17 same -- WSGR attorneys.
18 Q. Okay. Prior to that deposition and that work
19 with Align, had you had any other contact with Align?
20 A. No.
21 Q. Have you received any funding for research
22 from Align?
23 A. No.
24 Q. When were you first retained by Align in
25 connection with these proceedings?

1 A. I don't recall the exact date, but it was
2 last year.
3 Q. Okay. Other than your work in this
4 proceeding, and the prior proceedings that you
5 mentioned, have you had any other relationship with
6 Align?
7 A. No.
8 Q. Okay. Do you recall also participating in an
9 IPR proceeding on behalf of another company against
10 3Shape, Inc.?
11 A. Yes.
12 Q. Do you recall what the name of that company
13 is?
14 A. Medit.
15 Q. Did you have any prior relationship with
16 Medit?
17 A. No.
18 Q. Have you done any work with Medit since?
19 A. No.
20 Q. Okay. Prior to working with Align in the
21 Inter Partes Review proceedings, were you familiar
22 with Align's business?
23 A. Yes. As a layman, I know that they have a
24 line of products that they sell for alignment of
25 teeth.

1 Q. Other than that awareness, are you familiar
2 with any other aspects of Align's business?
3 MR. ARGENTI: Objection, form.
4 A. Prior to previous proceedings, no.
5 BY MR. BLYTHE:
6 Q. Prior to participating in this Inter Partes
7 Review proceeding, were you familiar with Dental
8 Monitoring?
9 A. General knowledge, yes.
10 Q. How did you become aware of Dental
11 Monitoring?
12 A. It's -- you know, as I said, general
13 knowledge. What I meant by that, as a layman, I know
14 that, you know, dental monitoring takes place for
15 either normal follow-up dentistry or orthodontists.
16 Q. Let me re --
17 MR. ARGENTI: I'm going to object to form on
18 that last question.
19 BY MR. BLYTHE:
20 Q. Let me rephrase that.
21 Were you familiar with patent owner Dental
22 Monitoring SAS, the company prior?
23 A. No.
24 Q. Okay. So you're not familiar with Dental
25 Monitoring SAS's products?

1 A. No.
2 Q. Okay. And you'll understand that if I refer
3 to "Dental Monitoring," I'm referring to the patent
4 owner in this case?
5 A. Now, I know.
6 Q. Okay. Glad we clarified.
7 Were you familiar, or are you familiar with
8 any of the inventors on the '409 patent?
9 A. No.
10 Q. Were you -- did you recognize any of the
11 inventors on the Salah reference that you're relying
12 on?
13 A. No.
14 Q. Same question for the Carriers reference?
15 A. No.
16 Q. Are you familiar with the authors of the
17 Maninis article?
18 A. I'm familiar with some of the authors.
19 Q. Okay. Which doctor is that?
20 A. Dr. Luc Van Gool. Not personal acquaintance,
21 but he's one of my colleagues. I've met him in
22 conferences.
23 Q. Okay. Are you familiar with the company Get
24 Grin?
25 A. I've heard of them.

1 Q. Okay. So if you could turn to the first
2 section of your declaration, Exhibit 1002, starting on
3 page 1 --
4 A. Um-hum.
5 Q. -- qualifications.
6 A. Um-hum.
7 Q. So you're a professor of computer science
8 here at the University of Central Florida?
9 A. That's right.
10 Q. Okay. And do you teach any classes related
11 to dentistry or orthodontics?
12 A. Not dentistry or orthodontics.
13 Q. Okay. Any other medical fields that you
14 teach classes in?
15 A. I teach an image processing class that has
16 components of medical imaging.
17 Q. Okay. And is that class taught to medical
18 students?
19 A. Not medical students.
20 Q. It's a computer science class?
21 A. It's actually an electrical engineering
22 class.
23 Q. Okay.
24 A. However, it doesn't mean that medical
25 students cannot take it. Nothing stops them from

1 taking it.
2 Q. And you received your PhD in computer
3 science?
4 A. Yes.
5 Q. And a Master's in computer science?
6 A. One of my Master's, yes.
7 Q. And a second Master's in electrical
8 engineering?
9 A. Earlier one, yes.
10 Q. Okay. And you also have a Bachelor of
11 Science in electrical engineering?
12 A. Yes.
13 Q. I saw that your PhD and one of your Master's
14 were obtained in France --
15 A. Yes.
16 Q. -- is that correct?
17 Do you speak French fluently?
18 A. I do.
19 Q. In obtaining your PhD, your two master's, and
20 your bachelor's, did you take any coursework related
21 to dentistry or orthodontics?
22 A. Not dentist field.
23 Q. In your prior work experience, have you ever
24 worked in the dental or orthodontics industry?
25 A. Not dental or orthodontics industry, but I

1 need to qualify that. I had a project a few years
2 back. I worked with a company that was working on
3 dental image acquisition, and dental 3D modeling and
4 alignment. I had a grant from them, and I worked for
5 them for a number of years. One of my PhD students
6 who I advised actually wrote -- his entire
7 dissertation was based on that.
8 Q. And that's -- that company is Imaging
9 Sciences International, Inc.?
10 A. That is correct.
11 Q. Okay. So we'll touch that in a second.
12 Just to confirm, you don't have a medical
13 degree?
14 A. No.
15 Q. You don't have any degrees in dentistry or
16 orthodontics?
17 A. No.
18 Q. Have you received any training in dentistry
19 or orthodontics?
20 A. No.
21 Q. And I take it you haven't treated any
22 patients?
23 A. No, I'm not qualified to treat patients.
24 Q. Good. Have you taken any dental or
25 orthodontic photographs?

1 A. Yes.
2 Q. In what context?
3 A. As I said, I was working with a company on a
4 project that was dealing with monitoring dental
5 treatments. So in the context of that project, I have
6 worked on taking many pictures and working with them.
7 Q. And what type of images did you acquire?
8 A. It required images obtained with cameras, as
9 we understand, but also they included computer-aided
10 tomography. So, 3D, if you want to model it.
11 Q. How did you select which images to take in
12 that project?
13 A. This project was about actually incorporating
14 imaging technology, and normal cameras, SLR camera
15 within a scanner to extend the applications.
16 Q. Let me try to ask that more specifically.
17 Were the images that you were taking
18 particular views of teeth?
19 MR. ARGENTI: Objection, form.
20 A. They included many views of the teeth.
21 BY MR. BLYTHE:
22 Q. Did you select which views of the teeth to
23 acquire?
24 A. I wasn't involved in selection personally.
25 But during the process of the project, sometimes we

1 had to deal with whether an image is good or not, is
2 useful or not.
3 Q. Did you work the apparatus, the camera that
4 acquired the images?
5 A. Yes.
6 Q. Okay. Who were -- whose teeth were being
7 imaged in that process?
8 A. Some volunteers.
9 Q. They were not patients?
10 A. I don't know, because those volunteers were
11 hired by the company.
12 Q. Was a dentist, an orthodontist, or a
13 physician present during those photographs?
14 A. Not during those photographs. Not to my best
15 knowledge. Unless it -- some of those pictures were
16 taken actually by the company when I was not present.
17 But there might have been. I don't know. I don't
18 know the answer to that.
19 Q. Okay. To your knowledge, none of the images
20 that you acquired were used for medical diagnosis or
21 treatment, right?
22 A. I don't know.
23 Q. You didn't analyze those images to form a
24 diagnosis or a treatment plan, correct?
25 A. I did analyze those images. I did the image

1 analysis; that's my area. I did the image analysis
2 and return the results to -- full evaluation.
3 Q. But you're not aware of the -- that
4 evaluation being used to guide medical treatment?
5 A. I'm not aware. I don't know.
6 Q. Okay. Have you ever acquired dental images
7 with a mobile device?
8 A. No.
9 Q. Have you ever used an application on a mobile
10 phone for acquiring images of -- for dental use?
11 A. No.
12 Q. In your work on the project with Imaging
13 Sciences International, did you analyze any of those
14 images using a neural network?
15 A. At the time, neural networks were not
16 popular.
17 Q. So that's a "no"?
18 A. That's a "no," yes.
19 Q. Would you consider yourself to have two years
20 of work in medical imaging?
21 A. No, I would consider myself many years of
22 working. In medical imaging, as you said, I worked
23 on -- I worked with ophthalmologists, I worked on
24 biomedical imaging. I worked with other companies,
25 not necessarily related to dentistry. I've worked

1 with LENSOR. They're working on imaging eyes. I
2 don't mean external imaging; I mean, internal imaging
3 of eyes for various diagnosis, etcetera.
4 Q. So you would consider yourself to have more
5 than two years of work in medical imaging?
6 A. Way more than two years. I think I have -- I
7 have 30 years of experience, more than 30 years of
8 experience in imaging. But, I mean, in doing research
9 and teaching medical imaging throughout these years,
10 yes.
11 Q. Other than the projects you were just
12 describing with Imaging Sciences International, was
13 any of that imaging of teeth?
14 A. No.
15 Q. Okay. So if you could turn to page 3 of
16 Exhibit 1002.
17 A. Yes.
18 Q. In paragraph 6, you mention a -- well, I
19 guess a project named Modeling and Visualization of
20 Musculoskeletal Structures in Dental CT Scan --
21 A. Um-hum.
22 Q. -- parens, 2006 to 2007.
23 A. Um-hum.
24 Q. Is that associated with the project with
25 Imaging Sciences International?

1 A. Yes.
2 Q. Is that the title of a project that was
3 published?
4 A. I believe -- I don't remember off the top of
5 my head, but it should be in my resume. I think the
6 title of the paper was that also.
7 Q. Okay.
8 A. But maybe not. Maybe it was just the title
9 of the -- the word "musculoskeletal" was in the paper,
10 I think. I believe that was the title of the project.
11 Q. Was the title of the paper -- would you
12 recognize it as "Alignment of Maxillofacial CT Scans
13 to Stone-Cast Models Using 3D Symmetry for
14 Backscattering Artifact Reduction"?
15 A. I believe so, yes.
16 Q. How do these stone-cast models come into that
17 project?
18 A. The doctors would take stone cast at the
19 time, or they would take a cast of the patient's
20 tooth, and convert that to a stone cast. We would
21 scan them, and then take that scan and align it with
22 another scan of the same patient. But, you know, the
23 second scan would be computational tomography.
24 And then align these two scans, these two 3D
25 models. And use one, the stone cast, to correct

1 different errors, measurement errors, or problems that
2 occurred during the CAT scan.
3 You know, one of the very obvious ones that
4 we handled was back -- backscattering problems,
5 well-known backscattering problem.
6 Q. In paragraph 7 of Exhibit 1002, you, at the
7 bottom of the page, refer to one project as directed
8 to the registration/alignment of dental CT scans. Is
9 that the same project --
10 A. Same project, yes.
11 Q. -- that we've been discussing?
12 In paragraph 9, on page 5, you refer to
13 having served as the advisor for a dissertation
14 directed to self pixel registration in computational
15 imaging and to applications to the enhancement of
16 maxillofacial CT data. Is that from the same project?
17 A. Yes, that was the PhD student who basically
18 worked on that project, advised by me. And his
19 dissertation was about that.
20 Q. In your work on this project with Imaging
21 Sciences International, were there any faculty
22 involved who had medical or dental backgrounds?
23 A. I wasn't in touch with any faculty with
24 medical or dental background. Imaging sciences, I'm
25 sure, were. They're very in touch with -- they had

1 many doctors as their clients.
2 Q. Okay. Do you know whether Imaging Sciences
3 International had been in contact with medical
4 professionals related to that project you were doing
5 with the scans?
6 A. I'm pretty certain they were, yes. In the
7 meetings that we had, these discussions would come up,
8 yes.
9 Q. Okay. Are you aware of which medical
10 professionals were involved?
11 A. No, they were not my contacts.
12 Q. Okay. Other than the papers that were
13 published in connection with that work with Imaging
14 Sciences International, have you published any papers
15 that relate to dentistry or orthodontics?
16 A. No.
17 Q. In paragraph 12 on page 6, you mentioned that
18 you have conducted research in the area of computer
19 vision and computer modeling and physical structures,
20 including dental structures. Is that in reference to
21 dental structures again in connection with the Imaging
22 Sciences International work?
23 A. That is correct.
24 Q. Prior to your work on this proceeding
25 regarding the '409 patent, had you ever seen the

1 Maninis publication?
2 A. I might have noticed it, but I didn't pay
3 attention to it.
4 Q. Had you ever come across the Carrier patent?
5 A. No.
6 Q. Had you ever come across the Salah patent?
7 A. No.
8 Q. Prior to your work on this proceeding, were
9 you familiar with the '409 patent?
10 A. No.
11 Q. So I want to turn to a different section of
12 your declaration. I believe at paragraph 21 on page
13 8 --
14 A. Yes.
15 Q. -- do you see that this is a section called
16 "Legal Standards"?
17 A. Yes.
18 Q. And paragraph 21, you indicate that you'd
19 been advised that in determining the level of ordinary
20 skill in the field that someone would have had at the
21 time the claimed invention was made, you should
22 consider three things listed there, correct?
23 A. Yes.
24 Q. And the first is the levels of education and
25 experience of persons working in the field?

1 A. Yes.
2 Q. The types of problems encountered in the
3 field?
4 A. Yes.
5 Q. The sophistication of the technology, right?
6 A. Yes.
7 Q. When it says "the field," is it the same
8 field throughout paragraph 21, as you understand it?
9 MR. ARGENTI: Objection, form.
10 A. I don't know. This is a general legal term.
11 I'm not a legal expert to answer your question, but --
12 BY MR. BLYTHE:
13 Q. Fair enough. Let me make it more specific.
14 When you analyze -- you did analyze who
15 would -- what the level of ordinary skill in the art
16 was in connection with this proceeding?
17 A. Yes.
18 Q. What was the field that you -- what field did
19 you determine the level of skill in the art in?
20 A. I determined -- it's in my declaration. I
21 determined that it would be someone in the area of
22 computer vision, image processing, or machine
23 learning -- and/or machine learning.
24 Q. Do you think that the field that's relevant
25 to your analysis includes dentistry or orthodontics?

1 A. No, not really. I think that is in -- you
2 know, the application area is dentistry. But the '409
3 patent itself, I think the subject matter is really
4 computer vision and mission learning.
5 Q. So is it fair to say, then, you did not
6 consider the types of problems encountered in
7 dentistry and orthodontics?
8 A. No, it actually doesn't say the types of
9 problems. It says types of problems encountered in
10 the field.
11 Q. Correct.
12 A. So, I mean, somebody like me who is working
13 in the area of computer vision and machine learning
14 can do a lot of work on medical imaging, including
15 dentistry. And it could be that you are part of a
16 team, that you get some required knowledge to -- to do
17 that research.
18 But as a -- you know, if I am doing the work
19 in the computer vision and machine learning, that's
20 all needed to learn, and do the research in -- in my
21 area.
22 Q. Sure. So my question was a little more
23 simple than that.
24 A. Um-hum.
25 Q. You had indicated that the field did not

1 include dentistry and orthodontics. So I'm just
2 confirming then that the types of problems encountered
3 in the field, as you considered it, did not include
4 the types of problems encountered in dentistry and
5 orthodontics, correct?
6 MR. ARGENTI: Object, form.
7 A. Yeah, I just think your question is a little
8 bit misleading, because types of problems -- so I'm a
9 computer vision scientist, and a machine learning
10 scientist. I can deal with types of problems, and
11 dealing with, you know, monitoring dental treatment.
12 But from the point of view of a computer vision
13 scientist, I don't need to be a dentist to --
14 So that's what I'm trying to say; there's a
15 nuance there. The problem -- the application area is
16 dentistry. But I'm a computer vision scientist. And
17 so I'm solving computer vision and machine learning
18 problem.
19 BY MR. BLYTHE:
20 Q. Did you consider the education and experience
21 of the persons in the dental or orthodontic field?
22 MR. ARGENTI: Objection, form.
23 A. Did I consider? I mean, I have my definition
24 of everything that you are -- in my copy of my
25 declaration. As I said, I -- based on my valuation,

1 patent '409 is in the area of computer vision and
2 machine learning, and is dealing with image
3 acquisition and analysis of images. And, therefore,
4 yes, I mean, they are dealing with images of teeth.
5 But the problems you are dealing with, I consider them
6 as part of the computer vision and machine learning.
7 Q. If there are aspects of the '409 patent that
8 are directed to dentistry or orthodontics that do not
9 relate to machine learning, would it be fair to say
10 that your expertise is not in understanding those
11 aspects of the patent?
12 MR. ARGENTI: Objection, form.
13 A. I disagree with that. I think if the two
14 references, Salah and -- and Carrier, that I
15 presented, teaching to computer vision scientists to
16 understand enough to come up with that patent. So
17 everything -- everything I needed to learn about
18 dentistry, I think, to my opinion, Salah and Carrier
19 are teaching me.
20 Q. What do you mean when you say "needed to
21 learn"?
22 A. Well, that, for instance, teeth have
23 attributes; they have numbers associated with them.
24 The type of teeth, you know, incisor versus molar,
25 etcetera. I mean some basic knowledge that needs to

1 be given to POSA in order to accomplish the '409
2 patent.
3 Q. So, in your opinion, there is no disclosure
4 in Carrier that requires dental or orthodontic
5 expertise to understand?
6 A. That's not what I said. I -- what I said was
7 that Salah and Carrier teach enough for a POSA to
8 understand everything he or she needs to know about
9 the '409 patent as far as dentistry is concerned.
10 Q. I understand.
11 And my question is: Are there parts of
12 Carrier that require dental or orthodontic expertise
13 to understand?
14 MR. ARGENTI: Objection, form.
15 A. No. I'm saying that a computer scientist can
16 read Carrier and understand everything about dentistry
17 that is needed to understand Carrier.
18 BY MR. BLYTHE:
19 Q. I'm sorry. Your answer started "no," and I
20 want to be clear what you were responding to.
21 Is it your opinion that Carrier does not have
22 any disclosures that require expertise in dental or
23 orthodontics to understand the reference?
24 MR. ARGENTI: Objection to form.
25 A. I'm saying that -- that Carrier provides

1 enough teaching for a computer vision scientist to
2 understand anything that is required to know about
3 dentistry in order to come up the '409 patent.
4 BY MR. BLYTHE:
5 Q. Let's turn to page 35 of Exhibit 1002.
6 A. Yes.
7 Q. In paragraph 69 and 70, you address an
8 overview of the level of skill in the art; is that
9 correct?
10 A. Yes.
11 Q. And in paragraph 70, you opine as to the
12 experience that a person of ordinary skill in the art
13 as of July 21st, 2017 would have, correct?
14 A. Yes.
15 Q. Okay. And again, when it says, "a person of
16 ordinary skill in the relevant field," that relevant
17 field, in your view, is computer science?
18 A. Computer science; specialization in computer
19 vision and mission learning, yes.
20 Q. Okay. Now, in your definition, you say that
21 a person of skill would typically have an advanced
22 degree, such as a Master's degree or a PhD in computer
23 science or related field, with at least two years of
24 work in computer vision, image analysis, medical
25 imaging, or related areas, correct?

1 A. Yes.
2 Q. And we were just discussing you have at least
3 that experience, correct?
4 A. Yes.
5 Q. Okay.
6 A. And I had that experience at the priority
7 date of the '409 patent, too.
8 Q. A POSA could be a member of an
9 interdisciplinary team, you say that as well?
10 A. Yes.
11 Q. The term "could" is conditional there,
12 correct?
13 A. Um-hum. Um-hum. Yes.
14 Q. In what condition would a person of skill be
15 a member of an interdisciplinary team?
16 A. I'm just saying that anything that needs to
17 be learned to -- again, to come up with the '409
18 patent, it could come with some members of the
19 interdisciplinary team, like people with experience in
20 dentistry. But that is not really required. As you
21 say, it's conditional. I'm saying that a person of
22 ordinary skill could also learn all of that from Salah
23 and Carrier.
24 Q. Do you consider yourself to have a background
25 in dentistry or orthodontics?

1 A. I think this question is repeating myself.
2 No. I mean, you have my CV, and you know that that's
3 not my area of specialization.
4 Q. I'm asking specifically about the word
5 "background."
6 A. Um-hum.
7 Q. But I understand your answer.
8 In considering your opinions in -- excuse me.
9 In forming your opinions in this case, did
10 you consider the person of ordinary skill to be a
11 member of an interdisciplinary team, with a person
12 with a background in dentistry or orthodontics?
13 A. Not --
14 MR. ARGENTI: Objection to form.
15 A. Not necessarily. I said "could." And as I
16 said, I believe that prior arts, like Salah and
17 Carrier, teach entirely what POSA would need in order
18 to come up with the '409 patent. So, not necessarily.
19 That's why I said "could."
20 BY MR. BLYTHE:
21 Q. So in this instance, with the ground
22 references that you've proposed, it's -- a person of
23 skill would not be a member of that interdisciplinary
24 team?
25 A. Could be, or could not. I mean, they can --

1 a person of ordinary skill -- you know, for me to read
2 and understand '409 patent, all I needed was the --
3 you know, to refer to Salah and Carrier.
4 That doesn't mean that as a layman, I don't
5 have understanding, you know, basic things about
6 teeth, and I go to dentist. And you know, as a
7 layman, I understand teeth has numbers. I've heard
8 this from my doctor. I know this from my doctor.
9 Q. Would you agree that the '409 patent claims
10 an improved medical imaging process?
11 A. It's actually the -- that -- it's actually
12 talking about methods in computer vision and machine
13 learning that provide improvement in that area.
14 Q. And "that area" is medical imaging, correct?
15 A. Dental imaging.
16 Q. You've not identified any reason in your
17 declaration that a person would acquire images in the
18 context of a '409 patent claims for purposes other
19 than providing dental or orthodontic treatment,
20 correct?
21 A. That is right, yes.
22 Q. Did you consult with anyone else in forming
23 your opinions in this declaration?
24 A. No.
25 Q. So, this will be easy. So then, you did not

1 consult with a person having a background in dentistry
2 or orthodontics, correct?
3 A. No. As I mentioned, all I needed was the
4 teachings of Salah and Carrier.
5 Q. Do you know Dr. John Langan?
6 A. No.
7 Q. Have you read Dr. Langan's declaration
8 submitted in this proceeding?
9 A. First time I heard about the declaration by
10 Dr. John Langan was yesterday, actually. I wasn't
11 aware of that declaration, and I have never read it.
12 Q. Are you familiar with Dr. Langan's
13 credentials?
14 A. No.
15 Q. Are you aware of any reason to dispute his
16 credentials as a person of ordinary skill?
17 MR. ARGENTI: Objection, form.
18 A. I can neither dispute or not. I cannot tell
19 you because I don't know him. I don't know his
20 credentials. I cannot.
21 BY MR. BLYTHE:
22 Q. That's fair.
23 So you have no reason to dispute his
24 credentials?
25 A. That's not what I said. I said I could

1 dispute. I just said that I don't know him. At this
2 point, I have not seen his credentials, so I can't
3 answer yes or no.
4 Q. As of today, you don't have any information
5 that would allow you to dispute his credentials?
6 MR. ARGENTI: Objection, form.
7 A. I don't know him. I don't have his
8 credentials. So I may be -- you know, if I see, I may
9 dispute his credentials. But I don't know. This is a
10 hypothetical question, so I cannot dispute credentials
11 of a person that I don't know.
12 BY MR. BLYTHE:
13 Q. No, I'm not asking a hypothetical question.
14 You're -- you're answering whether you will be able
15 to.
16 So, I'm asking specifically: As of today, do
17 you have any reason that would make you think that
18 Dr. Langan is not qualified?
19 A. How can --
20 MR. ARGENTI: Objection, form.
21 A. How can I answer that question? I don't know
22 Dr. Langan.
23 BY MR. BLYTHE:
24 Q. Well, you could answer it yes or no.
25 Are you able to answer that question yes or

1 no?
2 A. No, I cannot answer that question yes or no.
3 Because you're asking me as of today, do I have any
4 objections. I don't know whether I do, because I
5 don't know the credentials of Dr. Langan.
6 Q. Do you know Dr. Budi Kusnot?
7 A. No.
8 Q. Do you know Dr. Scott Acton?
9 A. No.
10 Q. Dr. Maurine Valley?
11 A. No.
12 Q. Dr. Lina Karam?
13 A. Dr. Lina Karam is one of my colleagues, I met
14 in some conferences.
15 Q. I'm going to turn back to paragraph 28 on
16 page 10.
17 A. Yes.
18 Q. Looking at the first sentence, you understand
19 that in deciding whether the patent satisfies this
20 written -- sorry -- written description requirement,
21 one must consider the description from the viewpoint
22 of a person skilled in the field of technology of the
23 patent when the application was filed.
24 Do you see that?
25 A. Yes.

1 Q. You analyzed the written description of the
2 Carrier patent in this case, correct?
3 A. Yes.
4 Q. And I direct you to paragraph 51 of your
5 report. And when you say it is your position that
6 Carrier Provisional supports at least one claim of the
7 Carrier Publication, that is the written description
8 analysis we were just looking at in paragraph 28?
9 A. Yes.
10 Q. The field of technology of the Carrier patent
11 is dental imaging, correct?
12 A. It's monitoring the dental treatments with
13 imaging.
14 Q. Okay. Is that the same field as the '409
15 patent?
16 A. I believe so, yes.
17 Q. Okay. Did you apply the same standard for
18 the Person of Ordinary Skill in the Art in evaluating
19 the written description of the Carrier reference in
20 its Provisional?
21 A. Yes.
22 Q. Let's go to a different section here. Turn
23 to page 40, starting at paragraph 77.
24 A. Yes.
25 Q. It's your opinion in your -- in your

1 declaration that the combination of Salah, Carrier,
2 and Maninis render obvious each claim of the '409
3 patent, correct?
4 A. Correct.
5 Q. How did you identify the Salah, Carrier, and
6 Maninis references?
7 MR. ARGENTI: Objection, form.
8 A. Well, through searches and interactions. I
9 mean, it was an interactive process of -- with the
10 counsel and myself to -- to zero down on the set of
11 prior arts.
12 BY MR. BLYTHE:
13 Q. What search did you conduct?
14 A. Search online and -- to find out what is out
15 there. And also, there were prior searches done by
16 also the counsel.
17 Q. When you were conducting your search online,
18 what were you searching for?
19 A. Searching for the exact area of applications
20 of medical or, rather, dentistry dealing with --
21 rather, applications in dentistry of image acquisition
22 and image analysis.
23 Q. Did you find any other publications in that
24 area, other than Salah and Carrier?
25 A. I'm sure I did. And I just discarded them

1 maybe -- for whatever reason, I don't remember.
2 Q. You don't recall any of those publications?
3 A. No.
4 Q. Did you search for publications in neural
5 networks?
6 A. I'm not -- not specifically neural networks,
7 but applications -- maybe applications of neural
8 networks, or neural networks that could be applied to
9 the content -- in the context of '409 patent.
10 Q. In your search, you didn't identify any
11 publications indicating that a neural network had been
12 applied to analyze images of -- dental images,
13 correct?
14 A. I might have come across some.
15 Q. You haven't identified any here in your
16 declaration?
17 A. No. Here, I'm just relying completely on
18 Salah, Carrier, and Maninis.
19 Q. Did you search specifically for whether
20 neural networks had ever been applied to analyzing
21 images of dental or orthodontics?
22 A. Sure, yes.
23 Q. Okay. Other than the evidence cited as
24 exhibits in your declaration, did you consider any
25 other evidence in forming your opinions in this case?

1 A. No.
2 Q. Sorry?
3 A. No.
4 Q. Okay. Okay. So I want to make sure I
5 understand the combination of Salah, Carrier, and --
6 Maninis?
7 Sorry, I want to make sure I'm pronouncing it
8 the same way.
9 A. I don't know. I pronounce it "Maninis."
10 Q. "Maninis," okay, that's fine. We've been
11 going back and forth.
12 So I want to make sure I understand what the
13 resulting combination is here. First, I want to ask:
14 The only combination that you've proposed in your
15 declaration is Salah, Carrier, and Maninis, correct?
16 A. Yes.
17 Q. And you have not proposed that a person of
18 skill would combine only two of those references,
19 correct?
20 MR. ARGENTI: Objection, form.
21 A. I actually considered that Salah and Carrier
22 were essentially the same in the subject area. So --
23 but, however, I thought they were, you know, each of
24 them were going into some details that provide
25 complimentary details to each other.

1 BY MR. BLYTHE:
2 Q. So, as written in your declaration, there is
3 no ground that involves only two of those three
4 references, correct?
5 A. You have to refer to a specific place in my
6 declaration to see if I can find it.
7 Q. In pages -- well, let me see here.
8 I believe it's pages 40 to 48, you address
9 the motivation to combine these references, and the
10 expectation of success in doing so, correct?
11 A. Um-hum. Um-hum. Yes.
12 Q. Your combination starts with the Salah
13 reference, right?
14 A. I don't know what you mean by "starts." My
15 combination includes all the three of them.
16 Q. Let me clarify. Is a person of skill in your
17 combination starting with the goals that are set forth
18 in the Salah reference?
19 MR. ARGENTI: Objection, form.
20 A. Can you repeat that question?
21 BY MR. BLYTHE:
22 Q. Sure.
23 Have you identified in your declaration,
24 other than Salah, what the person of skill would be
25 setting out to achieve when they arrive at this

1 combination of Salah, Carrier, and Maninis?
2 A. I'm still confused about the question. But,
3 I consider Salah, Carrier, and Maninis as a perfect
4 combination to come up with the '409 patent. I'm not
5 sure if I understand your question.
6 Q. In paragraph 81 --
7 A. Yes.
8 Q. -- in the middle there, in the sentence
9 starting "a POSA would thus have considered Carrier's
10 teachings," do you see that?
11 A. Yes.
12 Q. You say that a POSA would thus have
13 considered Carrier's teachings directly applicable to
14 the types of imaging methods taught by Salah, and
15 would use Carrier's complimentary teachings to
16 supplement Salah's disclosure.
17 Do you see that?
18 A. Yes.
19 Q. So, in your view, a person of skill is
20 working with the methods disclosed in Salah, and going
21 to Carrier to use those complimentary teachings in the
22 methods disclosed in Salah?
23 A. I don't look at it completely sequentially.
24 I think in connection with each other, they -- you
25 know, those would come up with that conclusion. But

1 as I said, I see -- as I mentioned a little bit
2 earlier, I see Salah and Carrier covering, you know,
3 substantially the same subject area. And -- but there
4 are details in each that would make them
5 complimentary. That's what I mean by that sentence.
6 Q. You haven't proposed that any techniques from
7 the Salah reference are incorporated into the methods
8 set forth in Carrier, correct?
9 A. What do you mean -- you mean Carrier had the
10 knowledge of Salah's work, and incorporated some of
11 that work in their work; is that what you mean?
12 Q. Let me put it this way: You understand that
13 in -- Carrier describes a method of having an
14 application on a mobile phone that is used to acquire
15 dental images, correct?
16 A. Yes.
17 Q. And it discloses using overlays to acquire
18 those images?
19 A. It -- yes, it discloses using overlays as a
20 guide for the user --
21 Q. Right.
22 A. -- to position the direct pose and
23 orientation in order to capture an acceptable image.
24 Q. And you understand it's acquiring those as
25 standard orthodontic images for retention by a dental

1 professional, right?
2 A. What do you mean by "standard orthodontic"?
3 I don't understand what that means.
4 Q. We can look at that in the context of Carrier
5 later --
6 A. Um-hum.
7 Q. -- but you understand that Carrier is not
8 disclosing that the dental images are being acquired
9 for the purposes of building a 3D model, correct?
10 A. Actually, I mean, Carrier is not -- is not
11 saying either way. Carrier is not saying that the
12 overlay, for instance, that they say is -- I would
13 interpret that as overlay coming from the 3D model.
14 Q. I was asking a different question.
15 A. Um-hum.
16 Q. So let me phrase it differently.
17 There is no disclosure in Carrier of taking
18 the images acquired through the Carrier application
19 and using those to generate a 3D model, correct?
20 A. Probably not. I don't recall.
21 Q. There is a disclosure in Salah that the
22 acquired images are used to form a 3D model, correct?
23 A. Yes.
24 Q. So what I'm trying to figure out is: The
25 person of skill who's motivated to combine Salah,

1 Carrier, and Maninis, is their goal to acquire images
2 to form a 3D model?
3 A. No, actually, that's not true. Both
4 documents, work in prior art, say that the end goal is
5 not to create 3D models; the end goal is to monitor a
6 patient's treatment, or orthodontics treatment.
7 That's the end goal.
8 Now, the tools, computer vision tools and
9 machine learning tools are just produced there to
10 achieve that goal. The end goal is not creating 3D
11 model. So, to a great extent, I see the overlay that,
12 for instance, Carrier described is the same as the 3D
13 model project into images by Salah in a
14 semi-transparent way.
15 So, Salah is using this 3D model so that
16 whether it's patient specific or not, to guide the
17 user through the imaging process. And Carrier is
18 using an overlay. They say these are things that --
19 predetermined set of overlays, and predetermined pose
20 of the camera.
21 And they're using that to align in order --
22 rather, guide the user or the patient to align
23 their -- their cell phone to acquire the acceptable
24 image.
25 Q. You have never disclosed in your declaration

1 that Salah is using its 3D models to guide the user
2 through the imaging process, correct?
3 MR. ARGENTI: Objection, form.
4 A. I -- I'm sure I have disclosed -- I don't
5 remember off the top of my head, but I'm sure I have
6 disclosed what I just said, that the functionality of
7 3D modeling used by Salah is the -- is the equivalent
8 to what Carrier proposed as predetermined overlays.
9 BY MR. BLYTHE:
10 Q. Sorry. So I'm asking a different question --
11 A. Um-hum.
12 Q. -- because I'm talking about what you just
13 said.
14 You just said something that I don't think is
15 in your declaration. And if it is, I'd like you to
16 point me to it. So I will ask again.
17 You have never identified in your declaration
18 that the 3D models in Salah are used to guide a
19 patient to acquire images, correct?
20 MR. ARGENTI: Objection to form.
21 A. Again, I don't recall if I had that in my
22 declaration. But as I said, the way I interpret and I
23 see, based on my reading of Salah, is that Salah is
24 using 3D models for guiding the user for acquiring
25 pictures. And I'm pretty certain I have put that in

1 my declaration.
2 MR. BLYTHE: Objection to the answer as
3 nonresponsive.
4 Why don't we take our first break?
5 (A recess was taken beginning at 9:58 a.m.,
6 and ending at 10:12 a.m.)
7 MR. BLYTHE: Back on the record.
8 BY MR. BLYTHE:
9 Q. All right. So we were talking about
10 combination of Salah, Carrier, and Maninis before the
11 break. Do you recall?
12 A. Yes.
13 Q. Okay. In your combination of Salah, Carrier,
14 and Maninis, is the person of skill going to practice
15 the aspects of Salah that involve creating a 3D model
16 of a patient's teeth?
17 A. He may do, yes.
18 Q. Will they do so? Is that part of what
19 they're motivated to do?
20 A. Well, I mean, the motivation is to combine
21 these three to come up with '409 patent. And if it
22 requires that, yes, they would do.
23 Q. So, we were just looking at paragraph -- I
24 don't know how it is that I keep losing it -- 81,
25 where -- say, a person of skill will use Carrier's

1 complimentary teachings to supplement Salah's
2 disclosure.
3 Specifically the techniques from Carrier that
4 are being used in this combination are the use of an
5 overlay to determine alignment with the teeth, and the
6 detection that all required teeth are present, right?
7 A. Not just that. I mean, the way I was
8 seeing -- again, just to repeat myself, I'm saying
9 that the Carrier and -- and Salah mostly cover the
10 same thing, and the same subject matter.
11 However, for instance -- I mean, they talk
12 about acquisition of images, and using some means --
13 let's say overlay with 3D model projected in the
14 transparent form to guide the user to align.
15 And then Carrier discloses the using set
16 points, for instance, to decide whether the alignment
17 is good enough. To my opinion, Salah is implicitly
18 doing that. But Carrier explicitly mentions the use
19 of set points to do that. That's what I mean by they
20 are complimentary.
21 Q. Okay. I want to introduce what's been marked
22 as Exhibit 1001, which is a copy of the '409 patent
23 itself. Dr. Foroosh, you recognize this as the patent
24 whose claims you evaluated?
25 A. Yes.

1 Q. If you could turn to the end where the claims
2 are listed, starting in column 32.
3 A. Yes.
4 Q. Claim 1 is a method for acquiring an image of
5 the dental arch of a patient.
6 (Phone interruption.)
7 MR. BLYTHE: Sorry. Who just joined the
8 line?
9 MS. JACOBSEN: It was me. I was delayed
10 getting back on. I had some technical issues.
11 MR. BLYTHE: Just wanted to confirm.
12 BY MR. BLYTHE:
13 Q. Sorry. So let me ask that again.
14 A method -- Claim 1 of the '409 patent is
15 directed to a method for acquiring an image of a
16 dental arch comprising the following steps, correct?
17 A. Yes.
18 Q. And there are five steps labeled (a') through
19 (e')?
20 A. Yes.
21 Q. Okay. These steps are interrelated, right?
22 MR. ARGENTI: Objection, form.
23 A. I don't know what you mean by "interrelated."
24 BY MR. BLYTHE:
25 Q. In step (a'), the image acquisition apparatus

1 acquires an analysis image, correct?
2 A. Yes.
3 Q. That analyst image is analyzed by means of
4 deep learning device trained by means of a learning
5 base, right?
6 A. Yes.
7 Q. And that analysis of that analysis image
8 goes -- is -- is used to determine a value for an
9 image attribute, correct?
10 A. Yes.
11 Q. And that image attribute determined from the
12 analysis of the deep learning device of that analysis
13 image is compared to a set point, correct?
14 A. Right.
15 MR. ARGENTI: Objection to form.
16 BY MR. BLYTHE:
17 Q. So you can see that if one process, such as
18 the analysis being done, is changed, you're going to
19 have a different determination or a different set
20 point, correct?
21 MR. ARGENTI: Objection, form.
22 A. You have to give me specifics. I don't -- I
23 don't know. That is a very general --
24 BY MR. BLYTHE:
25 Q. Sure.

1 A. -- question.
2 Q. Well, I can give you an example.
3 If, for example, the analysis by the deep
4 learning device is to determine which teeth are
5 present in an image, then you -- if that was the
6 analysis done, then you would not be able to determine
7 from that analysis, let's say, the distance between
8 the teeth and an overlay, correct?
9 MR. ARGENTI: Objection, form.
10 A. I actually disagree with that because that --
11 this -- is that (c') determination for the analysis
12 image as a function of the result of the analysis, and
13 the preceding steps of the value for an image
14 attributes; is that the one you're referring to?
15 BY MR. BLYTHE:
16 Q. Yes.
17 A. It doesn't say what that -- it doesn't
18 specify. I mean, it's just saying that using the
19 analysis images, you're -- that should be the value
20 for the image. But it doesn't say whether there are
21 teeth separation, presence of the teeth. Not in
22 that -- in that sentence.
23 Q. Right. So I'm not saying that it's limited
24 to a certain image attribute. I'm saying that,
25 practically, there's a limitation that if you don't

1 analyze the right thing, you won't be able to make
2 certain determinations, right?
3 MR. ARGENTI: Objection, form.
4 A. I think that almost applies to anything. If
5 you don't analyze the right thing, you're not going to
6 get the answer you're looking for.
7 BY MR. BLYTHE:
8 Q. Okay. I'm glad we at least agree on that.
9 So that's why I'm focused on figuring out what exactly
10 your combination is, right?
11 So we're going back to what is being done in
12 the combination. Let's be specific. If you turn to
13 the section of your report that addresses
14 determination of an image attribute, I think is
15 Section 1(c'). And it starts on page 60 -- 59.
16 Do you see that?
17 A. 1(c')?
18 Q. Yes.
19 A. Yes.
20 Q. The image attributes that you identify values
21 for here include in paragraph 112, the distance
22 between the edges of the teeth and an overlay,
23 correct?
24 A. One possible image attribute. In fact,
25 earlier in my declaration, I'm clarifying what I

1 understand, what is my opinion of image attributes,
2 and teeth attributes.
3 Q. Right.
4 A. More details there.
5 Q. One of the image attributes being determined
6 is this distance between the edges of teeth and the
7 overlay, right?
8 A. It could be that, yes.
9 Q. Another image attribute being determined is
10 the recognition of which teeth are visible in the
11 image, correct?
12 A. Yes.
13 Q. In your combination, are both of those image
14 attributes being determined in Claim 1 of the '409
15 patent?
16 A. Claim 1 doesn't say both are. It just says
17 that an image attribute is assigned to the image.
18 Q. Right.
19 I'm asking: In your combination, are you
20 saying that a person of skill would be motivated to
21 determine both of those attribute values?
22 MR. ARGENTI: Objection, form.
23 A. I -- again, you know, I think in my
24 combination, it exactly satisfies the Claim 1, that an
25 attribute, or maybe multiple attributes are assigned

1 to the image. So it -- I mean, the claims do not
2 limit what -- how many, or one, or many. So I'm
3 saying that my combination provides exactly the same
4 possibility.
5 BY MR. BLYTHE:
6 Q. When you describe the motivation to combine
7 Carrier, Salah, and Maninis, are you describing the
8 motivation to combine them in a way that both of these
9 image attributes are determined?
10 MR. ARGENTI: Objection, form.
11 A. Could be.
12 BY MR. BLYTHE:
13 Q. You haven't provided separate analyses of the
14 motivation to achieve one versus the other, correct?
15 MR. ARGENTI: Objection, form.
16 A. What do you mean by "one versus the other"?
17 BY MR. BLYTHE:
18 Q. Well, a device could analyze only the, say,
19 distance between the teeth and the overlay, correct?
20 A. Your question, I think, is misleading. And I
21 can tell you why.
22 Q. That's okay.
23 MR. ARGENTI: Objection.
24 Q. I want to ask another question.
25 MR. ARGENTI: Let him finish his answer.

1 A. I can tell you why.
2 For instance, in the case of Carrier, when we
3 are looking at the distance, which Carrier discloses,
4 between the edges and contours with a -- with an
5 overlay, basically, we are also at the same time
6 identifying if the proper alignment is there, if the
7 set value is reached. In which case, we know which
8 teeth, for instance, are there.
9 So one is not, you know, mutually exclusive
10 from the other one. The alignment actually tells us
11 what teeth are there.
12 BY MR. BLYTHE:
13 Q. Is it your understanding that in order to
14 determine the distance between an overlay and the
15 outlines of teeth in Carrier, that you would identify
16 which outlines are associated with which individual
17 teeth?
18 A. This is -- again -- so I'm not -- I'm not
19 exactly sure about your question. So if you're saying
20 that -- if your question is that -- correct me if I'm
21 wrong -- after alignment, do we know which contours
22 belongs to which teeth? Is that your question?
23 Q. Not quite.
24 So, in Carrier, there is an analysis of the
25 average distance between the overlay --

1 A. True.
2 Q. -- and the edges of the teeth, correct?
3 A. Right.
4 Q. You can perform that analysis without ever
5 identifying whether those edges correspond to
6 individual teeth by number, correct?
7 A. It depends what you use for edge detection
8 and contour detection.
9 Q. Right.
10 And it's possible to do that without using
11 contours that are too specific, correct?
12 A. That's not the combination I am providing.
13 The combination I am providing with Maninis is
14 actually making them category specific. We do not
15 just identify contours. We are also identifying
16 where each -- to which teeth -- to which tooth a
17 contour belongs to.
18 Q. Okay. I think I understand now.
19 So, regardless of whether you make the
20 determination of whether the required teeth are
21 present, or whether you determine the distance from
22 the overlay, the underlying analysis determines the
23 edges of individual teeth, correct?
24 A. You mean post analysis? No. Because the
25 edge detection has already provided that information.

1 I have an image I perform using Maninis edge
2 detection. The edges are defined. Maninis discloses
3 that, that those are category specific. The edges,
4 the contours tell me the teeth -- tooth number 1,
5 number 2, etcetera. So I'm using that -- those
6 contours for performing alignment.
7 So it's part of the process. It's achieved
8 at the same time. Once the alignment is done, I know
9 where the teeth are, whether a tooth is present or
10 not.
11 Q. You're aware that Salah teaches its own
12 methods for determining alignment of the acquisition
13 device, right?
14 A. Of course.
15 Q. In your combination, is -- are the techniques
16 employed by Salah being used, in addition to the
17 overlay and tooth number determination techniques from
18 Carrier, or are they being replaced?
19 A. What do you mean by they -- the alignment
20 technique?
21 Q. Sure.
22 Are you aware that in Salah, there's a
23 reference to the use of registration marks and
24 references that are aligned with them?
25 A. Yes.

1 Q. In your combination, are Salah's registration
2 marks being used in addition to the overlays from
3 Carrier?
4 A. It could be. That's not a limiting factor in
5 the -- in the claims. The registration technique used
6 is not specified there, so I don't think that's
7 limited.
8 Q. Okay. So we're -- sorry.
9 A. It could be any registration method used,
10 either one proposed by Salah or -- or Carrier.
11 Q. Your opinion is that a person of skill would
12 be motivated to make this combination, regardless of
13 whether the registration mark technique is used from
14 Salah, in addition to, or in place of the techniques
15 in Carrier?
16 A. Absolutely. A computer vision person, a
17 POSA, would know that registration is used to achieve
18 a certain goal, which is alignment of two sets of
19 data. Now, it could be used -- it could be using one
20 or the other, or could be both, you know, to improve.
21 Or for that matter, even add something to it. But
22 definitely combination of Carrier and Salah would
23 definitely put -- get the POSA to there, to that
24 point.
25 Q. If you could turn back to page 49 of your

1 declaration.
2 A. Yes.
3 Q. This addresses step 1(a') of Claim 1,
4 correct?
5 A. Yes.
6 Q. And Claim 1, step (a') recites, activation of
7 a image acquisition apparatus so as to acquire an
8 image called analysis image of said arch, right?
9 A. Yes.
10 Q. What -- well, let me put this way: In your
11 proposed combination, the image acquisition apparatus
12 is a mobile phone, correct?
13 A. It could be a variety of mobile devices,
14 mobile phone, cell phone, as specified by the two
15 references.
16 Q. Other than a mobile phone, cell phone, or
17 similar device, you haven't identified any other image
18 acquisition that would -- apparatus that would satisfy
19 that limitation, right?
20 A. I don't know what do you mean by "any other."
21 You know I -- I assume that everything that is
22 disclosed by Salah and Carrier are the image
23 acquisition devices that I'm considering.
24 Q. Did you consider what the -- let me rephrase
25 that.

1 You did not disclose in your report any
2 considerations that a POSA would need to account for
3 in selecting between different image acquisition
4 apparatuses, right?
5 A. That's because the '409 patent doesn't
6 disclose that any one of them for -- to be selected
7 either. I mean, I think that both Carrier and Salah
8 are referring to the same image acquisition apparatus
9 that '409 patent is referring to. I don't see in
10 Claim 1(a) saying that you need to use such-and-such
11 device.
12 Q. Okay. I see.
13 Okay. Because Claim A is referring -- sorry,
14 Claim 1, step 1(a') is referring to an image
15 acquisition apparatus without limitation, it isn't
16 important to your combination which image apparatus is
17 being used?
18 A. Yes. I think that a POSA would have a choice
19 of any one of the ones that are cited either in Salah
20 or Carrier.
21 Q. In your combination, the alignment techniques
22 of tooth overlays and identifying the presence of
23 individual teeth are -- those -- those processes are
24 being run on the image acquisition device, correct?
25 A. Not necessarily, no.

1 Q. You haven't identified any other device,
2 other than the image acquisition device, on which
3 these processes would run, right?
4 A. Actually '409 patent is referring to -- well,
5 I'm going to say some obscure terminology, deep
6 learning device. And I have some opinion on that,
7 what they -- on that.
8 But -- not my opinion. I rather -- I have to
9 say that I was instructed that that's a deep
10 learning -- you know, deep learning neural network.
11 But '409 patent is referring to another device; it's
12 called the "deep learning device."
13 Q. In forming this combination, is it your
14 opinion that a Person of Skill in the Art would be
15 motivated to perform the image acquisition and
16 analysis on the acquisition device?
17 A. Maybe, maybe not. It could be done either
18 way. It could have been done on the acquisition
19 device, or it could have been done on another machine,
20 shall I call it, or device that performs the image
21 analysis, and returns results to the acquisition
22 device.
23 Q. You haven't described anywhere in your
24 declaration the sending of images or analysis between
25 devices for purposes of carrying out the methods

1 described in the '409 patent Claim 1, right?
2 A. I have described sending messages. I have
3 described -- what I have been instructed what the --
4 the deep learning device is. And I have been -- I
5 have been considering that. The list is -- there are
6 these two devices that '409 patent is referring to.
7 Yes, I have been looking at them.
8 I'm not sure if I understand your question.
9 Yes, I have.
10 Q. The question in the opinions that you're
11 giving is what a person of skill would be motivated to
12 do, right?
13 A. Um-hum.
14 Q. Is that your understanding?
15 MR. ARGENTI: Objection, form.
16 A. Well, can you put more context into this?
17 BY MR. BLYTHE:
18 Q. Sure.
19 A. Excuse me.
20 Q. If you'd turn to paragraph 23 in your report
21 in the "Legal Standards" Section.
22 A. Yes.
23 Q. You were advised that a patent claim composed
24 of several elements is not proved obvious merely by
25 demonstrating that each of its elements were

1 independently known in the art, right?
2 A. Yes.
3 Q. You also advised that evaluating whether such
4 a claim would have been obvious, you may consider
5 whether there is a reason that would have prompted a
6 person of ordinary skill in the field to combine the
7 elements or the concepts from the prior art in the
8 same way as the claimed invention, right?
9 A. Yes.
10 Q. So my question is: Have you identified a
11 reason that would prompt a person of ordinary skill in
12 the field to perform the analysis on the acquisition
13 device?
14 MR. ARGENTI: Objection, form.
15 A. Well, my answer to you is that '409 patent
16 does not say that acquisition device and the deep
17 learning device are the same devices. So, a POSA
18 would have no problem seeing that; and therefore, use
19 Salah and Maninis to come up with this. Either on the
20 same device, or on two different devices.
21 There is nothing in '409 patent that says
22 deep learning device is the same as the acquisition
23 device. If so, please show me.
24 BY MR. BLYTHE:
25 Q. The analysis could be performed on the

1 acquisition device, correct?
2 A. Could.
3 Q. A person of skill would know that it could,
4 correct?
5 A. Sure.
6 Q. Would a person of skill be motivated to do
7 that?
8 MR. ARGENTI: Objection, form; relevance.
9 A. I mean, I don't know whether that -- the
10 answer to that question would be totally related.
11 Whether it's motivated to do it under acquisition
12 device, or on a separate device that's remotely
13 connected, it doesn't matter. It achieves the '409
14 patent requirements.
15 BY MR. BLYTHE:
16 Q. Okay. So whether or not a person of skill
17 would be motivated to do it on the device, or between
18 several devices, that doesn't affect your opinions in
19 this case?
20 MR. ARGENTI: Objection, form.
21 A. It -- not that it doesn't affect my opinion.
22 I'm just saying that '409 patent does not disclose
23 that the deep learning device, where the analysis of
24 the images are performed, is the same as the image
25 acquisition device. Nowhere in the patent it says

1 that.
2 BY MR. BLYTHE:
3 Q. Right. And I'm not talking about the patent.
4 I'm talking about your opinions about what a person of
5 skill would have been motivated to do. And I'm trying
6 to figure out whether you have considered what a
7 person of skill would be motivated to do with respect
8 to where the analysis is performed.
9 A. I have --
10 MR. ARGENTI: Objection, form; relevance.
11 A. I have considered that a person of skill
12 would be motivated to use Salah and Carrier, to
13 combine them to come up with the same as the '409
14 patent. And that setting could be that the two are
15 the same, the two devices, or it could be that they're
16 separate. So my analysis is -- is limited to that.
17 BY MR. BLYTHE:
18 Q. Why would a Person of Skill in the Art be
19 motivated to combine the teachings of Salah and
20 Carrier?
21 A. Well, as I mentioned in my declaration,
22 they're substantially the same subject area, and I
23 would say same subject area as the patent '409. So
24 why shouldn't be -- the person of skill think about
25 combining them? They're really the same area.

1 They're -- the minor differences are actually
2 complimentary.
3 Q. How are they complimentary?
4 A. Well, I give you an example. There are
5 certain details that are in one, and not in the other
6 one. For instance, as I said, they're both looking at
7 image acquisition, and then using some means of
8 performing an alignment so that they can send a
9 message to the user, accept or not accept the image.
10 And that process is described in both.
11 Except that, for instance, Carrier says use a
12 set point. It's very specific. It says, use set
13 points, and even gives examples of those set points.
14 Whereas, Salah is more implicit, this idea of using
15 set points.
16 Q. Carrier and Salah don't have the same set
17 points, right?
18 A. I don't know that. I mean, what do you mean
19 they don't have the same set points?
20 Q. Salah doesn't refer to a set point of average
21 distance from an overlay, correct?
22 A. Well, but it talks about performing
23 alignment. And then based on an alignment, accepting
24 an image. So I think it's implicit there that any
25 computer vision scientist would understand that if

1 you're aligning two images and say, okay, at this
2 point, it's acceptable, or it's not acceptable yet,
3 that means that you have some means of measuring that.
4 There's a value there, which is the set point.
5 Salah does not disclose that explicitly it's
6 doing that. Carrier does. It says here are some
7 examples that I'm showing. These are the numbers that
8 could have been, you know, such-and-such millimeter
9 distance, for instance, could be acceptable.
10 Q. Is it your opinion that a person of skill
11 would consider those analyses interchangeable?
12 A. This goes back to what I said earlier. I
13 think Salah and -- and Carrier are substantially
14 disclosing the same subject matter. So, you know,
15 I -- I think they are.
16 One could be substituted for the other one in
17 a sense. However, there are some -- some, you know,
18 details in one or the other that I think are
19 complimentary. I gave you an example.
20 Q. Other than that Salah and Carrier are
21 complimentary, is there any other reason a person of
22 skill would be motivated to combine their disclosures?
23 A. The motivation is coming from the fact
24 that -- not just complimentary. It's coming from the
25 fact that they're disclosing the same subject matter.

1 Disclosing basically the same technology. And the
2 fact that they're complimentary, one improves the
3 other one.
4 Q. Which -- I'm sorry.
5 A person of skill would understand which
6 reference improves which reference?
7 A. Both. Both ways. It's not just going in one
8 direction. So, for instance, Salah discloses use of
9 deep learning; whereas, Carrier does not. But Carrier
10 says that any image processing technique could be
11 used, which means that it does not preclude deep
12 learning. So it's -- that's what I mean, they have
13 complimentary details that would help each over.
14 Q. So, other than what you've just described,
15 are there any other reasons a person of skill would be
16 motivated to combine Salah with Carrier?
17 A. Isn't that enough, that they're the same
18 technology, describing -- solving the same problem,
19 and they have a lot of complimentary details?
20 I mean, that should be enough. I'm looking
21 for solving the same problem as the '409 patent, and
22 they're in the same subject area as at the '409
23 patent. And they're both together in the same subject
24 area, solving the same problem, with some additional
25 complimentary details that would help each other. I

1 think that's more than enough for POSA to say, yes,
2 I'm going to pick Salah, combine it with Carrier, and
3 come up with the solution.
4 Q. Turn briefly -- we're going to come back to
5 this, but I want to turn to where you address Claim 11
6 in your declaration, which is at page 112.
7 A. Yes.
8 Q. Claim 11 depends from Claim 1, correct?
9 A. Yes.
10 Q. And you understand that that means that to
11 practice Claim 11, you practice all of the limitations
12 of Claim 1, in addition to the limitation disclosed in
13 Claim 11?
14 A. Yes.
15 Q. So, is it fair to assume that the combination
16 you have proposed for Claim 1 will be the same
17 acquisition apparatus analysis, the same
18 determination, steps 1-A through E are going to be the
19 same ones performed when performing Claim 11?
20 A. Yes.
21 Q. Okay. And in Claim 11, it further requires
22 that the acquisition apparatus is a cell phone, right?
23 A. Yes.
24 Q. And you indicate that both Carrier and Salah
25 disclose an image apparatus that's a cell phone,

1 correct?
2 A. Yes.
3 Q. And do you identify any reason why a person
4 of skill would be motivated to practice the method of
5 Claim 1 where the acquisition apparatus is a cell
6 phone?
7 A. Can you rephrase your --
8 Q. Sure.
9 A. -- your question?
10 Q. In this combination --
11 A. Um-hum.
12 Q. -- for Claim 11, a person of skill is
13 practicing the limitation of Claim 1.
14 A. Yes.
15 Q. Further, the acquisition apparatus is a cell
16 phone, right?
17 A. Yes.
18 Q. What -- what would motivate a person of skill
19 to practice the Carrier, Salah, Maninis combination
20 with a cell phone as the acquisition apparatus in
21 particular?
22 A. Well, both Salah and -- and Carrier are
23 disclosing that as an image acquisition device. So,
24 why not? I mean, a POSA would say, I can do it on a
25 cell phone.

1 Q. You were just telling me that they also
2 disclose other devices that aren't cell phones, or am
3 I wrong about that?
4 A. No. They disclose similar mobile devices,
5 yes.
6 Q. Okay. So Carrier and Salah only disclose
7 mobile devices as the acquisition apparatus?
8 A. Not only. They -- they disclose -- okay.
9 They disclose cell phone also. That's what I meant.
10 Q. Okay. So Carrier and Salah only disclose
11 mobile devices and/or cell phones, correct?
12 A. Right.
13 Q. Okay. Is there a reason that a person of
14 skill would be motivated to use a cell phone in
15 particular, as opposed to other mobile devices?
16 A. Well, is there a reason why it shouldn't be
17 motivated? I'm saying that -- I mean, one could think
18 of that -- that was the trend. Cell phones are the
19 most powerful handheld devices; and therefore, they
20 could be used.
21 I don't see any reason why a POSA shouldn't
22 be motivated -- if Salah is proposing it, and Carrier
23 is proposing it, why shouldn't POSA think of the same
24 thing?
25 Q. In your proposed combination of Salah,

1 Carrier, and Maninis, are the images being analyzed by
2 the deep learning device in real time?
3 A. Yes, that's the disclosure of the '409
4 patent, yes.
5 Q. So a Person of Skill in the Art would be
6 motivated when combining Salah, Carrier, and Maninis
7 to analyze the images in real time?
8 A. Yes.
9 MR. ARGENTI: Objection, form.
10 BY MR. BLYTHE:
11 Q. What is your understanding of the term "real
12 time"?
13 A. Well, that's where the ambiguity comes in.
14 It's not my understanding. The definition of real
15 time is not given in the -- in the actual document,
16 you know, the '409 patent for references.
17 I am not going to guess what they mean by
18 real time. So, I leave it there. I mean, they don't
19 say what real time is. There are no intrinsic
20 evidence in reading the '409 patent what real time is,
21 and by other references. They just say "real time."
22 So, I leave it there. You know, any interpretation I
23 do, would be my interpretation, not theirs.
24 Q. Sure.
25 What would be a Person of Skill in the Art's

1 interpretation of real time be in the context of your
2 opinion that a Person of Skill in the Art would be
3 motivated to perform the analysis in real time?
4 A. Well, as I said, that -- I cannot give a
5 straightforward answer to that, because they all
6 disclose that, that they can do it in real time. So,
7 the -- the only thing I can say is the person of
8 ordinary skill would say that, okay, you know, Carrier
9 is doing real time, so I can use it.
10 Q. Did you have an understanding -- let me
11 rephrase that.
12 Would a person of skill combining these
13 references have an understanding of what it means to
14 perform the analysis in real time?
15 A. Again, that's very -- you know, the word
16 "real time" is not a well-defined term. And even less
17 so within the context of these documents, you know.
18 So, I leave that interpretation to -- to the word
19 "real time," just to that word. You know, I don't
20 want to add or subtract anything from it, you know.
21 And I think a POSA would have the same
22 approach, you know, that they -- they all say they can
23 do it in real time. So, I mean, that would be enough,
24 you know. They're all disclosing the same
25 information.

1 Q. Could you turn to page 116 of your report?
2 A. Yes.
3 Q. And page 116, starting at paragraph 226, you
4 address Claim 14, right?
5 A. Um-hum.
6 Q. Claim 14 of the '409 patent also depends from
7 Claim 1, right?
8 A. Yes.
9 Q. And 14 says the method as claimed in Claim 1
10 in which said analysis image is analyzed and checked
11 in real time, right?
12 A. Yes.
13 Q. And it's your opinion that a person of skill
14 would be motivated to combine Salah, Carrier, and
15 Maninis, such that the analysis image is analyzed and
16 checked in real time, right?
17 A. Yes.
18 Q. Did you have an understanding of what the
19 term "real time" means in the context of Claim 14?
20 A. I -- I did not interpret it more than what it
21 says. The only thing I looked at was that Carrier had
22 disclosed the same information, real time. And I have
23 pointed out that same thing with Salah.
24 Q. Are you able to give me an example of
25 analysis of an image that is not in real time?

1 MR. ARGENTI: Objection to form.
2 A. Again, it's the -- you're asking the same
3 question in the opposite direction. I'm saying that
4 in the context of '409 patent, and the documents of
5 the prior arts use, the word real time is not defined
6 in terms of how much time. So you're asking me now to
7 do the opposite, tell me what is not real time. So
8 it's the same question you're asking. No, I'm just
9 repeating myself now.
10 Is that -- that is not disclosed, neither by
11 '409, nor by any of the prior arts. So -- but they're
12 both -- they're all saying that they're doing it in
13 real time. And I'm saying that a POSA would say,
14 okay, you know, if I combine Carrier with Salah, I'm
15 going to achieve that real time.
16 BY MR. BLYTHE:
17 Q. Did you have an understanding of the scope of
18 the term "real time" when you analyzed the obviousness
19 of Claim 14?
20 MR. ARGENTI: Objection, form.
21 A. I don't understand what you mean by "scope of
22 the term real time."
23 BY MR. BLYTHE:
24 Q. Sure. Let me clarify that.
25 When you analyzed the obviousness of

1 Claim 14, did you have an understanding of what
2 analysis would be in real time, and what analysis
3 would not be in real time?
4 A. I don't think I needed to know -- to consider
5 that, what analysis is real time, what analysis is not
6 real time, in order to combine Salah with Maninis.
7 All I needed to consider is that both Salah and
8 Maninis are disclosing the same information, the exact
9 same information that they are performing these
10 analysis in real time.
11 Q. So with respect to how you determined that
12 the combination is, in fact, happening -- analyzing in
13 real time, you're just relying on the reference to
14 real time in the references?
15 A. So does the '409 patent. They don't disclose
16 what they mean. They don't put any scope on the '409
17 patent, so why should I use -- you know, I tried to do
18 that, rather, on Salah or Maninis. I'm sorry, on
19 Carrier.
20 Q. Yeah. So, we'll debate the disclosure of the
21 patent another time. But I'm asking: For you, when
22 you analyzed this, are you just relying on the
23 references referenced to real time?
24 MR. ARGENTI: Objection, form.
25 A. Well, I'm relying on Salah and Maninis -- I'm

1 sorry, on Salah and Carrier, to say that this -- that
2 the disclosure of real time in '409 patent was
3 obvious.
4 BY MR. BLYTHE:
5 Q. So is it fair to say that you understood that
6 the analyses that are disclosed as happening in real
7 time in Salah and Carrier also fall within analyzing
8 real time within the scope of Claim 14?
9 A. I would say that there's a direct mapping,
10 yes, between what Salah discloses or Carrier discloses
11 as real time, maps directly to what '409 patent
12 discloses in real time.
13 Q. Okay. Is it your opinion that a person of
14 skill would understand performing an analysis and
15 check in real time is an advantage?
16 MR. ARGENTI: Objection, form.
17 A. What do you define as "an advantage"?
18 BY MR. BLYTHE:
19 Q. A person of skill practicing the combination
20 of Salah, Carrier, and Maninis, would that person of
21 skill consider it advantageous in that combined method
22 to conduct the analysis in real time?
23 MR. ARGENTI: Objection, form.
24 A. I don't think that that is -- you know, that
25 affects the issue, that real time is disclosed by both

1 prior arts in the same manner as the '409 patent
2 discloses. '409 patent, I don't believe, says it's an
3 advantage or disadvantage. Neither do the other
4 references.
5 BY MR. BLYTHE:
6 Q. So I'm not asking about whether it affects --
7 whether it's the same discloser.
8 I'm just asking: Would a person of skill
9 practicing Salah, Maninis, and Carrier consider it
10 advantageous to perform that analysis and check in
11 real time?
12 MR. ARGENTI: Objection, form.
13 A. I don't know. I mean, again, the word
14 "advantage," it appears -- does not appear in any one
15 of those references, including the '409 patent. And
16 I'm not sure why -- why that issue is -- and even -- I
17 mean, besides the fact that the word "advantage" would
18 mean anything. It's such a broad term. What is an
19 advantage, you know? Advantage in what sense, you
20 know?
21 So, the answer to your question is a little
22 bit difficult, you know. I mean, what is an
23 advantage? I don't know. I mean --
24 BY MR. BLYTHE:
25 Q. Can you think of an advantage of performing

1 the analysis and check in real time in the combination
2 of Salah, Carrier, and Maninis?
3 A. I may be able to think of some advantages in
4 doing it real time. But again, as I said, that not --
5 that's not a central issue recognized by any of the
6 references, or --
7 Again, I'm -- I'm repeating myself. The word
8 "advantage" could mean anything. I mean, what is an
9 advantage? I don't know.
10 BY MR. BLYTHE:
11 Q. You said you'd be able to think of some
12 advantages of doing it in real time. What advantages?
13 A. Well, it means that it's faster than normal,
14 real time.
15 Q. How is that advantageous?
16 A. That's what I said, that -- that's why I'm
17 saying that. I don't even know there's a right answer
18 to your question. So, what is advantage? So that's
19 why I was not answering that question. But you asked
20 me to give you an example, so, okay, here is a
21 possible example I could think of.
22 Is that an advantage? I don't know. Whether
23 it's an advantage in the context of here (indicating),
24 no, necessarily. I have -- I don't know. I don't
25 know what an advantage is.

1 Q. Would a person of skill be motivated in
2 practicing the combination of Salah, Carrier, and
3 Maninis to perform the analysis in real time?
4 A. Sure.
5 Q. And why is that?
6 A. Because they're disclosing that. They're
7 disclosing that we can do it in real time, they said,
8 okay.
9 Q. Is a person of skill motivated --
10 Sorry, did I -- were you done?
11 A. No, I'm done.
12 Q. Okay. Let me start over.
13 Is the person of skill motivated to carry out
14 whatever Carrier, Salah, and Maninis say, or would a
15 person of skill consider their own objectives,
16 knowledge, and experience?
17 MR. ARGENTI: Objection, form.
18 A. I think in many ways, both. I mean, a person
19 of ordinary skills has the experience, knowledge, that
20 would use to combine those two; therefore, you know --
21 and whatever is disclosed there, they would use their
22 skills to combine them. They both come into play.
23 BY MR. BLYTHE:
24 Q. So if Carrier, Salah discloses these
25 techniques as preferable or advantageous, a person of

1 skill is going to rely on that disclosure?
2 MR. ARGENTI: Objection to the form.
3 A. I disagree with that. It's not because Salah
4 says that, for instance, some method is not
5 preferable -- preferable, it doesn't mean that POSA
6 would disregard it, no. I disagree with that.
7 BY MR. BLYTHE:
8 Q. So, how would a POSA determine whether it's
9 desirable or undesirable to perform the analysis and
10 check in real time versus any other time?
11 A. Well, the -- you know, a POSA would -- if --
12 you know, the -- you know a -- let's say Salah is
13 saying that this is preferable to -- to another
14 possible option, I think that -- but not saying that
15 disregard completely the other option, I think the
16 POSA would try both, and find out what can be
17 achieved.
18 Q. Other than Carrier and Salah's reference to
19 real time analysis, are you able to identify in your
20 declaration anything that would motivate a person of
21 skill to perform the analysis and check in real time,
22 when practicing your combination of Salah, Carrier,
23 and Maninis?
24 A. Why should I rely on any other references?
25 Those are my main references on dental imaging and

1 analysis. So they both say that they can do in real
2 time. I rely on them.
3 Q. I'm not trying to suggest an answer to you.
4 I just need to know yes or no, whether you have one.
5 So, other than Carrier and Salah's references
6 to real time analysis, are you able to identify in
7 your declaration anything that would have motivated a
8 person of skill to perform the analysis and check in
9 real time when practicing your combination of Salah,
10 Carrier, and Maninis?
11 A. No. I think Salah and Carrier actually
12 disclosing that, and that that's enough motivation for
13 a POSA to say, okay, I'm going to try to do this in
14 real time.
15 Q. It's your opinion that a Person of Skill in
16 the Art would be motivated to use the convolutional
17 neural network described in Maninis to carry out the
18 alignment techniques disclosed in Carrier; is that
19 accurate?
20 MR. ARGENTI: Objection, form.
21 A. In my view is that both Salah and Maninis are
22 proposing deep learning as a tool to perform analysis
23 of the images, and the person of ordinary skill would
24 be motivated to combine them.
25

1 BY MR. BLYTHE:
2 Q. You have not identified the deep -- the
3 reference to deep learning in Salah as satisfying the
4 limitations of Claim 1, element (b'), correct?
5 A. Can you refer to my declaration?
6 Q. Yeah. It's on page 53.
7 A. Yes.
8 Q. So you identify that -- let me get to the
9 right point here.
10 In paragraph 101, you indicate that Salah
11 teaches that its contour detection may employ any
12 variety of known methods, including object detection
13 and deep learning, correct?
14 A. Yes.
15 Q. In Salah, the object detection and deep
16 learning analyses are not being used to guide image
17 acquisition, correct?
18 A. No, that's incorrect. Those analysis are
19 used to send a message to the user to do the correct
20 image acquisition. That's -- that's completely wrong.
21 The entire image acquisition is based on those image
22 analysis.
23 You told me earlier yourself that the claims
24 in -- you know the -- in Claim 1, those steps are
25 interrelated. So it's not like that, oh, we do some

1 image analysis, and it's not used for alignment. On
2 the contrary -- in fact, it's the purposes of this --
3 of this -- of all of these, you know, references; both
4 the '409 patent, and the -- and Salah and Carrier,
5 that they use the image analysis to send a message to
6 the user, to tell him or her that -- to point in a
7 direction where the -- and to align the imaging
8 apparatus in such a way that the correct image -- an
9 acceptable image is taken.
10 Q. So I fully appreciate that that is the
11 analysis and the steps set forth in the claims of the
12 '409 patent. I'm asking specifically about the Salah
13 reference. The analysis that -- let me rephrase that.
14 In Salah, the reference to deep learning --
15 and we'll take a look at this in a minute. But the
16 reference to deep learning in Salah is part of
17 determining what it calls "discriminant information,"
18 do you recall that?
19 A. I do recall that, yes.
20 Q. Salah never indicates that discriminant
21 information is used to form a message to guide image
22 acquisition, correct?
23 A. That's incorrect to my opinion.
24 Q. Looking at --
25 I'm sorry. Please.

1 A. Yeah.
2 So, as I -- as I said, it's not like we are
3 dealing with independent steps. Salah is disclosing
4 that that step is used to determine, you know, whether
5 your image is acceptable or not, which means that they
6 are using that to send a message.
7 Q. Looking at this section of your declaration,
8 starting at page 53 where you address the analysis of
9 step (b'), can you please identify for me where you
10 have indicated that Salah's analysis that includes
11 deep learning is used to inform -- you know what,
12 scratch that. Let me switch -- switch gears here.
13 In Section 1(e) on page 68. Sorry, in (e'),
14 starting on page 68 of your declaration.
15 A. Yes.
16 Q. In this section, you address step (e'), which
17 addresses sending an information message, etcetera,
18 right?
19 A. Yes.
20 Q. On page 69, you identify several instances of
21 messages in Salah, correct?
22 A. Yes.
23 Q. Your only citation to Salah is in page 27,
24 line 21 to page 28, line 2, correct?
25 A. My only citation? Oh, yes. Okay. Yes.

1 Q. Okay. And we'll -- we'll take a look at
2 Salah itself in a minute, and we'll pay attention to
3 that section.
4 Salah does not disclose training by means of
5 a learning base, correct? Or sorry, let me phrase
6 that better.
7 Salah does not disclose a deep learning
8 device trained by means of a learning base, correct?
9 A. Salah discloses that deep learning can be
10 used for one of their steps. And a POSA would know
11 that the deep learning -- deep learning and machine
12 mission -- and machine learning had to be trained
13 first before you can use it. Yeah, that would have
14 been a -- you know, a POSA's knowledge.
15 I'm sorry, how can you use deep learning if
16 you have not trained it? So, as simple as that. So
17 basically, all of the publications prior to Salah,
18 when deep learning became popular, are disclosing that
19 information. So POSA would have known by the priority
20 date that if deep learning is mentioned, a training
21 has happened somewhere.
22 Q. Can you turn to paragraph 84 of your
23 declaration? It's on page 45.
24 A. Oh, paragraph 84?
25 Q. Yeah, page 45.

1 A. Page 45. Yes.
2 Q. And if you want to look at page 40, you'll
3 see this is in the context where you're addressing the
4 combination of the three references; is that correct?
5 A. Yes.
6 Q. Okay. In paragraph 84, you note that -- in
7 the middle, you say, "Carrier expressly invites the
8 incorporation of various possible techniques into his
9 apparatus, teaching that its edge detection can be
10 achieved using any appropriate technique, e.g., edge
11 detection imaging processing, etcetera."
12 Do you see that?
13 A. Yes.
14 Q. Am I understanding correctly that a person of
15 skill would read Carrier's reference to the use of any
16 appropriate technique as motivating the use of
17 different techniques in what is disclosed in Carrier?
18 A. Different techniques that are disclosed in
19 Carrier?
20 Q. That are not disclosed in Carrier.
21 A. My understanding is that -- I think your
22 understanding -- my understanding is that it leaves it
23 open. So, any technique could be used, and they say
24 that in the very sentence you read. It said edge
25 detection image processing, etcetera. So that does

1 not limit what method is used.
2 Q. When you say "expressly invites," you mean
3 leaves open the possibility?
4 A. Yes.
5 Q. Okay. That technique has to be appropriate
6 for achieving edge detection in the context of
7 Carrier, correct?
8 A. What is your definition of "appropriate"?
9 Q. Whatever Carrier means by "appropriate,"
10 right?
11 A. I mean, I'm not sure what Carrier says is
12 appropriate. I think Carrier says that, you know, any
13 edge detection image processing, etcetera. It doesn't
14 talk about appropriateness.
15 Q. Well, it invites -- it says you can use any
16 appropriate technique, for example, edge detection
17 imaging processing, correct?
18 A. Oh, I see. You're referring to -- yes, I
19 think by "any appropriate technique" there, they mean
20 that there's a wide variety of tools available. Any
21 one of them, you can use.
22 Q. That disclosure is specific to edge detection
23 techniques, correct?
24 A. Well, you know, the -- it's a little bit
25 tricky to answer that question. Because although it

1 just says edge detection image processing, but edge
2 detection in the context of the -- the -- in the
3 context of combining Salah, Carrier, and Maninis, it
4 is way more than that. Edge detection, I described
5 this in -- earlier in my declaration.
6 What edge detection meant 20 years ago is not
7 the same as what edge detection means at the priority
8 date of the '409 patent. By the priority date of the
9 '409 patent, edge detection implied category-specific
10 edge detection, to be clear. It implied that there is
11 more to it than just the binary image output.
12 So it could be interpreted that -- you know,
13 that sentence, any appropriate technique, e.g., edge
14 detection image processing, at that point in time, it
15 could be a semantic edge detection.
16 Q. It's your understanding -- it's your
17 understanding that a person of skill, as of July 2017,
18 would understand the reference to edge detection to be
19 the detection of semantic contours?
20 A. It could be, yes. And I think it would be in
21 that direction. Yes.
22 Q. Okay. So a person of skill would understand
23 a reference to edge detection as being object
24 specific?
25 A. By the priority date, yes.

1 Q. Okay. Can you indicate for me where you've
2 provided that opinion in your declaration?
3 A. Well, everywhere that I talk about Maninis.
4 And, in fact, at the very beginning of my declaration,
5 I also -- when I talk about edge detection, I say that
6 edge detection -- I find -- I expand on that. I say
7 that edge detection, prior to deep learning, was
8 basically a mapping from high-definitional space to a
9 binary space.
10 So basically the output image is indicating
11 whether a pixel is an edge or not an edge. But I'm
12 saying that we moved away from that concept, and it
13 became -- as deep learning, you know, appeared, we
14 moved more towards semantic, or category-specific edge
15 detection.
16 Q. You address this in paragraphs 35 to 37?
17 A. Paragraph 37? Yes, among other places, that
18 is correct, yes.
19 Q. Okay. And --
20 A. Wherever I talk about Maninis, I address that
21 again. I specifically say that this is what Maninis
22 is disclosing.
23 Q. And you're comparing the type of semantic
24 contours in Maninis to what you've described here as a
25 classical edge detection? Is that the right

1 terminology?
2 A. No, no, no, the other way around. By
3 "classical edge detection," I mean it would be mapping
4 from some high-definitional image space to a binary
5 space. Whereas, more recent, I would say by the
6 priority date of the '409 patent, they are moving away
7 from that concept towards more category-specific
8 contours.
9 Q. Right. Sorry. I might have misspoke.
10 I meant to say, you're contrasting the
11 contours of Maninis with the older technique that
12 you're calling classical edge detection?
13 A. I do that, and Maninis himself does it.
14 Q. Sure.
15 A. At the very beginning of the -- the paper,
16 they say, hey, this was prior to our --
17 (Phone interruption.)
18 A. So it says that prior to a certain time, in a
19 prior work, which I call "classical edge detection,"
20 it was not category specific. So they say, okay, we
21 are -- we've have moved into a new era. And in the
22 era of deep learning, we are dealing with the category
23 specific.
24 Q. And that also corresponds to the kind of
25 categorized -- the categories you referenced with

1 respect to David Marr as between low-level and
2 high-level vision problems; is that fair?
3 A. No, no, no. No, no. This is completely
4 out -- not in -- David Marr was a very well-known
5 scientist who published seminal work saying that he
6 was a psychologist. And he published influential work
7 on how human vision analyzes the visual stimulus.
8 And --
9 (Phone interruption.)
10 A. That has inspired a lot of scientists in the
11 area of computer vision. That's what I'm talking
12 about. Yeah.
13 The reason I mentioned David Marr's work
14 there is because he basically came up with a theory,
15 and said this is a hierarchy of vision system, that
16 that's how humans do. And he argued that humans do
17 that almost simultaneously.
18 The reason I mentioned that, I'm saying that
19 prior to deep learning, most of the techniques that
20 were developed were kind of handling these three
21 levels separately most of the time. And I'm -- people
22 were trying to put them together, you know, as
23 individual pieces.
24 Whereas, deep learning basically overcame
25 that, and made it more human like, you know, and

1 end-to-end learning, so that all of these levels are
2 processed simultaneously within the deep learning.
3 MR. ARGENTI: We've been going over an
4 hour --
5 MR. BLYTHE: Yeah.
6 MR. ARGENTI: -- does it make sense to take a
7 break?
8 MR. BLYTHE: Let's take a break, sure.
9 (A recess was taken beginning at 11:21 a.m.,
10 and ending at 11:37 a.m.)
11 BY MR. BLYTHE:
12 Q. In your declaration, you identified deep
13 learning as a trend in July of 2017?
14 A. Yes.
15 Q. You've not identified anywhere in your
16 declaration indicating that deep learning was a trend
17 in dental and orthodontic imaging, correct?
18 A. Correct. Not specifically dealing with
19 dental imaging.
20 Q. You hadn't identified anywhere in your
21 declaration that deep learning was a trend for mobile
22 applications in 2017, right?
23 A. Can you rephrase that question? Did you say
24 that I have not identified it for mobile applications?
25 Q. Yes.

1 A. Well, I disagree with that. I didn't say
2 what area. I said in general term, deep learning. I
3 didn't specifically, for instance, say this
4 application or that application. I said in general,
5 that was the trend.
6 And let me actually clarify. By "trend," I
7 mean not fashion trend. But that it had so much
8 advantages that people move towards that.
9 Q. In your combination of Salah, Carrier, and
10 Maninis, is the convolutional neural network disclosed
11 in Maninis operating on the image acquisition device?
12 A. I think I answered this question earlier. So
13 as I said, '409 patent is disclosing that there is
14 these two separate devices. So there's the image
15 acquisition device, and the deep learning device.
16 Now -- so, Salah and Carrier do not say where it
17 should be operated. Is it going to be on the image
18 acquisition device, or could it be on a separate
19 platform? So there's no disclosure of that. So I
20 would say it's either/or. You know, there is no
21 preference given to either option.
22 Q. Other than the mobile devices or cell phones
23 of Salah or Carrier, you haven't identified any other
24 hardware on which the convolutional neural network in
25 Maninis would operate, right?

1 MR. ARGENTI: Objection, form.
2 A. That's not true. I mean, I just said that
3 this contradicts -- what you said contradicts what I
4 said just before answering this question. Is that the
5 compilation of the neural network basically, which as
6 I said, I was advised is the same as the deep learning
7 device, does not have to be the same device as the
8 acquisition device.
9 So there's no disclosure of that in the '409
10 patent that they have to be the same device. So,
11 therefore, no, that's not true. The answer to your
12 question is that, no, it could be on a separate
13 platform.
14 BY MR. BLYTHE:
15 Q. Right. So that's actually -- I was actually
16 asking a different question.
17 A. Um-hum.
18 Q. I was asking: You haven't identified in your
19 declaration what separate platform that would be,
20 correct?
21 MR. ARGENTI: Objection, form.
22 A. Well, it's, I think, implicit. Even if I
23 don't say "computing device," deep learning device is
24 understood that it is running on a computing device.
25 It could be any computing device. But it doesn't have

1 to be the same as the image acquisition device.
2 BY MR. BLYTHE:
3 Q. If the -- let me start with this: You'll
4 understand if I say "CNN," I mean convolutional neural
5 network today?
6 A. Yes.
7 Q. Okay. Does CNN in Maninis, if it is running
8 on a different computer device of some kind than the,
9 say, mobile device that's being used as the image
10 acquisition apparatus, you haven't described anywhere
11 in your declaration as to how the analysis and the
12 image would be exchanged between those two devices,
13 correct?
14 A. I haven't disclosed that because I didn't
15 think there was any need for that, because even the
16 '409 patent doesn't disclose that. It doesn't say how
17 the communication are occurring between the image
18 acquisition device and the deep learning device. It
19 just says that they are there, and they each do their
20 part.
21 And Salah also practically discloses the same
22 information. And I thought the combination of Carrier
23 and Salah, with Maninis, would make '409 patent
24 obvious.
25 THE STENOGRAPHER: What was that last part,

1 "would make for"?
2 THE WITNESS: "It would make the '409 patent
3 obvious."
4 THE STENOGRAPHER: There we go. Thank you.
5 BY MR. BLYTHE:
6 Q. So because the -- because the '409 patent
7 doesn't disclose how any such connection would occur,
8 you also didn't consider how a person of skill would
9 choose to interconnect these different devices?
10 A. I think it's left open in the '409 patent.
11 And so, it's also in Salah. So a POSA would be free
12 to choose his or her own method.
13 Q. It's also left open in your declaration,
14 correct?
15 A. Because I did not see any need to address
16 that in the context of obviousness.
17 Q. And can you turn to paragraph 150 on page 79
18 of your report?
19 A. Yes.
20 Q. And do you see starting on page 78 that in
21 this portion of your declaration, you're addressing
22 Claim 3 of the '409 patent?
23 A. Yes.
24 Q. In paragraph 150, you say, "With regard to
25 the images being images of dental arches or historical

1 images, a POSA would have understood that this would
2 be a routine manner of adapting Maninis' contour and
3 object detection device to Carrier's dental imaging
4 apparatus."
5 Do you see that?
6 A. Yes.
7 Q. What do you mean by "adapting Maninis'
8 contour and object detective device"?
9 A. I mean combining it with Salah and Carrier.
10 Q. Would it need to change in any way to be
11 combined with Salah and Carrier?
12 A. Well, the only change -- it's not a change.
13 But the only change that the -- the POSA would have
14 done is to train on dental imagery. And in fact, in
15 paragraph 150, that's what I mean by adapting. It
16 means -- all I mean that -- taking the -- what Maninis
17 is proposing and converting it to perform the same
18 tasks on dental imagery. So, for that, the POSA would
19 have know that you had to train the model in dental
20 imagery.
21 Q. Okay. While we're on the subject of Claim 3,
22 I wanted to confirm in your proposed combination where
23 the deep learning device is the CNN in Maninis, and it
24 has to be trained by means of a learning base. The
25 learning base in your combination comprises at least

1 10,000 dental images acquired with a mobile device or
2 cell phone, correct?
3 MR. ARGENTI: Objection, form.
4 A. Not really. I did not put any limiting terms
5 of "at least." What I said is those are possibilities
6 that, you know, those references are referring to.
7 But I didn't say "at least."
8 BY MR. BLYTHE:
9 Q. Okay. So a person of skill might choose a
10 different number of images for the deep learning?
11 A. May or may not. So based on the knowledge
12 that they have about deep learning.
13 Q. Do you have an opinion about what they --
14 choice they would make based on a person of skill's
15 knowledge about deep learning?
16 A. I don't think I need to have an opinion on
17 that. But I'm -- you know, I think that's left open
18 again, so I left it open.
19 Q. In your combination -- sorry.
20 In your combination, a person of skill, who
21 is training the CNN of Maninis with a learning base
22 appropriate for practicing the claims in this patent,
23 would annotate on the -- the historical images
24 semantic contours identifying each tooth in the image,
25 correct?

1 A. I -- I -- I'm not sure if I understand your
2 question. Can you repeat the question?
3 Q. Sure.
4 So, in the context of '409 patent Claim 1 --
5 A. Um-hum.
6 Q. -- limitation (b') requires analysis of the
7 analysis image by means of a deep learning device
8 trained by means of a learning base, right?
9 A. Um-hum, yes.
10 Q. That learning base comprises historical
11 images of patient's teeth, right?
12 A. Right.
13 Q. And in order for those images to train the
14 deep learning device, they need to include some other
15 kind of information; in this case, contours of teeth,
16 correct?
17 A. Actually, it would require labeling --
18 Q. Labeling.
19 A. -- of the image segments.
20 Q. That's probably my -- my mistake with the
21 terminology.
22 So, you would label the historical images in
23 the learning base with semantic contours identifying
24 each tooth, correct?
25 A. Semantic contours which are the output of the

1 neural network. You would do labeling. So label here
2 is basically synonymous to what is referred to in this
3 prior attributes or in the attributes. So those
4 attributes are two categories; image attributes, and
5 teeth attributes.
6 Q. Okay.
7 A. So image attributes, it would just be a label
8 to the entire image overall. And the teeth attributes
9 within an image, you would come for the -- for the
10 historical set would come by label -- labeling the
11 images.
12 Q. Just so I understand the terminology, if you
13 label an image, identifying the boundaries associated
14 with each tooth, I understand now that as an output of
15 the neural network, you would call that identification
16 semantic contours.
17 Is there a name for what you would call
18 making those labels on the training images?
19 A. No, it's called "labeling." So, Maninis
20 discloses that the -- the VOC dataset that they
21 mentioned for training the -- their neural network,
22 they say that it has a pixel-wise label, which means
23 that basically, that image segmented, saying this
24 pixel belongs to this object. They do that for every
25 pixel. It already includes that label.

1 Q. Okay.
2 A. It may include a global image label also.
3 Like, for instance, cat, dog. Okay, this is an image
4 of a cat. That's called an "image label." We call
5 that "image label," what the patent is describing. So
6 labeling is basically in the context of Maninis, is
7 the pixel-wise label, where it describes for each
8 region what object is there.
9 Q. Okay. It's also possible to have a deep
10 learning device trained on a learning base where the
11 training images have the pixel-wise boundaries or
12 edges identified, but not identified as pertaining to
13 a particular object, correct?
14 A. No, that is not correct.
15 Q. Okay.
16 A. So the -- in the context of Maninis, as
17 Maninis discloses, is that each region -- every pixel
18 in each region is associated with some semantic
19 attributes. You know, for instance, a semantic
20 attribute would be cat.
21 Of course within the computer, that would be
22 a value, a number. Like 1, which means -- the machine
23 knows "1" means cat. So -- so, it's not -- it's
24 actually the opposite of the scenario that you
25 described. And the pixels would have the label saying

1 that what object or category of objects would be
2 there.
3 Q. Okay. I think I understand the terminology
4 now.
5 A. Um-hum.
6 Q. And so, with that, does the -- the training
7 images -- sorry, the historical images that comprise
8 the learning base in your combination have pixel-wise
9 annotations identifying each tooth in the image; is
10 that correct?
11 A. Yes. And it could also -- the whole image
12 could have an image attribute based on that.
13 Q. Okay. And that image attributes could be --
14 well, is that image attribute -- let me take that
15 back.
16 You've identified one possible image
17 attribute as being the set or list of teeth that are
18 identified in an image. Is it your opinion that that
19 would be labeled in the training images separately
20 from the pixel-wise contours of teeth, or that that
21 would just be determined as a result of the analysis
22 by the deep learning device?
23 A. You're confusing two separate parts of CNN or
24 deep learning.
25 Q. Sure.

1 A. The one is the training set that has the
2 labels.
3 Q. Yeah.
4 A. And the output of the deep learning device,
5 when you run it on unseen images --
6 Q. Um-hum.
7 A. -- in other words, images that are not
8 labeled.
9 Q. Right.
10 A. And the word "unseen" has many -- extended
11 meaning. But when we are into that, it will return
12 whatever labels that you initially have in your
13 training set.
14 Q. Right.
15 A. So if your training set has both image
16 labels, and the region labels, the machine learns how
17 to return both of them.
18 Q. Yeah.
19 And in your combination, specifically with
20 respect to identifying which teeth are visible on the
21 image, what I'm trying to determine is, in your
22 combination, is the person of skill identifying in the
23 training image the pixel-wise contours, the deep
24 learning device is analyzing them, and the result of
25 that analysis would be in an unseen image. The

1 contours identified as belonging to each tooth,
2 subsequently to be rolled up into a list of here are
3 the teeth that are in this image; is that correct?
4 A. You can consider it -- if you want to put it
5 sequentially, you could consider it that way, yes.
6 Q. Okay. It would be a potential different
7 outcome, right, if the images, instead of being the
8 training images, instead of being labeled with
9 pixel-wise semantic contours, would apply a global
10 attribute that just says this image contains the
11 following teeth, and you could train a learning device
12 on that, right?
13 A. Yes, you could. As I said -- I mean, let's
14 go to a general scenario. The deep learning learns to
15 return the attributes or labels in the proper
16 terminology. Labels --
17 Q. Right.
18 A. -- of unseen images.
19 Now if your training set contains image
20 labels and regional labels -- in this case, a tooth
21 label, then it will -- when you train it, it learns
22 how to return both of them.
23 Q. Um-hum, right. And that's what I'm trying to
24 get to, is: In your combination, would a person of
25 skill be motivated to apply both region and global

1 image labels to be historical images in the learning
2 base, or are they only applying the regional labels
3 because other information can be derived from the
4 analysis?
5 MR. ARGENTI: Objection, form.
6 A. I think that would not -- whether the person
7 of skill does it sequentially or not, just -- you
8 know, I think those are implementation details you are
9 getting it.
10 BY MR. BLYTHE:
11 Q. Yes.
12 A. So --
13 Q. So, to confirm, you haven't identified
14 whether a person of skill would do one versus the
15 other, they're both options?
16 A. Yes, a person of ordinary skill may make both
17 options, that returns both images and -- and, you
18 know, dental information. Or first to derive dental,
19 by which to derive further analysis of image
20 attribute.
21 Q. Turn to page 86 of your report.
22 A. Yes.
23 Q. Claim 5 requires that the learning base is
24 created comprising more than 10,000 historical images,
25 correct?

1 A. Yes.
2 Q. And it's -- it's your opinion that it would
3 have been obvious to include more than 10,000
4 historical images in this instance?
5 A. Yes.
6 Q. You also say later in that paragraph, 167,
7 that it would be -- well, the use of that many images
8 would be routine and predictable application of
9 Maninis' teaching to use a sufficient number of
10 training images?
11 A. Yes.
12 Q. So I gather that a person of skill would
13 consider a sufficient number of training images for
14 this combination of Salah, Carrier, and Maninis to be
15 more than 10,000 images?
16 A. Yes, but no exact number.
17 Q. Okay. A person of skill might consider it to
18 be fewer than 10,000 images?
19 A. I would say that would be highly unlikely,
20 because of the -- you may think of it as a trend. I'm
21 not saying "trend" in the sense of fashion.
22 Trending understanding that deep neural
23 networks, as we call them in computer science, they're
24 data hungry. So nobody would go in the opposite
25 direction, reducing the number of images in the

1 training set. At the end of the day, it's -- it's a
2 little bit more complicated than this.
3 It is not disclosing -- at least, it's
4 possible, to, you know, some extent -- to a great
5 extent, it is disclosed at least indirectly in
6 Maninis, but not in the two prior arts of '409 patent.
7 It's a bit more complicated than that. The choice of
8 the number of images or the data that you need in the
9 trending set.
10 But what I'm trying to say in that paragraph
11 is that Maninis is saying that, hey, we have a data --
12 we are using a dataset with 10,000, whatever number,
13 so that's it. I mean, it's saying it. It's more than
14 10,000. So why go for less than that?
15 Q. I certainly wouldn't know.
16 Can you turn to paragraph 149 of your report,
17 page 78?
18 A. Yes.
19 Q. So, here again, in the context of Claim 3,
20 Claim 3 requires a learning base comprising more than
21 1,000 images. As I understand, from what we were just
22 talking about in Claim 5, a person of skill is
23 motivated to use 10,000-plus images in all instances,
24 correct? They wouldn't use fewer in Claim 3?
25 A. They would be motivated to gather more, yes.

1 Q. Okay. That would apply for the learning base
2 in Claim 1 as well? Maninis would teach a person of
3 skill that 10,000-plus images should be used?
4 A. Yes. A learning base is the same learning
5 base, yes.
6 Q. In paragraph 150, let's go back to that
7 one --
8 A. Um-hum.
9 Q. -- for just a moment. Let me find the
10 language.
11 Okay. In the sentence that breaks between
12 page 79 and 80, beginning "the" -- sorry.
13 It begins "indeed" in the last line on page
14 79.
15 A. Um-hum.
16 Q. "Indeed, the most efficient way to train such
17 a neural network, the training set should include
18 images representative of the types of images likely to
19 be seen during ordinary use of the imaging device,
20 such as real historical photographs taken of patient's
21 teeth with the device in which the training network
22 will be deployed, e.g., a cell phone as taught by
23 Salah and Carrier."
24 Do you see that?
25 A. Yes.

1 Q. So as I understand it, a person of skill
2 would be motivated to use historical images in this
3 learning base that are captured using a cell phone or
4 mobile device; is that correct?
5 A. Right, yes.
6 MR. ARGENTI: Objection, form.
7 BY MR. BLYTHE:
8 Q. So, in that instance, the learning base would
9 comprise 10,000-plus images of -- dental images
10 captured with a cell phone or mobile device?
11 A. Yes.
12 Q. Okay. And you've not identified anywhere in
13 your declaration that such images existed in the prior
14 art, correct?
15 A. What I have identified is that '409 patent is
16 saying that we need that learning base, and you're
17 going to rely on the collected historical images. And
18 I'm saying that exactly maps to what Maninis is
19 teaching, and saying that we need training images.
20 Okay. In the case of Maninis, they're
21 relying on an existing dataset. But -- but the patent
22 '409 is not either saying that go and collect, you
23 know, the training. They say, that's okay, these are
24 historical dataset that we get from somewhere.
25 Q. Okay. So you could rely on a historical

1 dataset of 10,000-plus images -- dental images
2 captured with a mobile device or cell phone, or you
3 could create that learning base, either way, correct?
4 A. Well, when you say "you," you mean who?
5 Q. Sorry. The Person of Skill in the Art,
6 practicing this combination, could either rely on the
7 historical database, or capture the images, correct?
8 A. No. That's basically what I'm saying is that
9 the point here is that you want those images -- that's
10 basically the paragraph that we just read, you know,
11 between page 79 and --
12 Q. Um-hum.
13 A. -- page 80. That's basically -- that's what
14 that is pointing out. It's saying that a POSA would
15 be motivated to look for historical images because you
16 want your images to be as realistic as possible.
17 Q. Right.
18 A. Not collected by some random person from the
19 team. So you go to the historical images. That's the
20 point I'm trying to make. So, the fact that I'm
21 saying -- I'm saying that the fact that '409 patent is
22 saying that to be using historical images, I'm saying
23 that that's an obvious statement that comes directly
24 out of even Maninis. Because Maninis is going to
25 create realistic images that they want to train their

1 neural network on.
2 Q. Right.
3 So my question is: Are you aware of whether
4 such a set of historical images existed as of July
5 2017?
6 A. I am not aware of such dataset. But I don't
7 think it's required to be aware of -- for a POSA to be
8 aware of such dataset, because '409 patent doesn't
9 talk about existence of such dataset. They say that,
10 okay, we can go and collect such dataset. And we can
11 expand that dataset as more data becomes available.
12 That's what '409 patent says.
13 So, Salah with Carrier and Maninis could go
14 exactly in the same direction. So, not rely on an
15 existing dataset, but say that dataset can be created.
16 In fact, the -- in fact, the -- the -- doesn't the
17 '409 patent say that we do that by one of the claims?
18 It says that such a dataset, you know, learning base
19 is created using historical dataset.
20 Q. Yeah, and I want to touch on that in a
21 second.
22 So I'm not intending to suggest what's a
23 requirement or not. I'm just trying to figure out
24 what it is that you're saying a person of skill would
25 be motivated to do.

1 I'm still understanding correctly, right,
2 that a person of skill would be motivated to have the
3 learning base comprise images that are dental images
4 captured with cell phone or mobile devices, correct?
5 A. That's correct, yes.
6 Q. Okay. And in order to acquire those, they
7 would either have to have already been taken, or a
8 person of skill would have to capture those images,
9 correct?
10 A. Yes, obviously. Either the dataset is there
11 or it's not. In which case, you have to collect it.
12 Q. Right. And as far as you're aware, that
13 dataset was not there as of July 2017?
14 MR. ARGENTI: Objection, form.
15 A. That, I don't know. I don't have any
16 specific knowledge if such dataset was there or not.
17 BY MR. BLYTHE:
18 Q. Got it.
19 In paragraph 151, I believe it's the second
20 sentence starting "As discussed above."
21 You say, "As discussed above for Claim 2, a
22 POSA would have been motivated to identifying teeth in
23 the image by using Maninis' object detection
24 algorithms to assign teeth attributes to imaged teeth,
25 including attributes such as," and you list several

1 attributes, correct?
2 A. Yes.
3 Q. And that includes tooth identification,
4 patient age, diagnosis, and tooth -- tooth shape
5 parameters, correct?
6 A. Yes.
7 Q. When you say the attributes include tooth
8 identification, does -- is that tooth number and tooth
9 shape, or are there other attributes you had in mind?
10 A. No, I had in mind tooth ID number.
11 Q. Okay. For tooth shape parameter, what's your
12 understanding of tooth shape parameter?
13 A. Well, I -- I am not a dentist to say, you
14 know, each tooth has this shape or that shape. My
15 understanding is, from the point of view of computer
16 vision and computer scientist is, that -- and as a
17 layman, a layperson that knows that, yes, we have
18 different categories of teeth, and they have different
19 shapes. I don't have to be a dentist to understand
20 that.
21 And my understanding is also, again, based on
22 my computer science background in machine learning.
23 And I know that you can train a machine to come up
24 with shape parameters. In this case, contours. And
25 those -- if the original shape is different, I'm

1 expecting these contours to come up with different
2 shapes. And shape, in the sense of, you know, what
3 it -- the machine learning is producing, not from a
4 dentist point of view what is the shape.
5 Q. Would you consider the width of a tooth to be
6 a tooth shape parameter?
7 A. I -- again, I don't want to get into what is
8 a tooth shape parameter that is -- you know, that can
9 be used in particular application that '409 or the
10 references apply. I would consider that that's
11 probably some information we can get from -- you know,
12 as I said, the POSA would be part of the
13 multi-disciplinary team.
14 For instance, that -- a POSA could be
15 provided that information. If tooth width is
16 information that is useful for them, you know, it
17 could be through the process of deep learning, it
18 could be a parameter, a shape parameter that can be
19 produced.
20 Q. So in the context of this sentence where
21 you're saying, "A POSA would have been motivated to
22 identify teeth to assign tooth attributes," which
23 tooth attributes in particular is it your opinion that
24 a Person of Skill in the Art would be motivated to
25 assign?

1 A. With the very obvious one that are disclosed
2 by '409, and also Salah and Carrier, is tooth ID, the
3 number. You know, which -- which tooth -- which teeth
4 are present in the image is one of the obvious ones
5 that they have stated.
6 But I'm going to rely, again, on Salah and --
7 and Carrier. But those are -- they have defined them,
8 what they mean by tooth attributes there.
9 Q. Carrier never refers to a tooth
10 identification number, correct?
11 A. Yes. But they -- they -- Carrier actually
12 refers to aligning an image with a predetermined
13 overlay. Now, if you combine that with Maninis, or
14 Salah, for that matter, then that teaching is already
15 there. It's just implicit in there.
16 Q. Is it implicit in Carrier before or after you
17 combine that with Maninis or Salah?
18 A. I think it's implicit there, even before
19 combination. But combination makes it clear that
20 those are -- you know, those teeth could be labeled.
21 Q. Is it your understanding that identification
22 of -- of tooth number or identification number is
23 necessary to determining the distance between an
24 overlay and the contour of the teeth?
25 A. Is it necessary? No. I mean, the alignment

1 is performed by aligning the overlay, for instance, in
2 the case of Carrier with edges. So, that does not
3 require of -- require the knowledge of knowing. It's
4 the opposite process once it's aligned, because
5 Maninis is proposing category-specific edges. Then
6 the teeth are identified automatically once we get to
7 that set point.
8 So, the set point tell us yes or no, whether
9 it's aligned or not. Once it's aligned, then we have
10 the ground truth based on overlay.
11 Q. I'm a little confused because I think that
12 mixed a couple of concepts, so let me break that down.
13 So to back up, I was -- I think you said,
14 yes, it's not necessary to do tooth number
15 identification to determine the alignment of an
16 overlay and a contour, correct?
17 A. The alignment is not dependent on that.
18 Q. Okay.
19 A. The alignment is dependent on finding that
20 this -- we're talking about Carrier on this one.
21 Q. Yes.
22 A. Because it's talking about measuring the
23 average distances of teeth from their -- you know,
24 from their edges to the overlay. And if some average
25 distance, aggregate distance is meeting some

1 threshold --
2 Q. Right.
3 A. -- some set point, then we say alignment is
4 achieved.
5 Q. Right.
6 And, in fact, not only is it not necessary to
7 identify the teeth in that contour by number, it's not
8 necessary to identify the edge of one tooth from the
9 edge of any other tooth, correct?
10 A. For alignment, it is not --
11 Q. Correct.
12 A. -- necessary to do that. But once it's
13 aligned, you can take -- for instance, as I actually
14 say it in my -- my declaration, once it's aligned, you
15 can take the overlay as the ground truth and assign
16 the labels.
17 Q. Right. And Carrier --
18 All right. So, you're saying a person of
19 skill can do that, but Carrier does not disclose
20 assigning labels from overlays to reference edges,
21 correct?
22 A. Carrier does not do that. But I think a
23 person of ordinary skills --
24 Q. Okay.
25 A. -- would be natural to him or her. Say,

1 okay, now the alignment -- I have the ground truth;
2 therefore, I can use that to label my images.
3 Q. Okay. Are you familiar with the cost of
4 labeling medical images with pixelized contours
5 identifying objects in those images?
6 A. Cost of it; do you mean dollar amount?
7 Q. I do.
8 A. I'm not. But I didn't see any relevance of
9 that to the analysis of obviousness, either. That's
10 why I have not addressed that.
11 Q. Are you familiar with how long that process
12 takes?
13 A. Again, that's a very hypothetical question.
14 It depends how you do that.
15 Q. Right.
16 A. So, for instance, as we were discussing
17 earlier, we can automate that process. And I have
18 given some references, saying, here it is. There are
19 some ways of automating that.
20 Q. Are you aware of whether automated
21 labeling -- sorry, let me rephrase that.
22 Are you aware of whether a deep learning
23 device that's been trained on a learning base whose
24 historical images have been labeled through an
25 automated process are appropriate for use in medical

1 diagnoses?
2 MR. ARGENTI: Objection, form.
3 A. This is a very, you know, hypothetical
4 question, that -- in the sense that, first of all, I
5 assume that you mean at the priority date --
6 BY MR. BLYTHE:
7 Q. I do.
8 A. -- of the '409 patent.
9 So I think it's a hypothetical question in
10 the sense that -- I mean, not hypothetical, but I
11 don't know. I mean, I wasn't involved in collecting
12 such dataset. Or I'm not aware, as I said earlier,
13 of -- of, you know, any data collected in that area.
14 But as I explained in my -- the declaration,
15 the POSA would have been motivated to collect such
16 dataset, both from Carrier's teaching and Maninis'
17 teaching, and as well as, of course, Salah's teaching.
18 THE STENOGRAPHER: Can you hold on for a
19 second? My plug-in isn't charging. It should be
20 good now. Thank you.
21 BY MR. BLYTHE:
22 Q. Let's turn to page 12. Actually focus on
23 paragraph 115 on page 62. And for context, from page
24 59, this is where you're addressing Step (c') 21
25 regarding determination of value for the image

1 attribute.
2 A. Um-hum.
3 Q. In paragraph 115, in the last sentence, you
4 say, "A POSA would understand that ensure all required
5 all teeth are visible, each required tooth should be
6 detected by the image recognition algorithm. That is
7 by applying the Maninis' deep learning techniques,"
8 right?
9 A. Um-hum, yes.
10 Q. So I understand, technically what this
11 process would be, when you say "detected by the image
12 recognition algorithm," are you indicating that as a
13 person of skill has been motivated to combine this,
14 the detection is indicating whether a tooth is present
15 or not present in the image?
16 A. I'm trying to -- okay. I'm not going to ask
17 you to paraphrase your question.
18 What this is saying here -- what this
19 sentence is saying --
20 Q. Um-hum.
21 A. -- is that a person of ordinary skill would
22 be motivated to use Maninis. And when -- once the
23 alignment is achieved, then Maninis is telling us
24 exactly where each tooth is. So if we know where the
25 tooth -- teeth are, we know which ones are present,

1 and which ones are not, if any. So that attribute
2 would be -- would be direct result of alignment using
3 Maninis, because we are using Maninis' information.
4 In other words, the semantic edges to do -- to perform
5 the alignment. But Maninis itself, once the alignment
6 is done, provides that information, that in our image,
7 or the image that the user is attempting to take,
8 which teeth are present.
9 Q. And so, the -- the image attribute value in
10 that instance, as you're using it in paragraphs 115
11 and 116, the image attribute value is the list of
12 teeth that are present in the image?
13 A. That's right.
14 Q. Okay. And that would be a list of teeth that
15 are present in the image from any perspective, or to
16 any degree that Maninis has detected, correct?
17 MR. ARGENTI: Objection, form.
18 A. Well, obviously, it has to be detected in
19 order to identify.
20 BY MR. BLYTHE:
21 Q. Sure.
22 A. That's kind of an obvious statement.
23 Q. Um-hum.
24 A. But from any angles or an indention and all
25 of that, that's part of the training. So you collect

1 this historical data in a realistic setting so that
2 your machine -- when I say "machine," I'm talking
3 about machine learning. The machine learns, is
4 trained to identify them from any point of view --
5 Q. Um-hum.
6 A. -- from any direction, from any position. So
7 that's what I mean by realistic data, that historical
8 dataset should be realistic.
9 Q. Right. And my only question is to confirm
10 that the -- excuse me.
11 To confirm that the image attribute value is
12 the list of teeth, not a list of teeth as filtered by
13 some other parameter, right? That's not the image
14 attribute value that you're discussing in paragraph
15 115?
16 A. What do you mean by list of teeth filtered?
17 I've never -- I have not seen that anywhere.
18 Q. Yeah. That's not a great way of putting it.
19 I don't mean to make this more complicated than it is.
20 I'm just trying to confirm that the attribute
21 value that meets the limitation of (c') in Claim 1 is
22 a list of tooth numbers, just tooth number X, tooth
23 number Y, tooth number Z, correct?
24 MR. ARGENTI: Objection, form.
25 A. That could be one of the attributes.

1 BY MR. BLYTHE:
2 Q. Okay. As related to determining whether
3 required teeth are visible, that's the attribute?
4 A. That would be the attribute.
5 Q. Okay. On page 67, you address limitation
6 (d').
7 A. Yes.
8 Q. And that is comparison of said image
9 attribute value with a set point?
10 A. Yes.
11 Q. Am I correct that the set points you have
12 identified here are, one, a threshold distance of
13 teeth from the overlay; and, two, the set of teeth
14 required in the image?
15 A. Those are two possibilities.
16 Q. Okay. Have you identified any others in
17 these two pages?
18 A. Well, I identify, you know, the collection of
19 tooth attributes at the beginning.
20 Q. Um-hum.
21 A. And the image attributes at the beginning of
22 my declaration.
23 Q. Right.
24 A. Any one of those attributes can come up with
25 the alignment and the identification stuff we do.

1 Q. They can. But have you identified any of
2 them in these three paragraphs?
3 A. I need to read it again. But --
4 Q. Yeah, please take a look.
5 A. Okay. So where do you want me to start
6 reading?
7 Q. From 123 to 127.
8 A. 120 -- okay. (Reading) Step (d') of Claim 1
9 recites, comparison of said image attribute value with
10 set point. Salah, Carrier, and Maninis teach this
11 limits element. As I discussed above for Step 1 (c'),
12 Salah's image acquisition apparatus assesses whether
13 an image is acceptable or -- and properly positioned.
14 Why Salah does not expressly disclose that
15 evaluating whether an image is acceptable involves
16 comparison to a set point, a POSA would consider such
17 a comparison to be a routine option. Speaking
18 generally, a POSA would implement an assessment of
19 whether an image is acceptable or not acceptable by
20 defining some criteria for acceptability, and
21 determining whether those criteria were satisfied.
22 I can actually stop here and answer your
23 question.
24 Q. Sure.
25 A. So -- it says "criteria," "some criteria."

1 So criteria could be even absent as -- other than the
2 two that you mentioned, and because I have already
3 said in my declaration that, you know -- earlier,
4 that, you know, there are other image attributes.
5 Some of them could be the image quality, for instance.
6 Q. But here, you only say "some criteria,"
7 right?
8 A. So, criteria is the plural of criterion.
9 Q. Um-hum.
10 A. So, yes, that could encompass a lot of
11 attributes already. So I am putting it -- I'm putting
12 it in general terms there. So I'm not limiting to any
13 particular attribute. Once the alignment is done,
14 many attributes can be deduced.
15 Q. Okay. And so, is it your view that a person
16 of skill would be motivated to implement Salah,
17 Carrier, and Maninis, such that any of these other
18 criteria are determined?
19 A. Absolutely. You know, why not? I mean, if
20 you're -- if -- a POSA would know that a image, for
21 instance, is blurry, that's a useless image. So why
22 shouldn't the POSA consider other attributes, like the
23 quality of the image.
24 Presence of teeth is one thing. It can be
25 detected even in blurry images. But is the blurry

1 images useful for --
2 Q. Okay.
3 A. -- you know, for applications? So, yes, I
4 would say yes.
5 Q. So in the context of step (d'), the set point
6 or the criteria is not identified as any particular
7 criteria from the perspective of a person's skill?
8 MR. ARGENTI: Objection, form.
9 A. Yeah, can you --
10 BY MR. BLYTHE:
11 Q. I can rephrase that.
12 A. -- explain what you mean by --
13 Q. Yeah.
14 A. For -- so, for every attribute, you could
15 have a set point, and use that set point to find out
16 whether -- I mean, determine whether an image is
17 acceptable or not. If it's not acceptable, then of
18 course retake the image.
19 Q. Different set points would only be
20 appropriate for certain determinations, right?
21 A. What do you mean by "certain determinations"?
22 Q. Well, you wouldn't compare -- there -- let me
23 rephrase this.
24 If you're going to compare an image attribute
25 value with a set point, you would have to be comparing

1 the value to a set point that is relevant to the
2 value, right?
3 A. Obviously. If you are for instance
4 comparing -- I don't know -- if the teeth are present,
5 then you compare to the set value of that. So
6 teeth -- let's say that five teeth should be present.
7 If -- they're either there or not in the image. And
8 if they're not, the set value is there, that the five
9 teeth that you're looking for are not there in the
10 image. So the set value should be associated with
11 what attributes you are dealing with, yes.
12 Q. Okay.
13 MR. BLYTHE: Let's get through a little bit
14 more, and then we can break for lunch.
15 MR. ARGENTI: Okay.
16 BY MR. BLYTHE:
17 Q. For step (e') in Claim 1, in your
18 declaration, this starts on paragraph 128.
19 A. Yes.
20 Q. You've identified several information
21 messages as ones that a person of skill would
22 recognize in Salah and Carrier, correct?
23 A. Correct.
24 Q. And that includes looking at paragraph 129,
25 written and/or voice prompts; that includes arrows,

1 beeps, audio messages, right?
2 A. Yes.
3 Q. Which, if any, of these techniques is it your
4 opinion that a person of skill would be motivated to
5 employ in sending the information message in Step (e')
6 of Claim 1?
7 MR. ARGENTI: Objection, form; scope.
8 A. I don't think they are mutually exclusive.
9 So, for instance, arrows are telling the user or the
10 patient in which direction to move to get the
11 appropriate image, or intended image. Whereas, a beep
12 or a change of color on the screen could have a
13 complimentary information.
14 I'm not going to speculate there for, you
15 know, which ones a POSA would be motivated to
16 implement. It's an implementation issue that you're
17 asking me. It could be all of them, a subset of them.
18 A POSA could be motivated to implement any number.
19 MR. BLYTHE: Okay. You know why don't we --
20 why don't we take the break for lunch?
21 MR. ARGENTI: Sounds good.
22 (A recess was taken beginning at 12:36 p.m.,
23 and ending at 1:34 p.m.)
24 BY MR. BLYTHE:
25 Q. We're back, Dr. Foroosh.

1 During any of the breaks in today's
2 deposition, is it fair to assume that you haven't had
3 any discussions with your counsel regarding the
4 substance of your prior or future testimony in this
5 deposition?
6 A. Huh-uh, no discussions.
7 Q. Okay. I'm going to hand you what's been
8 previously marked as Exhibit 1005 in this case. And
9 also what we've previously marked as Exhibit 1006.
10 Do you recognize Exhibit 1005 as the Carrier
11 Publication?
12 A. Yes.
13 Q. And Exhibit 1006 is the provisional
14 application of publication of claims, priority 2?
15 A. Yes.
16 Q. In forming your opinions on this case, you
17 understand that only disclosure in Carrier Exhibit
18 1005 that also appears in this provisional, Exhibit
19 1006, is considered prior art for purposes of your
20 obviousness analysis, correct?
21 A. For the purposes of obviousness analysis,
22 everything that I have used has been common between
23 the two.
24 Q. Great.
25 So if we take a look at Exhibit 1006 today,

1 there won't be anything we're missing that's relevant
2 to your opinions?
3 A. Well, yes, I have been using anything that
4 has been common between the two, yes.
5 Q. Okay.
6 A. I did not use anything from 1005 that wasn't
7 in 1006.
8 Q. Fair enough.
9 And I take it you also haven't used anything
10 from 1006 that is not in 1005?
11 A. That is correct.
12 Q. Okay. Great.
13 So let's -- let's open up Exhibit 1006 to
14 where the disclosure starts on 2 of 32. I believe
15 it's page 17 in the bottom right-hand corner of this
16 exhibit.
17 A. Yes.
18 Q. Okay. In paragraph 3, Carrier identifies a
19 field for the subject matter of the provisional; is
20 that correct?
21 A. Right.
22 Q. And it says that the disclosure relates
23 generally to methods and apparatuses for image
24 capturing, and more specifically for methods and
25 apparatuses for capturing dental images; is that

1 correct?
2 A. Yes.
3 Q. Do you understand that the Carrier
4 Provisional is in the field of capturing dental
5 images?
6 A. It's in the field of capturing teeth images,
7 yes.
8 Q. Okay. You see at the start of paragraph 4,
9 it says, "In dental and/or orthodontic treatment, a
10 set of 2D facial and dental photos is often required
11 in addition to 3D impressions"?
12 A. Yes.
13 Q. Do you have any understanding of which
14 situations require 2D facial and dental photos?
15 MR. ARGENTI: Objection, form.
16 A. I'm not a specialist of dental areas. So I
17 say I take it on the face value.
18 BY MR. BLYTHE:
19 Q. Would a person of skill reading this
20 reference in July of 2017 have an understanding of
21 when facial and dental photos are required?
22 A. I mean, a POSA would be exactly -- I am a
23 POSA. Would be exactly my situation.
24 Q. Okay. Do you see at the bottom of that
25 paragraph starts, "If the camera of the mobile phone,"

1 it's the second-to-the-last sentence. Do you see
2 that?
3 A. Yes.
4 Q. Okay. It says, "If the camera of the mobile
5 phone is too far of the teeth, dental photos cannot
6 meet the orthodontic standards." Do you see that?
7 A. Yes.
8 Q. Do you have an understanding of what
9 orthodontic standards are?
10 A. I'm not an orthodontist, so I would not like
11 to make any opinion on that.
12 Q. Okay. Is it your understanding, from the
13 next sentence, that one of the advantages of using the
14 mobile phone cameras as disclosed in the Carrier
15 Provisional is that they may be faster and easier to
16 use than the DSLR cameras that were used previously?
17 A. That's what they say in the next sentence.
18 Q. Okay. A Person of Skill in the Art would
19 understand that in reading this reference?
20 A. A person of skill would understand the plain
21 and ordinary meaning of that sentence.
22 Q. Okay. In paragraph 9 on page 19 of this
23 exhibit --
24 A. Yes.
25 Q. -- do you see that it says, "The overlay can

1 comprise a generic overlay in some appliance"?
2 A. Yes.
3 Q. What's your understanding of a generic
4 overlay?
5 A. It's the opposite of not patient -- it's the
6 opposite of patient specific.
7 Q. So if a generic overlay was being used,
8 rather than a patient-specific overlay, would a Person
9 of Skill in the Art understand that there would be a
10 more-likely variance between the overlay and the
11 patient's teeth than when using a patient-specific
12 overlay?
13 MR. ARGENTI: Objection, form.
14 A. Possibly. I think the person of ordinary
15 skill probably wouldn't be worried about that. You
16 know, those two options. If those two options are
17 available, one of them, they would use.
18 BY MR. BLYTHE:
19 Q. A person of skill would not be worried about
20 that because the Carrier Provisional regularly
21 indicates that the overlay need only approximately
22 match with the patient's teeth, correct?
23 A. Can you point to any specific place where it
24 says that?
25 Q. Sure. In paragraph 11 on the same page.

1 A. Okay. It says, "The method can further
2 comprise automatically capturing any image of the
3 patient's teeth when the overlay approximately matches
4 with the patient's teeth."
5 Q. So, is it -- would it be a Person of Ordinary
6 Skill in the Art's understanding that the alignments
7 between overlay and teeth, as described in Carrier
8 Provisional need only be approximate?
9 A. I mean, the definition of approximate itself
10 is vague. So, a person of ordinary skill would
11 understand it means it's not a perfect match. So,
12 it's actually the opposite of a perfect match.
13 Q. Do you have any reason to believe that a
14 person of ordinary skill would expect that Carrier is
15 using the phrase "approximately" in some sense other
16 than its ordinary meaning?
17 A. I have no reason to believe that.
18 Q. Okay. Do you see in paragraph 10, it
19 describes a method that comprises automatically
20 triggering an indicator, do you see that?
21 A. Yes.
22 Q. It says, "For example, the method can further
23 comprise triggering the indicator when the overlay
24 approximately matches with the patient's teeth
25 comprises estimating an indicator of the distance

1 between an edge of the patient's teeth, and the view
2 of the patient's teeth, and the outline of the teeth
3 in the overlay," right?
4 A. Yes.
5 Q. For the indicator to be triggered on the
6 basis of its distance -- sorry. Let me rephrase that.
7 For the indicator to be triggered based on
8 the difference between the overlay, and the view of
9 the patient's teeth, the system in Carrier would
10 already have to have made an analysis of what that
11 distance is, correct?
12 A. Yes.
13 Q. So, in this embodiment, Carrier is saying
14 that the distance between the edges of the teeth and
15 the overlay are being estimated prior to the trigger
16 being automatically -- well, the indicator being
17 automatically triggered, correct?
18 A. Yes.
19 Q. Okay. At the end of that paragraph, it says,
20 "The indicator can be a visual indicator, such as
21 change in color." Do you see that?
22 A. Yes.
23 Q. That change in color would also happen after
24 the analysis of a distance between the overlay and the
25 edges of the patient's teeth has taken place, right?

1 A. Yes. My understanding of that is that --
2 based on the context of Carrier, that word
3 "approximate" means that it's reached that set of set
4 points. So that's why I said "approximate" is just a
5 general word.
6 Q. Um-hum.
7 A. But in the context of Carrier, I'm taking it
8 that that "approximate" means we have reached that set
9 point. And if that happens, yes, it's triggered.
10 Q. Same for the voice indicator in the next
11 sentence?
12 A. Yes.
13 Q. In paragraph 11 where it indicates it can --
14 the method can further comprise automatically
15 capturing an image of the patient's teeth when the
16 overlay approximately matches with the patient's
17 teeth.
18 It would be your understanding that prior to
19 the image being captured, the system has evaluated the
20 match between the patient's teeth and the overlay,
21 right?
22 A. Right.
23 Q. And that is happening while the image
24 acquisition device, let's say, is being held up to the
25 teeth, correct?

1 A. Right.
2 Q. That evaluation would need to happen quickly
3 enough to capture the image while that acquisition
4 device is still positioned so that the teeth and the
5 overlay are approximately matching, correct?
6 A. What's your definition of "quickly enough"?
7 Q. Well, I think it defines itself in this
8 sentence. Let me try that again.
9 The analysis would need to occur prior to the
10 image acquisition device moving out of alignment,
11 correct?
12 A. Yes.
13 Q. Carrier does not disclose the use of any
14 stabilizing equipment for the image acquisition
15 device, correct?
16 A. Not explicitly.
17 Q. There's no reference to the use of a tripod
18 or anything like that in Carrier?
19 A. Is that what you call it, a stabilizing
20 device?
21 Q. It's one example, I think.
22 A. Most cell phones have stabilizing software
23 inside. And this has been for many years, so that it
24 does not require a tripod to get that stable.
25 Q. Does Carrier refer to any of those?

1 A. No. That's what I said, not explicitly.
2 Q. Okay. All right. You also haven't described
3 any of that technology in your declaration either,
4 right?
5 A. No, because neither does the '409 patent talk
6 about stabilization, and all of that.
7 Q. Okay. I wanted to ask you a question about
8 terminology, and it -- while we're talking about edges
9 of teeth. And it may be best to reference your
10 report. Do you have Exhibit 1002 in front of you
11 still?
12 A. Yes. It would be my declaration?
13 Q. Yes, your declaration. I'm used to saying
14 "report" in District Court.
15 Would you turn to paragraph 35 of your
16 declaration?
17 A. Yes.
18 Q. Here, you're referring to edges, contours,
19 boundaries, and discontinuities, correct?
20 A. Yes.
21 Q. And you know that they've been used
22 interchangeably in the literature?
23 A. When I say that, basically, these terms have
24 been used interchangeably, but some people make
25 distinctions between them.

1 Q. Would a Person of Skill in the Art recognize
2 that in some instances, the term "edge" is a part or a
3 portion of a contour?
4 A. As I said, it depends. I can -- you know, I
5 cannot name a particular publication in the last 40
6 years. I mean, edge detection has been around for at
7 least 40 years or more. People have referred to even
8 contours as "edges." So it's been used
9 interchangeably. And that's what -- basically what
10 I'm saying there.
11 Q. Okay. Do you have a different understanding
12 of the distinction between edges and contours that
13 others have used previously?
14 MR. ARGENTI: Objection, form.
15 A. No, I don't have a different understanding.
16 My understanding is the same as a POSA would have at
17 that point in time, the priority date.
18 BY MR. BLYTHE:
19 Q. Okay. A Person of Skill in the Art would be
20 aware that, at least in some instances, the term
21 "edge" might refer to only a portion of
22 the delineating boundary of an object, correct?
23 A. No. As I said, depending on the use of
24 these -- these terms --
25 Q. Um-hum.

1 A. -- they have been used interchangeably. So
2 as a POSA, I would believe that they are
3 interchangeable uses of these words. And maybe in the
4 contents -- context, rather, would understand what
5 they mean.
6 Q. Okay. If you could turn to paragraph 29 of
7 Exhibit 1006, going back to the Carrier Provisional.
8 A. What was the paragraph number?
9 Q. 29.
10 A. 29. Yes.
11 Q. Paragraph 29 refers to a brief description of
12 figures 1-A to 1-C. Do you see that?
13 A. Yes.
14 Q. Describes them as one example of traditional
15 dental photography using a digital SLR camera?
16 A. Yes.
17 Q. Are you familiar with traditional dental
18 photography?
19 A. As I explained earlier, you know, I've
20 done -- through the projects that I have, I've done
21 dental imaging, but I am not a dentist. And, of
22 course, I'm familiar with -- as a vision scientist
23 with SLR cameras.
24 Q. Okay. Do you -- let's turn back to paragraph
25 18.

1 A. Yes.
2 Q. This paragraph talks about -- okay. Well,
3 let me just say this.
4 The second sentence says, "Specifically
5 described herein are nontransitory computer-readable
6 storage media storing a set of instructions capable of
7 being executed by a processor, e.g., of a mobile
8 phone. Do you see that?
9 A. Yes.
10 Q. And that when executed by the processor
11 causes the processor to display real time images of
12 the patient's teeth on a screen. Do you see that?
13 A. Yes.
14 Q. It also says, "And display an overlay
15 comprising an outline of teeth in a predetermined
16 view." Do you see that?
17 A. Yes.
18 Q. In the example of a mobile phone -- let me
19 rephrase that.
20 In the example of the set of instructions
21 being executed by a processor of a mobile phone, a
22 person of ordinary skill would understand that in that
23 example, the mobile phone's processor is displaying in
24 real time images of the patient's teeth, displaying
25 the overlay of the patient's teeth, and enabling

1 capture of that image, correct?
2 A. That is right.
3 Q. Okay. In paragraph 19, it also talks about
4 instructions capable of being executed by the
5 processor of a mobile phone. Do you see that?
6 A. Which line is that.
7 Q. It is the second line where it says
8 "processor of a mobile phone."
9 A. Yes.
10 Q. And it goes on to say that when executed by
11 the processor causes the processor to display real
12 time images, display an overline, trigger an
13 indicator. Do you see that?
14 A. Yes.
15 Q. In that instance, the processor of the mobile
16 phone is also triggering the indicator, right?
17 A. Right.
18 Q. Turning to paragraph 22 on the next page, do
19 you see that it says, "The set of instructions, when
20 executed by the processor, can further cause the
21 processor to automatically trigger an indicator." Do
22 you see that?
23 A. Yes.
24 Q. And specifically, it says, "For example, the
25 set of instructions can further cause the processor to

1 estimate an indicator of the distance between an edge
2 of the patient's teeth in the view of the patient's
3 teeth, and to trigger the indicator when the outline
4 of teeth in the overlay is less than or equal to a
5 threshold value." Do you see that?
6 A. Yes.
7 Q. So, in that instance, the processor of the
8 mobile phone is also estimating the distance between
9 the edge of the teeth and the overlay, correct?
10 A. In that example, yes.
11 Q. Okay. At the bottom of that paragraph, the
12 last two sentences, there are references to some
13 specific visual indicators, right?
14 A. Yes.
15 Q. Okay. In this case, the indicator, as
16 described above, is triggered when the overlay is an
17 approximate match with the patient's teeth prior to
18 image capture, correct?
19 A. Yes. Actually, I believe in that paragraph,
20 it says that it triggers when the overlay is less than
21 or equal to a threshold value.
22 Q. Right.
23 A. So basically, it's -- instead of using the
24 word "approximate," it's saying that there's a set
25 value.

1 Q. Okay. So, in that instance, these indicators
2 are being, you know, triggered or notified to the user
3 while the phone is in alignment prior to capture of
4 the image, correct?
5 A. Yes. I mean --
6 Q. Okay.
7 A. -- when the alignment happens, it captures
8 that -- that signal.
9 Q. Okay. Turn forward to paragraph 32.
10 A. Yes.
11 Q. Paragraph 32 is a brief overview of figure
12 2-C. Do you see that?
13 A. Yes.
14 Q. And it says that this shows an example,
15 etcetera, including an overlay on the screen, which
16 shows what teeth should be visible in the view. Do
17 you see that?
18 A. Yes.
19 Q. Would you understand that "what teeth should
20 be visible in the view" to be equivalent to what this
21 patent refers to as what required teeth should be
22 visible?
23 MR. ARGENTI: Objection, form.
24 A. I don't understand what you mean by
25 "required."

1 BY MR. BLYTHE:
2 Q. Look forward to paragraph 81.
3 A. Yes.
4 Q. You see the last sentence in paragraph 81
5 says, "In some embodiments, the method can further
6 comprise using image recognition algorithms to ensure
7 that all required teeth are visible." Do you see
8 that?
9 A. Yes.
10 Q. Would you understand that "ensuring all
11 required teeth are visible" is also described in
12 paragraph 32 as "showing what teeth should be visible
13 in the view"?
14 A. It could be interpreted that way.
15 Q. Okay. If you look at Figure 2-C itself,
16 which is on page 49 of this exhibit.
17 A. Those are page numbers at the bottom?
18 Q. Yeah, the bottom right-hand corner.
19 A. Yes. What was the figure number again?
20 Q. 2-C.
21 A. 2-C, yes.
22 Q. So it's a little hard to see. But do you see
23 that in the bottom row of teeth, that the overlay
24 actually has one more tooth than the teeth it's
25 overlaid onto?

1 A. I don't know.
2 Q. This might make it easier. If you turn to
3 page 51, you'll see figure 4-H.
4 A. 51, 4-H. Yes.
5 Q. Flipping back and forth between them -- and I
6 won't blame you for not being able to see this clearly
7 on the spot, but do you recognize the overlay in
8 Figure 4-H as having the same shape as that imposed
9 over Figure 2-C?
10 A. No, I'm not sure.
11 Q. Sorry. You're not sure?
12 A. I'm not sure.
13 Q. All right.
14 A. If they have the same -- did you say they
15 have the same shape?
16 Q. That was my question, yeah.
17 A. I'm not sure --
18 Q. Okay.
19 A. -- by looking at them.
20 Q. That's fine.
21 Looking at Figure 4-H, though --
22 A. Um-hum.
23 Q. -- do you see that Figure 4-H depicts a set
24 of lower teeth that includes three molars?
25 MR. ARGENTI: Objection, form.

1 A. Are you asking me to give you dentist
2 opinions here?
3 BY MR. BLYTHE:
4 Q. No. I'm asking if you recognize that.
5 A. I recognize there's some bottom jaw teeth
6 there.
7 Q. Okay. So you don't recognize which of these
8 teeth are molars versus premolars?
9 A. I'm not going to get into that. I'm not
10 qualified to say that. I'm not a dentist to say --
11 Q. That's totally fine. I wouldn't ask you for
12 your opinions, if you don't feel comfortable giving
13 them. That's -- that's fine.
14 So, let me flip back then to where we were
15 earlier, on page 23.
16 A. You were talking about my declaration or --
17 Q. Oh, sorry. Page 23 of Exhibit 1006 --
18 A. Okay.
19 Q. -- earlier in this reference, where we were.
20 A. Yes.
21 Q. Do you see in paragraph 34, Figure 3-B is
22 described as an example of an indicator which is
23 triggered when the overlay approximately matches with
24 the patient's teeth?
25 A. Yes.

1 Q. And sorry to make you flip back and forth,
2 but if you actually look at Figure 3-B, which appears
3 on page 50, do you see the overlay in approximate
4 alignment with the teeth?
5 A. Right.
6 Q. And you'll notice that the teeth to the left
7 and rightmost extremes are actually not very well
8 aligned with the overlay, correct?
9 MR. ARGENTI: Objection, form.
10 A. Well, depends of -- it's subjective to say
11 "not very well aligned." But you may argue that.
12 BY MR. BLYTHE:
13 Q. Do you have an estimate of how many
14 millimeters those are off from the left and rightmost
15 teeth?
16 A. You mean just personally by looking at it
17 visually. And doing that analysis? No. But I can
18 write a computer algorithm to do that for you.
19 Q. Nope. Just asking if you knew.
20 A. No. I mean, I cannot just look at this image
21 and say how many millimeters away it is.
22 Q. Okay.
23 A. But I can write a computer algorithm to do
24 that by simply performing a calibration.
25 Q. Um-hum. When you calibrate a computer to

1 make that measurement, that allows Carrier to go from,
2 you know, what is an image of kind of unknown size
3 because of the distance, to an actual measurement of
4 the teeth in millimeters, right?
5 A. Well, there's more to that. But distance is
6 one aspect.
7 Q. Um-hum. I'm sure there are multiple aspects,
8 including focal length, for example, among other
9 things?
10 A. Yeah. I mean, there's more to that. As I
11 said, you know, it's -- the models have more
12 parameters than just scale.
13 Q. Sure.
14 Okay. The -- but I guess my question is --
15 well, we'll get to it when it -- we get to the part
16 about the overlay. I'm sorry. So, never mind. We'll
17 come back to that.
18 Let's move forward to -- do you see in
19 paragraph 51, on page 24 --
20 A. Yes.
21 Q. -- you see in the middle of that paragraph,
22 the third sentence that says, "the user must
23 manually"?
24 A. Yes.
25 Q. "The user must manually adjust the patient

1 position and/or camera position." Do you see that?
2 A. Yes.
3 Q. In that instance, would you understand that
4 in that example, the user is not the patient
5 themselves?
6 A. What this is referring to, SLR -- SLR camera.
7 This is not referring to what Carrier wants to
8 achieve. The patient themselves use the cell phone to
9 do that. This is a different part of that exhibit.
10 Q. I appreciate the context --
11 A. Yes.
12 Q. -- but the question still stands.
13 Is the term "user" in that phrase, would a
14 person skilled in the art understand that the user in
15 that instance is not the patient?
16 A. Could be, yes. Could be two different, yes.
17 Q. Is it possible that the user must manually
18 adjust the patient refers to the patient must manually
19 adjust the patient?
20 A. No, as I said, this is -- what paragraph 51,
21 as I see, he described there is it referring to the
22 old-fashioned way of doing this they're saying we want
23 to replace that. Paragraph 51 is referring to SLR
24 camera. They're saying when you go to a doctor's
25 office, probably doctor would take an SLR camera.

1 Q. So to be clear, in that instance, user is not
2 the patient?
3 A. In that instance, yeah user.
4 Q. Okay. Do you see that in the next sentence,
5 it says any of the methods and apparatus described
6 herein may include one or more such retractors or
7 other assistance devices?
8 A. Can you tell me which line it is?
9 Q. Yes. Sorry, it's probably the fifth line,
10 sixth line from the bottom.
11 A. Same paragraph, 51; is that right.
12 Q. Yeah, 51. It's after the term figure 1-C.
13 A. Oh, I see yeah. Any of the methods and
14 apparatuses described herein may include the use of
15 one or more such re tractors or other assistance
16 devices. And there are appellate uses described here
17 may prompt the user to place and/or position the
18 devices including guidance for proper position.
19 Q. Right. Do you have an understanding as to
20 whether patients typically have access to retractors
21 or other assistance devices?
22 A. I have no idea.
23 Q. Okay. Let's turn forward to paragraph 4?
24 A. Yes.
25 Q. Okay. In paragraph 54, the last sentence

1 says, "In particular, these apparatuses and methods
2 may include the use of an overlay on a real time image
3 of the screen, providing immediate feedback on each of
4 the desired orientations." Do you see that?
5 A. Yes.
6 Q. So we were talking earlier about Carrier's
7 use of the term "real time." Do you have an
8 understanding -- or let me rephrase that.
9 Would a person of skill understand from this
10 sentence, that the way Carrier is using real time is
11 indicating a live feed on the screen of what the
12 camera is seeing?
13 A. What is "live feed"?
14 Q. Are you familiar with using a viewfinder on
15 the screen of a mobile device?
16 A. Yes.
17 Q. When you look through that viewfinder, it is
18 showing you the image that the camera is seeing, and
19 being updated as the camera is moved?
20 A. The definition of "live feed" could mean
21 anything. Whether it's a frame rate --
22 Q. Sure.
23 A. I mean, is it 10 frames per second, 30 frames
24 per second? What is live feed.
25 Q. And would a Person of Skill in the Art know

1 what the refresh rates of a mobile phone in July of
2 2017 would be?
3 A. Oh, absolutely.
4 MR. ARGENTI: Objection, form.
5 BY MR. BLYTHE:
6 Q. Okay. Do you have an understanding of what
7 that was in July of 2017?
8 MR. ARGENTI: Objection, form.
9 A. It could vary from one device to another one.
10 I thought you meant the process of refresh with the
11 understanding.
12 BY MR. BLYTHE:
13 Q. So, would you agree that a person of ordinary
14 skill in the art would understand that the overlay on
15 the real time image of the screen would be an overlay
16 on images that are being refreshed multiple times a
17 second?
18 A. Again, you're putting a number. I'm going to
19 stick with the word "real time" as the patents
20 describe it.
21 Q. Well, in July of 2017, this patent -- '409
22 patent didn't exist, right?
23 A. But you're also referring to the provisional
24 patent.
25 Q. Sorry. I meant the '409 patent.

1 A. Oh, the '409 patent, right.
2 Q. So I'm asking about what a person of ordinary
3 skill would understand the term "real time" to mean in
4 the context of the Carrier Provisional in July of
5 2017. So, to clarify, do you have an understanding of
6 what a person of ordinary skill would understand this
7 instance of real time in paragraph 54 of this
8 provisional to mean?
9 A. No. As I said, the word "real time" is not
10 putting a number on it. It just says that it's real
11 time. It leaves it open.
12 Q. It provides immediate feedback, right?
13 A. (Nods head affirmatively.)
14 Q. Would a person of ordinary skill understand
15 that this instance of real time in the paragraph 54 of
16 the Carrier Provisional is time such that it can
17 provide immediate feedback?
18 A. Nothing in the word is "immediate." It
19 doesn't take zero seconds. So, again, immediate
20 itself is -- what is it? One second immediate? Two
21 seconds immediate?
22 So, that's -- I'm saying that those terms are
23 somewhat subjective. In fact, they are subjective.
24 And they haven't defined their -- what do they mean by
25 "immediate." Within one second, 100 milliseconds. I

1 don't know. What is "immediate"?
2 Q. Is it your understanding that a -- is it your
3 opinion that a person of ordinary skill would
4 understand, in this context, that two seconds could be
5 immediate?
6 A. I don't know. That's a -- you know, as I
7 said, in the context, it can vary.
8 Q. Okay. Did you see down in paragraph 56, in
9 the third line from the bottom, it says, "The
10 on-screen overlay can help doctors to move the mobile
11 phone to a desired position." Do you see that?
12 A. Yes.
13 Q. And the next sentence says, "Therefore,
14 doctors can be guided to take dental photos by the
15 on-screen overlay, saving time and effort."
16 At least in those examples, the doctor is
17 operating the image acquisition device, correct?
18 MR. ARGENTI: Objection to form.
19 A. Yes.
20 BY MR. BLYTHE:
21 Q. In paragraph 57 on the next page, I take it
22 that you do not have an understanding of what quality
23 of dental image is required to submit a dental case,
24 or request a case assessment?
25 A. Why wouldn't I have an understanding about

1 quality of an image? So, I have an understanding of
2 quality of an image. Both as a layperson --
3 Q. Um-hum.
4 A. -- or as an expert in the area of computer
5 vision. But if you make it specific to dental
6 imaging, then I would apply the general -- my general
7 knowledge, or general understanding as a POSA with
8 expertise in computer vision.
9 That being said, as I said earlier,
10 Carrier -- Carrier set points do not have to be
11 defined by the POSA. Carrier's set points may be well
12 defined by a doctor. For instance, for the case of a
13 distance, I said that -- I mean, they had given
14 examples. But in the case of distance, I could say
15 either 0.1 millimeter, 1 millimeter, whatever. You
16 know, for the quality, it could be the same thing. It
17 could be set by an expert in dentistry.
18 Q. Um-hum. So, I'll rephrase that.
19 Would a person of ordinary skill understand
20 what constitutes a high-quality dental image as
21 required to submit a dental case, or request a case
22 assessment?
23 A. The person of ordinary skill does not need to
24 understand, because that information is provided by
25 the collaborator, the doctor, that this -- this is

1 what define -- we define in dentistry a high-quality
2 image. And here is the set point. And once that is
3 learned, and -- from the -- from the expert in
4 dentistry, it can be applied by the person of ordinary
5 skills in computer vision and machine learning.
6 Q. I understand the reason why.
7 But to confirm, that's a "no," a person of
8 ordinary skill would not themselves have an
9 understanding of what constitutes a high-quality
10 dental image as required to submit a dental case or
11 request a case assessment, correct?
12 MR. ARGENTI: Objection, form.
13 A. So, again, a person of ordinary skills would
14 have an understanding what is the quality of image.
15 Not only as a layperson, but as an expert in computer
16 vision. But what is a set point, and what defines a
17 high-quality dentistry imagery, that could be given by
18 an expert in dentistry.
19 So, I don't -- I do not think that the person
20 of ordinary skills is required to have that knowledge,
21 does not need to have that knowledge.
22 BY MR. BLYTHE:
23 Q. Would a Person of Ordinary Skill in the Art
24 understand what constitutes a high-quality dental
25 image as required to submit a dental case or request

1 case assessment?
2 MR. ARGENTI: Objection, form.
3 A. Again, the person of ordinary skill does not
4 require. So, whether he knows it or does not know
5 does not matter. It's irrelevant. Because that
6 information should come from an expert in the domain.
7 BY MR. BLYTHE:
8 Q. Respectfully, Dr. Foroosh, you need to answer
9 my questions, whether you agree with their relevance
10 or not. So I'm going to ask that again.
11 Would a person of ordinary skill understand
12 what constitutes a high-quality dental image, as
13 required to submit a dental case, or request case
14 assessment?
15 MR. ARGENTI: Objection to form.
16 Respectfully, he's answered it many times.
17 MR. BLYTHE: Disagree.
18 BY MR. BLYTHE:
19 Q. Are you able to answer that question, yes or
20 no?
21 A. I think --
22 MR. ARGENTI: Objection to form.
23 A. I think I've already answered your question.
24 BY MR. BLYTHE:
25 Q. Going down to paragraph 60.

1 A. Yes.
2 Q. You see it says, "The overlay with an outline
3 of teeth in a predetermined view can further provide
4 information, such as required visible teeth in the
5 predetermined view"?
6 A. Yes.
7 Q. As we discussed earlier, is it your
8 understanding that the overlay is capable of providing
9 the information about what required teeth are visible
10 in the same context as in paragraph 81 that we looked
11 at earlier?
12 A. Yes. Overlay basically may be taken as a
13 ground truth. And once it's aligned, then -- given
14 the set point, once it's aligned, then the user would
15 know that certain teeth numbers are present.
16 Q. Do you have any understanding of how much
17 variation there is in the location and positioning of
18 the teeth of dental and orthodontic patients?
19 MR. ARGENTI: Objection, form.
20 A. I don't understand the question. Because it
21 was completely no image involved in there. And you
22 took me completely to dentistry, I have a feeling. Is
23 positioning of original teeth? I mean, I'm not a
24 dentist. I said that.
25

1 BY MR. BLYTHE:
2 Q. Okay.
3 A. I have no knowledge.
4 Q. Maybe it's an easy "no" then, so let me try
5 that again.
6 Do you have an understanding of how much
7 variation there is from patient to patient in the
8 positioning and orientation of their teeth?
9 MR. ARGENTI: Objection to form.
10 A. I'm not a dentist, so I -- I'm not -- I
11 cannot judge that.
12 BY MR. BLYTHE:
13 Q. Okay. Would a person of skill have that
14 understanding?
15 MR. ARGENTI: Objection to form.
16 A. A person of skill would not have that
17 understanding, but they would not need that
18 understanding.
19 BY MR. BLYTHE:
20 Q. Okay.
21 A. There are two reasons for that. First of
22 all, as we discussed before in discussing the
23 document, it can be patient specific. Those overlays
24 can be patient specific. So that takes that out.
25 If an overlay is patient -- patient specific,

1 and it takes out that notion of variations from one
2 patient to another one. But if you use a generic one,
3 then of course the person of ordinary skill may not
4 have that knowledge. But that's irrelevant in the
5 context of, you know, the alignment because a set
6 point is given by the dentist. Say that for this
7 overlay, here's the set point.
8 Q. If you look at paragraph 62 on page 27 --
9 A. Yes.
10 Q. -- see the last sentence referring to the
11 overlay described in the rest of the paragraph? It
12 says, "This may provide optimal matching of
13 positioning, the handheld electronics, e.g., smart
14 phones, when taking the images." Do you see that?
15 A. Yes.
16 Q. Is it your understanding that in that example
17 in paragraph 62, that the overlay is being displayed
18 during the image acquisition process?
19 A. Yes.
20 Q. Okay. In paragraph 63, it begins, "Aligning
21 may be done manually by the user, or automatically,"
22 correct?
23 A. Yes.
24 Q. Is it your understanding -- I'm sorry.
25 Would a Person of Skill in the Art understand

1 that the Carrier Provisional is disclosing that a --
2 their method can be applied by visually aligning the
3 overlay with the teeth without making any calculation
4 or determination as to the distance to any contours of
5 teeth?
6 A. It says that both options are there, either
7 manually or automatically.
8 Q. I was just trying to confirm that we had the
9 same understanding of "manually." Is that consistent
10 with your understanding of "manually"?
11 A. Aligning manually means to align the teeth
12 edges with the overlay manually. You know, you
13 decide. Here it is, I've reached my threshold, and
14 here it is, it's aligned and --
15 Q. Okay.
16 A. -- I'm going to trigger it myself.
17 Q. Right.
18 The next sentence talks about indicators,
19 right? It says, "Any of the methods and apparatuses
20 described herein may be used to indicate, by visual or
21 audible or tactical image, that the teeth are aligned
22 in the frame with the overlay." Do you see that?
23 A. Yes.
24 Q. And it goes on to say, "As an example, in
25 Figure 3-A illustrates an example of automatic

1 detection of alignment in real time with the patient's
2 teeth and an overlay"?
3 A. Yes.
4 Q. And throughout the rest of this paragraph, it
5 refers to visual indicators, including changing the
6 color of the overlay from a first to a second color;
7 do you see that?
8 A. Yes.
9 Q. And you understand that each of these
10 indicators are being shown or transmitted to the user
11 of the apparatus during the process of acquiring the
12 image?
13 A. Yes.
14 Q. Flipping on to the next page, still paragraph
15 63. The Carrier Professional gives some example
16 thresholds, correct?
17 A. Yes.
18 Q. And it says specifically, "Alignment may be
19 indicated when greater than 50 percent, greater than
20 60 percent, 70, 80, 90, of the edges of the teeth are
21 within about 1 millimeter, about half a millimeter,
22 about .1 millimeter, about 0.05 millimeters,
23 etcetera." Do you see that?
24 A. Yes.
25 Q. Among those examples -- those examples --

1 well, let me rephrase it.
2 A person skilled in the art reading the
3 Carrier Provisional would understand that these
4 examples encompass indicating alignment when greater
5 than 50 percent of the teeth are within about
6 1 millimeter, correct?
7 A. Yes. Yeah. So those are the set points.
8 Q. Okay. And per our discussion earlier, since
9 these measurements are in millimeters, it's indicating
10 that the system that's making this determination is
11 doing some calculation to measure the teeth in the
12 image, correct?
13 A. Right.
14 Q. Okay. And down in paragraph -- well, let me
15 see here. Let me see here.
16 Let's look at paragraph 67.
17 A. Yes.
18 Q. Again, this is similar to what we looked at
19 before. It's saying that the method and apparatus may
20 trigger an indicator when the overlay approximately
21 matches the patient's teeth; do you see that?
22 A. Yes.
23 Q. And a Person of Ordinary Skill in the Art
24 would indicate that that indicator is being
25 transmitted to the user during the process of

1 acquiring the image?
2 A. Yes.
3 Q. In fact, prior to acquiring the image,
4 correct?
5 A. No.
6 Q. Sorry?
7 A. No.
8 Q. Prior to capturing the image?
9 A. Capturing the image, yes.
10 Q. Thank you.
11 Do you see in paragraph 68, the second
12 sentence says, "For example, the indicator can be
13 triggered by estimating an indicator of the distance
14 between an edge of the patient's teeth at two or more
15 regions, and the outline of teeth"?
16 Do you see that?
17 A. Yes.
18 Q. Is it your understanding that Carrier is
19 proposing to measure the distance between each tooth
20 represented on the screen with each corresponding
21 overlay of that tooth?
22 A. My understanding is that when it comes to
23 alignment, that distance is measured, yes.
24 Q. The distance is necessarily measured in the
25 aggregate, right? But my question is: Is it your --

1 would a Person of Ordinary Skill in the Art understand
2 that when Carrier talks about the distance between an
3 edge of the patient's teeth, are you understanding
4 that as it's calculating for tooth number blank, here
5 is the distance between the edge of that tooth and the
6 edge of the corresponding outlay for the next tooth
7 and etcetera, is that your understanding?
8 MR. ARGENTI: Objection to form.
9 A. Well, it doesn't say "tooth by tooth." It
10 says the edges compared to the overlay.
11 BY MR. BLYTHE:
12 Q. Right.
13 A. But if we are looking at maybe a tooth
14 attribute, then only for that tooth it would be.
15 Q. Okay. Carrier -- the Carrier Provisional
16 never discusses measuring the edges of individual
17 teeth, correct?
18 A. Yes.
19 Q. Similarly, when it says "edges of the
20 patient's teeth at two or more regions," that could be
21 two more regions that are associated with the same
22 tooth, correct?
23 A. Could be, or not. It could be multiple
24 teeth, too.
25 Q. It could be either.

1 A Person of Ordinary Skill in the Art would
2 understand it could be either, correct?
3 A. Could be, yes.
4 Q. Very similar question as before in paragraph
5 69, when it talks about a visual indicator when user
6 moves the mobile phone such that the overlay nearly
7 matches the teeth. A Person of Ordinary Skill in the
8 Art would indicate that the indicators described in
9 this paragraph are being communicated to the user
10 prior to capturing the image?
11 A. Where was that? I'm sorry, I got lost.
12 Q. Sorry. Paragraph 69.
13 A. Paragraph 69. From the very beginning?
14 Q. Yes.
15 So, this paragraph discusses a visual
16 indicator, correct?
17 A. Yes.
18 Q. And that visual indicator would be displayed
19 prior to capturing the image?
20 A. Yes.
21 Q. Same with paragraph 70, first sentence refers
22 to one or more visual or audible cues to the user in
23 aligning the images. Those visual or audible cues
24 would be transmitted prior to capturing the image?
25 A. Yes.

1 Q. And in the next sentence, one or more arrows
2 may be shown on the screen to indicate the user should
3 move the mobile phone in a particular direction.
4 Those arrows are appearing for the user prior to
5 capturing the image?
6 A. "Prior to capturing the image."
7 Q. Okay.
8 A. I read arrows are used to indicate in which
9 direction the user needs to move --
10 Q. Right.
11 A. -- to achieve the alignment.
12 Q. It wouldn't be helpful to show a user an
13 arrow after they've already captured the image,
14 correct?
15 A. Or, in that case, an indicator needs to go to
16 the user saying that that image wasn't a good image,
17 capture another one.
18 Q. Right.
19 But that wouldn't be an arrow in that
20 situation?
21 A. No. The arrow is just for guiding the user
22 to move the -- move his or her hand.
23 Q. Okay. And I assume you'd agree in paragraph
24 71, the same is true of generating a beeping sound to
25 indicate the overlay matches the teeth, and it is the

1 moment to capture the image?
2 A. Yes. It's basically -- it's the -- they're
3 using the frequency of beeping to say how close they
4 are to have the alignment.
5 Q. Okay.
6 MR. BLYTHE: Let me check the time here. I'm
7 about to change subjects. Why don't we take a
8 five-minute break?
9 MR. ARGENTI: Okay.
10 (A recess was taken beginning at 2:31 p.m.,
11 and ending at 2:36 p.m.)
12 BY MR. BLYTHE:
13 Q. Okay. Could you turn to Exhibit 1005,
14 Carrier? And if you could turn to the second-to-last
15 piece of paper, it's labeled at the top as page 19.
16 Where the claims begin. It's page 19 of 1,005.
17 A. Oh, I see. Oh, yes. Yes.
18 Q. Sorry. I started in the wrong spot. Do you
19 mind turning back to page 4? It starts paragraph 33.
20 A. Yes.
21 Q. And do you see that the last sentence
22 beginning "the automatic detection indicates that the
23 automatic detection of match may be determined by
24 machine learning"?
25 A. Yes.

1 Q. And that disclosure of machine learning is
2 not present in the Carrier Provisional, correct?
3 A. I don't recall that.
4 Q. Okay. You didn't rely on a disclosure of
5 machine learning being in Carrier for purposes of your
6 opinions, correct?
7 A. No.
8 Q. Okay. But it is disclosed as a technique in
9 Exhibit 1005, right?
10 A. Yes.
11 Q. Okay. Turning back to that last page where
12 we see Claim 1 in this publication.
13 A. Yes.
14 Q. Do you see this claim describes a
15 computer-implemented method providing guiding, guiding
16 and transmitting generally?
17 A. Yes.
18 Q. A Person of Skill in the Art would understand
19 that Claim 1 of the Carrier publication encompasses
20 using machine learning, correct?
21 MR. ARGENTI: Objection, form; scope.
22 A. Actually, I think it's incorrect. There's no
23 mention of machine learning in there. So those are
24 specifications, and I don't see that in the -- in the
25 actual claim.

1 BY MR. BLYTHE:
2 Q. So if a Person of Skill in the Art were
3 practicing this claim by guiding the patient using the
4 overlay disclosure of this patent, and that overlay
5 disclosure was calculating alignment using machine
6 learning, they would not be practicing Claim 1 of the
7 Carrier publication?
8 MR. ARGENTI: Objection, form; scope.
9 A. Well, again, you know, Claim 1 does not say
10 that it requires using machine learning.
11 BY MR. BLYTHE:
12 Q. No.
13 A. So, doesn't matter. So --
14 Q. I --
15 A. A person of ordinary skill reading this would
16 know that machine learning is not required.
17 Q. You're -- I agree with you there, it's not
18 required.
19 My question is: Is it permissible?
20 MR. ARGENTI: Objection, form; scope.
21 A. What do you call "permissible"?
22 BY MR. BLYTHE:
23 Q. Well, my definition of permissible is -- it
24 is within the full scope of this claim, Claim 1 of the
25 Carrier patent.

1 A. I mean, is that the legal term? That's why
2 I'm asking. I'm not a lawyer. I cannot --
3 Q. Sure.
4 Well, I believe it's one that you've actually
5 evaluated, right? So let's turn back to your report.
6 And in -- starting at page 25 of your report -- sorry,
7 declaration, you are evaluating -- I guess it starts
8 in paragraph 52 of your declaration. You describe
9 Claim 1 of the Carrier publication.
10 And at the end of paragraph 52, you say, "I
11 illustrate that the Carrier Provisional discloses a
12 method including each of these claim elements,"
13 correct?
14 A. Yes.
15 Q. When you were performing the analysis of
16 whether the disclosure of Claim 1 is present in the
17 Carrier Provisional, were you considering whether the
18 Carrier Provisional discloses the complete breadth of
19 what is claimed in Claim 1 of the Carrier publication?
20 A. I don't understand what you mean by "complete
21 breadth." If you mean going to a specification, and
22 saying for example, you can use machine learning, for
23 me, it didn't appear in the claim.
24 Q. Okay. Is it fair to say you haven't
25 construed the scope of Claim 1 of the Carrier

1 publication?
2 A. I'm not sure what you mean by the "scope of."
3 Q. So let me see if I can go back to your
4 standards section. Do you see paragraph 28 on page
5 10?
6 (Phone interruption.)
7 A. Yes, um-hum.
8 BY MR. BLYTHE:
9 Q. Why don't you read that to yourself, and let
10 me know when you're done. I want to talk to you about
11 it.
12 A. Yes.
13 Q. So in your -- in your declaration, you were
14 addressing whether the original patent application --
15 sorry.
16 Whether a person having skill in the art
17 reading the original patent application, which here is
18 the Carrier Provisional, would have recognized that it
19 describes the full scope of the claimed invention,
20 here Claim 1 of the Carrier publication, right?
21 A. Yeah, I agree with what I have written there.
22 Q. All right.
23 A. But I'm saying that if, in the
24 specifications, it says, for example, machine learning
25 can be used.

1 Q. Um-hum.
2 A. In the claims, they're not saying that. So
3 go to the scope, in the claims, they don't appear.
4 Those terms do not appear. There are no limiting --
5 Q. Yeah.
6 A. -- components in -- appearing in the -- they
7 don't say what -- what method to use in the -- in the
8 actual claim.
9 Q. It's fine if not, but do you have an opinion
10 one way or another as to whether using machine
11 learning to guide the patients as -- as claimed in
12 Claim 1 of the Carrier publication is within the full
13 scope of that claim?
14 MR. ARGENTI: Objection, form.
15 A. Well, again, the claim doesn't say machine
16 learning. It doesn't mention anything about machine
17 learning. I mean, so those are in the specifications.
18 BY MR. BLYTHE:
19 Q. Okay.
20 A. So, the answer is no. I mean, I don't
21 consider it -- machine learning as being part of the
22 scope.
23 Q. Okay. I'm going to hand you what has already
24 been marked as Exhibit 1008, which we've been
25 referring to today as the "Salah" reference. Do you

1 recognize this as the Salah reference that you've
2 relied on in your obviousness analysis?
3 A. Yes, this was the certified translation that
4 I used.
5 Q. You anticipated my next question. So the
6 Salah publication itself was published in French,
7 correct?
8 A. Yes.
9 Q. In forming your opinions, did you rely on the
10 English translation, or did you rely on the French
11 publication?
12 A. I only relied on the English, the certified
13 English translation.
14 Q. Okay. Have you read the Salah publication in
15 French?
16 A. I skimmed through it.
17 Q. Okay. I want to ask you one question about
18 that. So I'm going to hand you what has been marked
19 as Exhibit 1012. And I will direct your attention
20 to -- I believe it's page 3. I didn't have this one
21 marked. You know what, I will mark that on the next
22 break, and we'll come back to it. I won't waste your
23 time to look. Let's move on from that.
24 Looking at -- back at Exhibit 1008, if you
25 could turn to the -- what's marked as pages 1 and 2 of

1 the translation -- sorry, the summary of the
2 invention.
3 A. Pages 1 and 2 of the translation; is that
4 right?
5 Q. Yes.
6 A. Yes.
7 Q. You see that under "Summary of the
8 Invention," it refers to "a method comprising the
9 following steps"?
10 A. Yes.
11 Q. And it has steps A through F?
12 A. Yes.
13 Q. Do you recognize the summary of steps A
14 through F here as a summary of the steps in this
15 invention that are described in greater detail in the
16 remainder of this publication?
17 A. Yes, this is the summary of the steps in the
18 invention.
19 Q. And would a Person of Skill in the Art
20 understand that these steps generally involve in A,
21 creating a 3D model; in B, acquiring an updated image
22 of the patient's arches; in C, analyzing that updated
23 image to produce discriminant information; in D,
24 determining the gross visual acquisition conditions;
25 and then in E and F, searching for a corresponding

1 virtual acquisition condition, and determining a
2 reference model that aligns with the so-called, let's
3 say, ground truth of the updated image?
4 MR. ARGENTI: Objection, form.
5 BY MR. BLYTHE:
6 Q. Is that your general understanding?
7 A. It's -- those are the steps that you kind of
8 summarized yourself. I mean, you did not read exactly
9 through them, but --
10 Q. Yeah, fair enough.
11 A. Yeah.
12 Q. I agree, it's not a complete summary. I just
13 want to make sure that we're on the same page about
14 what happens in this.
15 A. Right.
16 Q. Is it your understanding that the way that
17 Salah discloses taking information from a 2D image and
18 translating it to a 3D model is by essentially
19 obtaining -- well, let me rephrase that.
20 Salah proposes updating a 3D model from a 2D
21 image by determining virtually an image that would be
22 taken from relatively equivalent acquisition
23 conditions, but of a 3D model, rather than in real
24 life?
25 A. Where do you map that, what you just asked in

1 here?
2 Q. Sure. Let me -- you see in step D, it says,
3 "determining gross virtual acquisition conditions"?
4 A. Yes.
5 Q. Do you have an understanding of what "virtual
6 acquisition conditions" is?
7 A. It's potential position orientation of
8 acquiring an image.
9 Q. And a virtual acquisition condition is the
10 condition of acquiring the image, but any virtual
11 space with the 3D model?
12 A. Yes.
13 Q. And if a virtual image is captured of a 3D
14 model from acquisition conditions that are similar to
15 the acquisition conditions in which the patient's
16 teeth were captured in the real world, those images
17 can be aligned and information can be derived from it?
18 A. Correct.
19 Q. Okay. I just want to make sure that we're on
20 the same page about that.
21 So one of the disclosures of the Salah
22 reference is a method for determining what the real
23 acquisition conditions are so that a virtual
24 equivalent can be identified from the model, correct?
25 A. Yes. So, the -- if I draw a parallel with

1 Carrier, this 3D model is playing almost the same role
2 as the overlay.
3 Q. Right.
4 In Carrier, the overlay, let's say, forces
5 the acquisition device into the predetermined
6 conditions; whereas, in Salah, the conditions that
7 were captured are determined after the fact; is that
8 fair?
9 A. What you call "after the fact"?
10 Q. Sure.
11 So, let's actually look at the -- the steps
12 here in -- in Salah. So, let's -- let's go a little
13 further. I think we'll see it a little better in a
14 little bit.
15 But let's actually start with page 6 of
16 Salah, around line 23, where it starts "in step B."
17 So, line 23.
18 A. Line 23, yes.
19 Q. Yes. In step B, retractor.
20 A. Oh, I don't --
21 Q. Oh, I'm sorry. On page 6,
22 A. 6. Yes.
23 Q. And step B, referring back to page 2, is
24 acquisition of the image?
25 A. Okay. Step B is -- you're saying that is the

1 acquisition? Yes.
2 Q. Okay. So, during acquisition -- it says,
3 starting at line 23, substituting step B right,
4 "During acquisition, a retractor is used with one,
5 preferably more than two, preferably unaligned
6 registration marks," right?
7 A. Yes.
8 Q. Do you have an understanding of what the
9 registration marks are in the Salah publication?
10 A. I'm having a guess, that markers are used for
11 registration. That is a standard practice.
12 Q. Were the registration marks something that
13 you described in your declaration?
14 A. No, but I don't think I relied on that in my
15 declaration, because I was using the combination that
16 relies on Carrier, Salah, and Maninis.
17 Q. I see.
18 A. And it did not require using markers.
19 Q. Okay. So in the combination of Salah,
20 Carrier, and Maninis, this registration mark
21 disclosure is not used in that combination?
22 A. No markers are used, yes, in that
23 combination.
24 Q. Okay. Well, I -- let's -- I still want to
25 ask a couple of questions about what these

1 registration marks are, so I make sure we're on the
2 same page.
3 Do you see that -- turning to page 11 at line
4 12.
5 A. Yes.
6 Q. Do you see the invention refers to an
7 "acquisition kit"?
8 A. Yes.
9 Q. And that kit includes a dental retractor
10 featuring a registration mark, and an image
11 acquisition apparatus comprising several components,
12 right?
13 A. Um-hum, yes.
14 Q. And you understand in the Salah reference,
15 it's taught that preferably this process is being
16 performed by the patient using their own device,
17 correct?
18 A. Yes. Yes.
19 Q. So, in that instance, the dental retractor --
20 Let me say this: Would a person of skill
21 understand that a dental retractor is included in the
22 acquisition kit to enable the patient to acquire these
23 images outside of a dental office setting?
24 A. I don't know. I cannot speculate on that --
25 Q. Okay.

1 A. -- whether it's in office, outside office.
2 Q. That's fine.
3 Do you see at the top of page 12 on line 2 --
4 A. Yes.
5 Q. -- it says that an acquisition kit, according
6 to the invention, thus makes it possible to
7 considerably improve information processing speed for
8 the implementation of the controlled procedures
9 according to the invention?
10 A. Yes.
11 Q. And do you understand -- well, does a person
12 skilled in the art understand that this acquisition
13 kit is the acquisition kit that included the dental
14 retractor with the registration mark, and the image --
15 image acquisition apparatus?
16 A. I do.
17 Q. You see at the bottom of page 11, in fact,
18 the preceding sentence says that, "As will be seen in
19 greater detail later in this description, an
20 acquisition kit, according to the invention, makes it
21 possible, in particular, to position the acquisition
22 apparatus in a position which substantially
23 corresponds to a preset position"?
24 Do you see that?
25 A. Yes.

1 Q. That is similar to the disclosure of Carrier
2 regarding the use of an overlay, correct?
3 A. With the difference that the Carrier is not
4 talking about an acquisition kit and any of that. But
5 the only similarities that it says -- it talks about
6 the preset position, and substantially corresponds to
7 that position.
8 Q. Fair enough.
9 Okay. Is it your understanding that the --
10 let me rephrase that.
11 Would a person skilled in the art understand
12 that a registration mark has a similar function to,
13 for example, a fiducial, like might be used in a QR
14 code?
15 MR. ARGENTI: Objection to form.
16 A. I mean, this is just getting really
17 completely out of -- you know, I don't see any
18 relationships between QR code and the word fiducials,
19 the way you used it, is not necessarily the way it's
20 used in computer vision, and not necessarily every
21 author uses it in the same way.
22 BY MR. BLYTHE:
23 Q. Okay.
24 A. Fidicuals are typically features that you
25 extract. Markers are handmade. So my first instinct

1 is to say: No, absolutely has nothing do with that.
2 Q. That's absolutely your prerogative.
3 Do you see that on page 12, between lines 10
4 and 16, it gives some -- it refers to a reference?
5 A. Yes, it says, "The reference is selected from
6 the group consisting of," and it lists there.
7 Q. Do you have an understanding of what the
8 reference is, as distinct from the registration mark
9 in the Salah publication?
10 A. SO, one may interpret this as features.
11 Q. Well, do you see on line -- approximately
12 line 18, the last dash mark says, "the registration
13 mark is positioned so that when it corresponds to set
14 reference on the screen, it is in a certain position"?
15 Do you see that?
16 A. Yes.
17 Q. Would a Person of Skill in the Art understand
18 that the reference is an on-screen indicator that the
19 user can align with the registration mark on the
20 retractors?
21 A. I didn't rely on registration marks.
22 Q. Um-hum.
23 A. I don't have any opinion on that.
24 Q. Okay. So you don't have an understanding of
25 the relationship between reference and registration

1 mark in this publication?
2 A. As I said earlier, the combination of Salah,
3 Carrier, Maninis that I propose, I'm not using
4 markers, hand -- hand-put markers.
5 Q. Okay. If you turn to page 14, do you see at
6 line 20, 21, there's a reference to "discriminant
7 information"?
8 A. Yes.
9 Q. It indicates that discriminant information
10 can be selected of a group consisting of various
11 information, correct?
12 A. Yes.
13 Q. One of those is contour information, right?
14 A. Yes.
15 Q. But there's several other types of
16 discriminant information that are not contours, right?
17 A. Yes.
18 Q. If you turn to page 16 --
19 A. Yes.
20 Q. -- starting at line 15, it refers to -- well,
21 the invention relates to a computer program?
22 A. Yes.
23 Q. In this instance, it says, "Invention also
24 relates to a computer program, and in particular, a
25 specialized cell phone application comprising program,

1 code, instructions for execution of one or more,
2 preferably all steps B to F, etcetera. Do you see
3 that?
4 A. Yes.
5 Q. So, in this instance, Salah is indicating
6 that preferably, all steps from image acquisition, to
7 step F where the model is updated, are performed using
8 code on the cell phone application --
9 A. On a cell phone.
10 Q. -- correct?
11 A. Yes.
12 Q. Okay. Could you turn to page 19? Do you see
13 at line 10, it refers to Figure 7?
14 A. Yes.
15 Q. And it says, "Figure 7 schematically
16 illustrates the relative position of registration
17 marks." Do you see that?
18 A. Yes.
19 Q. If you turn to Figure 7, which is on page --
20 well, page number restarts. But it's one of the last
21 few pages, Figure 7.
22 A. Page what?
23 Q. It's page 5 of 7 at the top.
24 A. 5 of 7, yes.
25 Q. And Figure 7, would a person skilled in the

1 art understand that this is depicting how the use of
2 these re-circular registration marks can help
3 determine the orientation and position from which the
4 image was acquired?
5 A. If they use markers, yes.
6 Q. Okay. And is it your understanding in the
7 Salah reference that the apparatus for acquiring the
8 images is a mobile device, such as a cell phone?
9 A. Yes.
10 Q. Okay. And you also understand that Salah
11 indicates this method can be performed by patients at
12 home, remote to dental offices?
13 A. Yes.
14 Q. Okay. If you could turn to page 27. If you
15 could also refer to Exhibit 1012, the original French
16 publication.
17 A. I cannot make any comments on the French
18 publication.
19 Q. And why is that?
20 A. Because I did not form my opinion -- any part
21 of my opinion on the French publication.
22 Q. You indicated earlier that you have looked at
23 the French publication, correct?
24 A. I quickly looked at it by curiosity.
25 Q. Okay.

1 A. But I didn't form my opinion on that.
2 Q. Okay. Nonetheless, can you turn to page 27
3 of the French publication?
4 A. I can do so, but --
5 Q. Okay.
6 A. Page 27?
7 Q. Yes, sir.
8 A. Yes.
9 Q. Do you have an understanding of the header at
10 line 15 that begins -- (Speaking French)?
11 A. I cannot answer that question.
12 Q. Okay. Fair enough.
13 You can flip back to Exhibit 1006. Sorry,
14 excuse me. Exhibit 1008, page 27.
15 A. Yes.
16 Q. You see at line 15, it indicates that a
17 method for checking the positioning of teeth according
18 to the invention does not require precise positioning
19 of the image acquisition apparatus relevant to the
20 teeth, correct?
21 A. Yes.
22 Q. Would a person of ordinary skill in the art
23 understand that one of the advantages of the method
24 disclosed in Salah is that the initial image does not
25 need to be precisely taken as a result of the method

1 disclosed for aligning it with the 3D model?
2 A. Why would you say "initial image"?
3 Q. Let me rephrase that.
4 Would a Person of Ordinary Skill in the Art
5 understand that the images that are acquired according
6 to this invention do not need to be precisely oriented
7 because of the techniques that Salah discloses for
8 aligning them with the 3D model?
9 A. It doesn't talk about aligning with the 3D
10 model. It just says that it is not to be -- I do not
11 see any mention in that sentence.
12 Q. Okay. From your review of the Salah
13 publication, is it your understanding that a Person of
14 Skill in the Art would know why Salah indicates that
15 the images do not require precise positioning?
16 A. For -- with my general knowledge of Salah, is
17 that Salah is using 3D model, in more or less almost
18 similar fashion as Carrier, how it uses overlays. So
19 yes, it assists user to align with the 3D.
20 Q. It's your understanding -- sorry.
21 It's your opinion that a person of ordinary
22 skill would understand that Salah is using the 3D
23 model to guide the user in aligning the acquisition
24 apparatus?
25 A. In a very similar manner as I said Carrier is

1 using overlay, yes.
2 Q. Do you see in the next paragraph, it says 27,
3 starting at line 19 or 20 or so, and extending onto
4 the next page by a couple of lines, do you recognize
5 this as the portion of the Salah publication and --
6 you have cited in your declaration as relating to the
7 guidance for a user to acquire the images?
8 A. Can you refer to a specific place in my
9 declaration?
10 Q. Sure.
11 Can you turn to page 69 of your declaration,
12 Exhibit 1002?
13 A. Page 69?
14 Q. Yes.
15 A. Yes.
16 Q. And this is, as you can see from the previous
17 page, addressing '409 patent Claim 1, step (e').
18 A. Um-hum.
19 Q. And you see that the citations to Salah are
20 exclusively to Exhibit 1008 at page 27, line 21 to
21 page 28, line 2?
22 A. Can you refer to which line in my
23 declaration?
24 Q. Sure. In paragraph 129.
25 A. 129, yes. Okay.

1 Yes, I have directly quoted from there.
2 Q. Okay. And again on paragraph 152.
3 A. 152 on my declaration?
4 Q. Yes. In the last line.
5 A. Yes.
6 Q. And, again, in paragraph 134 of your
7 declaration.
8 A. 144?
9 Q. 134.
10 A. 134?
11 Q. Um-hum.
12 A. Yes.
13 Q. And again in paragraph 137 of your
14 declaration.
15 A. Yes.
16 Q. Okay. So turning back to Exhibit 1008,
17 starting at line 21 -- actually, let's start at line
18 19. It says, "Preferably, however, the image
19 acquisition apparatus includes verification means to
20 facilitate its approximate positioning relative to the
21 patient prior to acquisition of the updated image."
22 Do you see that?
23 A. Yes.
24 Q. Is it your -- would a Person of Skill in the
25 Art understand that the use of "verification" means --

1 there refers to these various disclosures of guiding,
2 positioning the acquisition apparatus?
3 A. Yes, among -- there is various different
4 examples, methods that are provided.
5 Q. Right.
6 A. If they have different ways of doing it, it
7 includes one or another.
8 Q. Okay? And those various methods are
9 described, as you have cited, between lines 21 of page
10 27, and spilling over onto the first two lines of 28,
11 correct?
12 A. Um-hum, yes.
13 Q. Looking at some of these, do you see that in
14 line 22, it indicates, "The personal device may now
15 take a photo from the front," and later, it says,
16 "take a photo from the right"?
17 A. Yes.
18 Q. Those announcements would be given prior to
19 the user acquiring a photo from the front or to the
20 right, right?
21 A. Prior to the user acquiring, you said, or
22 capture?
23 Q. "Capture," thank you.
24 Those would be announced prior to the user
25 capturing the image, right?

1 A. Yes, to direct the user to go to the correct
2 position --
3 Q. Okay.
4 A. -- for that capturing.
5 Q. Okay. And then it indicates that the
6 completion of the acquisition process may also be
7 announced, correct?
8 A. Yes.
9 Q. Okay. And beyond announcement, it refers to
10 visual prompts in line 26, including, e.g., by
11 displaying arrows, do you see that?
12 A. Yes.
13 Q. It also says and/or audio messages, such as a
14 series of beeps, a frequency of which increases as the
15 device's positioning improves, right?
16 A. Yes.
17 Q. As we've discussed before, arrows and beeps
18 would both need to be communicated to the user while
19 they are in the process of capturing the image,
20 correct?
21 A. No. I -- not necessarily both communicating
22 simultaneously.
23 Q. Sure.
24 A. I mean --
25 Q. Either/or?

1 A. Either/or, or both --
2 Q. Okay.
3 A. -- could do.
4 Q. My question being: A person of skill would
5 understand that you are not -- that Salah is not
6 teaching to display arrows, or give a series of beeps
7 after the image has been captured, correct?
8 A. Well, after the image is captured, arrows or
9 beeps would be not useful. But, however, Salah
10 actually discloses that the image may not be accepted,
11 in which case it starts again, you know, starts with
12 beeps and the arrows.
13 Q. Okay. And then it says -- well, we talked
14 about the registration marks. Sorry. I will move on.
15 Do you see on page 30, if you could turn down
16 to line 22 on page 30.
17 A. Yes.
18 Q. Do you see that it says, "In a preferred
19 embodiment, acquisition is performed using an
20 acquisition kit comprises a dental retractor"?
21 A. Yes.
22 Q. And, in fact, on the next page, 31, starting
23 at line 4 --
24 A. Yes.
25 Q. -- it says, "A kit, according to the

1 invention, advantageously enables image acquisition
2 without the need for a specialist person, in
3 particular an orthodontist. And in particular, image
4 acquisition can be carried out by the patient himself
5 or by one of their relatives using a simple phone
6 anywhere, and especially outside a medical, dental, or
7 orthodontic practice," correct?
8 A. Yes, I see that.
9 Q. Okay. A Person of Skill in the Art would
10 understand that this advantage is being attributed to
11 a kit that includes a retractor having registration
12 marks?
13 A. He or she may do that. Again, I'm going to
14 go back on what I said. I'm not relying on
15 acquisition kits.
16 Q. Sure.
17 A. Or previously as we were discussing, markers,
18 or anything like that.
19 Q. I just want to understand if you have an
20 opinion about how a person with skill would understand
21 this paragraph of Salah. Would a person of skill
22 understand that this paragraph is referring to the kit
23 that includes retractors, with a registration mark?
24 A. Yeah, it may be -- be interpreted that
25 because it's done outside doctor's office, that helps

1 to acquire better images.
2 Q. Okay. Going down the page to line 23 --
3 A. Page 31?
4 Q. Yes, on page 31. The paragraph beginning,
5 "The ability to acquire images."
6 A. Yes.
7 Q. It says, "The ability to acquire images with
8 limited precision is a considerable advantage."
9 A. Yes, I see that.
10 Q. Would a Person of Skill in the Art, reading
11 the Salah reference, agree that it's a considerable
12 advantage to be able to acquire images with limited
13 precision?
14 A. That's what it says.
15 Q. Would a Person of Skill in the Art agree with
16 that?
17 A. A person -- a person of ordinary skill in the
18 art would take -- you know, would take the ordinary
19 meaning of those words.
20 Q. Okay. Let's turn to page 34.
21 A. Yes.
22 Q. So this starts in a section titled "Updated
23 Map." Do you see that?
24 A. Yes.
25 Q. And do you see that it says -- it's talking

1 about a Person of Skill in the Art -- sorry, line 11.
2 A Person of Skill in the Art know how to process and
3 update an image to reveal discriminant information?
4 A. (Nods head affirmatively.)
5 Q. A Person of Skill in the Art would understand
6 that this discussion is of determining discriminant
7 information in the images that have been captured?
8 A. Yes.
9 Q. And it -- at line 15, it indicates that these
10 processes include one or more of the following
11 well-known and preferred methods?
12 A. Yes.
13 Q. And would a Person of Skill in the Art
14 understand that the inventors and authors of the Salah
15 publication had determined what methods are preferred
16 or not preferred by experimentation?
17 MR. ARGENTI: Objection, form.
18 A. I have no idea if they've done it by
19 experimentation. That's speculation. But they say
20 that there's one group that is preferred, and another
21 group that is not.
22 BY MR. BLYTHE:
23 Q. So, you -- you don't have a view one way or
24 the other as to whether a Person of Skill in the Art
25 would understand that the Salah inventors actually

1 attempted to use these methods in the context of their
2 invention determining discriminant information?
3 A. No, I disagree with that. I think that
4 clearly Salah does not preclude any of the
5 nonpreferred ones. And it doesn't say don't do it,
6 because we tested and it didn't work. What you just
7 said is you said maybe they test it, and they figure
8 out it's not preferable and don't do it. But that's
9 not what Salah says.
10 Now why they say some are preferable and some
11 are not, I don't know. But the person of ordinary
12 skill, I don't think would interpret that. Because
13 they're not discouraging anybody using any of the
14 nonpreferred ones.
15 Q. In your view, a person of skill would link
16 whether or not the inventors are discouraging use with
17 whether or not they have actually tested these
18 methods?
19 A. That's not what they say.
20 MR. ARGENTI: Objection to form.
21 BY MR. BLYTHE:
22 Q. Okay.
23 A. That's not what they say. They don't say we
24 discourage you.
25 Q. No, right.

1 A. They say the group -- in that list, some of
2 them are preferable, some of them are not.
3 Q. Sure. So I --
4 A. There's no discouragement. I don't take it
5 that way. A POSA wouldn't see it that way.
6 Q. So, yeah, I'm not asking about whether it's
7 discouraging. I'm just trying to determine whether
8 you have a view or not as to whether a person of skill
9 would understand that they had tested these methods,
10 hadn't tested these methods, or wouldn't know. Do you
11 have any idea?
12 MR. ARGENTI: Objection, form.
13 A. I have -- I cannot make a comment on that
14 because Salah is not saying that we tested these. And
15 the person of ordinary skill neither would have any
16 opinion on that, because they don't say we tested
17 these ones, they are not working, don't use them.
18 That's not what they say.
19 BY MR. BLYTHE:
20 Q. Okay.
21 A. They say they have some preferred, and some
22 nonpreferred methods.
23 Q. That answered my question.
24 Do you see the first line says "by applying a
25 candy filter"?

1 A. Yes.
2 Q. And it says, in particular to search for
3 contours, using Candy's algorithm?
4 A. Yes.
5 Q. None of the other methods listed in the --
6 either the preferred, or not preferred methods refer
7 to search for contours, correct?
8 A. That's incorrect.
9 Q. Okay.
10 A. So that's coming, I'm sorry to say, from
11 nonexpert point of view.
12 Q. Sure.
13 A. In fact, number 2, you say use a Sobel
14 filter. That's an edge detector. Number 3 says using
15 a passing filter. That's an edge detector. And I
16 don't have to go on and on. There might be other
17 ones. But even the last one, it says deep learning,
18 that could be an edge detector. So that's not true.
19 Q. I mean that's expressly written in that
20 language, right?
21 A. Yeah, but the POSA would know that the Sobel
22 filter is an edge detector.
23 Q. Sure. I'm not disagreeing with you. I'm
24 just trying to confirm that -- I think we all know
25 what it says, so let me withdraw that.

1 A. Okay.
2 Q. A person of skill would recognize, though, as
3 you just said, a Candy filter is appropriate for
4 determining contours, right?
5 A. Yes.
6 Q. Okay. And when you look at --
7 Well, let me say this: Salah does not
8 indicate that deep learning is a preferred technique,
9 right?
10 A. Yes.
11 Q. Salah does not indicate that deep learning is
12 preferable to any other technique that it discloses,
13 correct?
14 A. That is correct. But it doesn't say that
15 deep learning shouldn't be used either. It just says
16 that he doesn't prefer it.
17 Q. In fact, what the Salah inventors indicate is
18 that there are more than a dozen methods that are
19 preferred to deep learning, correct?
20 A. Again, that doesn't matter from a POSA's
21 point of view, because they don't say why they prefer
22 one against another one. I can go -- come up with
23 some confusing examples. For instance, they say O2 is
24 preferred, and Cannons are not. Those are the same
25 methods. A POSA would know that even the proof of

1 mathematics behind them is the same, practically.
2 They're just variations of the same method. I have no
3 idea why Salah says that he prefers O2, but not, for
4 instance, Cannons, I don't know.
5 Q. Is it fair to say that what you're saying is
6 that a person of skill would not see some kind of
7 dramatic delineation between the preferred and
8 nonpreferred methods here?
9 A. Absolutely not. In fact, if I go all the
10 way, as I said, to deep learning, deep learning could
11 be used. But they say it's not preferable. But by
12 the priority date of the '409 patent, deep learning
13 was a lot more popular than any one of these methods.
14 And popularity -- by "popularity," I don't
15 mean, again -- I mean -- I don't mean fashion
16 popularity. I'm talking about the fact that a POSA
17 would have known that provides more accurate and
18 better results. Plus, the fact that by that time,
19 deep learning could provide -- provide
20 category-specific results, rather than, for instance,
21 Cannon that is preferred here.
22 Q. Okay. I want to introduce what has
23 previously been marked as Exhibit 1007. Do you
24 recognize this as the Maninis reference?
25 A. Yes.

1 Q. So, we've referred to it -- throughout the
2 day, we've been talking about a convolutional neural
3 network. And I wanted to back up, and understand, or
4 get your understanding of what would a Person of Skill
5 in the Art understand in July of 2017 is a neural
6 network?
7 A. Well, you're asking a very broad question.
8 Because there was prior to deep learning, and then
9 after deep learning. The neural network -- neural
10 network have been around before deep learning.
11 Q. Okay.
12 A. They've been around for decades. So there
13 are different architectural neural networks that has
14 appeared. But after the appearance of -- or invention
15 of deep learning, which is prior to the priority date
16 of '409 patent, way before, then deep learning would
17 refer to -- to deep neural networks that would have
18 many layers between the input layer and the output
19 layer.
20 Q. Do you have -- would you be able to describe
21 what a deep learning neural network is, at a high
22 level?
23 A. Yes. It's a -- it's a collection of -- each
24 layer -- it consists of many layers. And at each
25 layer, it consists of -- you can interpret it that

1 way -- a unit processing, a -- a processing unit. And
2 many of these processing units. That when you -- when
3 you have not trained, they contain a set of parameters
4 that are arbitrary.
5 And between the layers, it may have some
6 nonlinear properties also, without getting too
7 technical. So -- and -- so, by adjusting these
8 parameters of each layer, you're letting the machine
9 learn based on the labeled input data. So the process
10 requires an optimization process.
11 So you let the error propagate in the forward
12 direction and -- I'm sorry. You let the data
13 propagate in the forward direction, and you let the
14 error propagate in the reverse direction. It's called
15 "back propagation." It's a process by which you train
16 the machine.
17 Q. Okay. When you refer to the layers, and
18 propagating forwards and backwards through those
19 layers, the layer is a logical construct; is that
20 fair?
21 A. What do you mean by "a logical construct"?
22 Q. Well, I mean, they aren't physical layers
23 like there are sheets of paper, right? These are
24 layers of analysis?
25 A. A system -- yeah, we refer to that as a

1 model.
2 Q. Okay.
3 A. And that model has an architecture. And that
4 architecture has certain number of layers.
5 Q. Okay.
6 A. I'm not talking about hardware. This is
7 machine learning. Machine -- when we say "machine,"
8 we mean that.
9 So, yes, it has layers of -- of very
10 elementary processors that can be -- imagine that they
11 can -- their -- their parameters can be adjusted based
12 on the training process.
13 Q. Okay. So, it's -- it's an algorithm with
14 values that are updated through the training process,
15 is that --
16 A. You can put it that way. That's one way of
17 describing it, yes.
18 Q. Okay.
19 A. It's a machine that learns basically by
20 adjusting its parameters.
21 Q. Okay.
22 A. It learns the labels of the data. So once --
23 once it's trained and it's converged, you can figure
24 out -- once it's converged, then you present an input,
25 unseen data -- in this case, images, an unseen image,

1 then it can return the labels for you.
2 Q. And the way you're using "machine" there,
3 machine learning is an algorithm that gets updated as
4 it's trained; is that right?
5 A. Yeah, I -- we don't like to call it an
6 "algorithm."
7 Q. Okay.
8 A. "Algorithm" is -- usually refers to
9 handcrafted program.
10 Q. Okay.
11 A. Or a method of crafting -- handcrafting a
12 program. This is not that. This is that -- inside
13 your computer, you build a model that has millions of
14 parameters. And by adjusting those parameters,
15 basically that model learns whatever you want to train
16 it on.
17 Q. Okay. And the way that model functions is
18 determined by what it is trained on?
19 Let me rephrase that, and make that a little
20 bit easier.
21 Depending on how you train the model, it will
22 produce different results for different inputs; is
23 that correct?
24 A. I'm not sure if I understand what you're
25 saying.

1 Q. Okay.
2 A. Is that -- yes, you could take a baseline --
3 let's say CNN, as you mentioned earlier. Baseline
4 computational neural network, and you can train it to
5 perform a, let's say, I don't know, animal detection,
6 or, of course, propagator. And you can also train it
7 to perform a -- as a human detection --
8 Q. Okay.
9 A. -- a pedestrian detection. The baseline is
10 the same. And as you train it, it learns the labels.
11 Q. Okay. Do I understand correctly that at the
12 outset, prior to training, that the model -- that the
13 neural network begins with random values throughout
14 prior to training?
15 A. It could be.
16 Q. Okay.
17 A. So that would be the simplest way of doing
18 this. So you're sitting there -- you're saying that
19 initialize all of the -- all of the learning
20 parameters randomly.
21 Q. Um-hum.
22 A. But you could inject prior knowledge into
23 this to avoid randomness. With the hope that it
24 convergences faster to a better model.
25 Q. And that prior knowledge originally came in

1 the form of what was a simpler random -- initially
2 random model that itself was trained, correct?
3 A. I don't understand the question.
4 Q. Let me ask it this way: The CNN in Maninis
5 is pre-trained on images from ImageNet.
6 A. Um-hum.
7 Q. That pre-training on ImageNet is itself a
8 training process with back propagation, correct?
9 A. Okay. I -- I think I understand where you're
10 getting. You're getting to something else here.
11 Q. Okay.
12 A. So sometimes you pre -- you take a
13 pre-trained model --
14 Q. Um-hum.
15 A. -- and what you do is you -- the techniques
16 that you -- it's not the full training, but is -- but
17 it's called domain adaptations. Various techniques,
18 domain adaptation, or other techniques that would
19 allow you to -- for instance, a model that is
20 pre-trained in one dataset, you adapt it to handle
21 another dataset.
22 So, it usually does not require a full
23 training. It's usually -- it is some kind of
24 adaptation of that initially trained -- pre-trained
25 model.

1 Q. Okay. All right. I think I follow that.
2 A. Um-hum.
3 Q. Once the neural network is trained -- well,
4 let me be specific because it could be variations.
5 The convolutional neural network in Maninis
6 that is proposed in the combination we're discussing
7 today, once it has been trained, the internal values
8 are fixed such that you'll get the same output for an
9 identical input; is that correct?
10 MR. ARGENTI: Objection to form.
11 A. Once a model is trained, fully trained --
12 BY MR. BLYTHE:
13 Q. Um-hum.
14 A. -- then you can use it for evaluation and
15 testing on a test set. And that test set typically
16 should be unseen examples, or unseen input. In this
17 case, images.
18 Q. And when it is tested on those unseen images,
19 the model is not being updated like it is during
20 training, correct?
21 A. Not necessarily. You could -- you could
22 update the model. You could -- there are techniques
23 that would allow you to update the model also.
24 Q. Is that what is being performed in the CNN at
25 Maninis?

1 MR. ARGENTI: Objection to form.
2 A. Maninis is saying that the model is modular,
3 and that a model is -- is also flexible. And they say
4 that you can use any baseline CNN.
5 Q. Um-hum.
6 A. So one could interpret that using any
7 baseline CNN means that you can switch between them.
8 Q. Sure.
9 A. So --
10 Q. So my question isn't quite can the model be
11 adopted or can it be retrained.
12 My question is: As -- as used in this
13 combination, is the CNN in Maninis, let's say, being
14 trained as it evaluates the acquired images in --
15 A. Maninis may not be explicitly disclosing
16 that. It's not what -- it can be done. A POSA would
17 have known that it's a possibility.
18 Q. Okay. If it is being trained as it evaluates
19 the images, are those images part of the learning
20 base --
21 MR. ARGENTI: Objection --
22 BY MR. BLYTHE:
23 Q. -- in your opinion?
24 MR. ARGENTI: -- form; scope.
25 A. Again, so, it becomes a little bit more

1 complicated than that. It's not as straightforward as
2 that. Is that -- there are techniques, as I said --
3 BY MR. BLYTHE:
4 Q. Um-hum.
5 A. -- that allows you to do that. And
6 typically, they're -- those techniques are designed to
7 handle real-life problems. I mean, as an example, if
8 you want to use a CNN for autonomous driving, so you
9 want your CNN to improve itself. So basically, it's
10 as if you were learning by your own mistakes. So
11 there are techniques that would allow you to do that.
12 Q. Okay. To keep this really grounded, I'm
13 trying to determine --
14 A. Yes.
15 Q. -- is that a process or feature that, in your
16 view, a Person of Skill in the Art would be motivated
17 to implement in determining the image attributes of
18 the acquired dental arch that is in the context of
19 your combination here in the '409 patent?
20 MR. ARGENTI: Objection to form.
21 A. I mean, I have not assumed that, but a person
22 of ordinary skills could have thought about that.
23 BY MR. BLYTHE:
24 Q. Okay. Once a neural network model is
25 trained, it can be run on multiple devices, or be

1 transferred between devices; is that correct?
2 MR. ARGENTI: Objection, form.
3 A. Yes. I mean, once you -- your model is
4 trained, you can put it on any number of computers and
5 run it.
6 BY MR. BLYTHE:
7 Q. Okay.
8 A. On any number of cell phones, for instance.
9 Q. Let's take a look at Exhibit 1007 itself. Do
10 you see in the second paragraph, the introduction on
11 page 1, it's the paragraph beginning "this paper"?
12 A. Yes.
13 Q. Go down -- if you look on the left, it starts
14 "our overall approach."
15 A. Down all the way -- yes.
16 Q. It says: Our overall approach is both
17 efficient --
18 A. Yes.
19 Q. -- paren, it runs in 0.8 seconds per image?
20 A. Yeah. Yes.
21 Q. Do you see that?
22 A. Yes.
23 Q. Do you understand that 0.8 seconds per image
24 to refer to the results that are disclosed on page 9
25 in Table 3?

1 A. Actually, somewhere -- it actually says that
2 was 0.8, approximately 0.79, whatever it is, is for
3 the worst-case scenario. They said that was the upper
4 band, or the upper -- the image that took the maximum
5 time. They said that.
6 Q. Okay. But you understand that to correlate
7 to the 0.79 in Table 3?
8 A. Yes.
9 Q. Okay. I want to --
10 Well, in Table 3 -- let's stay on that for a
11 second. Table 3 is under the header "5.6, Efficiency
12 Analysis," correct?
13 A. Yes.
14 Q. And if you turn back to page 5, where Section
15 5 starts.
16 A. Page 5, yes.
17 Q. This is part of experiments on low-level
18 applications; do you see that?
19 A. Um-hum.
20 Q. And you understand that the results reported
21 in Table 3 for the 0.79 seconds is a determination of
22 hierarchal contours, but not object recognition?
23 A. No, that's not true.
24 Q. Okay.
25 A. As I mentioned earlier, that -- it's

1 not just -- it's not the way -- the way it happens is
2 not sequential. You know, the neural network is
3 providing category-specific contours. So what that
4 means is that if -- if it's providing a contour of a
5 cat, it's labeled as a cat that's contoured. So
6 it's -- simultaneously, we know where the cat is in
7 the image.
8 Q. I see.
9 Okay. So, just to confirm, it's -- it's your
10 understanding that when Maninis is discussing the
11 low-level applications in Section 5, that while it's
12 producing the contours or boundaries, it is also
13 identifying those contours or boundaries as associated
14 with a particular object?
15 A. Absolutely, definitely.
16 Q. Okay. Throughout, there's a reference to the
17 PASCAL VOC?
18 A. Yes.
19 Q. PASCAL VOC -- "VOC" stands for visual object
20 classes challenge; is that correct?
21 A. Yes.
22 Q. Okay. Is it fair to say that's a competition
23 that was hosted that provides an -- labeled datasets
24 for testing algorithms?
25 A. Yes.

1 Q. Okay. The PASCAL VOC dataset is not a set of
2 dental images, right?
3 A. That is right.
4 Q. Okay. It has 20 classes of objects; do you
5 know?
6 A. No, I believe it's 40-something, off the top
7 of my head.
8 Q. Okay. Do you know whether any of those
9 classes are teeth?
10 A. No, I don't think so.
11 Q. The PASCAL context dataset has more labels
12 than VOC, right?
13 A. Yes.
14 Q. In fact, I believe, as it says here in
15 Maninis, on page 6, if you look at -- sorry, am I on
16 the right page? Yeah.
17 In the first line at the top there, it says,
18 "This results in 459 semantic contours." Do you see
19 that?
20 A. Are we talking about the same?
21 Q. Oh, sorry. We're in Maninis Exhibit 1007.
22 There's a sentence that runs from page 5 to page 6.
23 A. Oh, I see. Page 5 to page 6, yes.
24 Q. Okay. The PASCAL context dataset has 459
25 semantic contours?

1 A. By -- in order of magnitude, yes.
2 Q. Right.
3 Do you understand whether any of those
4 classes or categories are teeth?
5 A. I don't believe so.
6 Q. Okay. In Section 6.3, which -- well, let me
7 start here. On page 9, do you see Section 6 starts
8 label, "Experiments on High-level Applications"?
9 A. Section 6?
10 Q. Yeah. Page 9. Starts on the bottom
11 right-hand corner.
12 A. Yeah.
13 Q. What's your understanding of the difference
14 between the high-level applications and the low-level
15 applications?
16 A. So, low-level applications is just looking at
17 the edges. And high-level applications, they should
18 be filling out, you know, additional information, like
19 finding the segments, and maybe finding instances.
20 Q. Okay. Do you see that Section 6.2 on page
21 11?
22 A. Section --
23 Q. 6.2.
24 A. 6.2, yes.
25 Q. This is a discussion of semantic boundaries.

1 A. Um-hum.
2 Q. Is the use of semantic boundaries here, is
3 that indicating the type of determinations that
4 Maninis would make as used in your combination of
5 Salah, Carrier, and Maninis?
6 A. Yes.
7 Q. Okay. And these semantic boundaries -- to
8 obtain these semantic boundaries, Maninis is
9 indicating that its COB, or convolutional oriented
10 boundaries, which is the name of the CNN in this
11 paper, right?
12 A. Yes.
13 Q. The COB is being combined with -- sorry --
14 with Fast R-CNN, is that your understanding? By -- if
15 you take a look at the sentence running from page 9 to
16 page 10, where it talks about Section 6.2 and 6.3.
17 A. Fast R-CNN, yes.
18 Q. So to achieve the results in 6.2, and
19 subsequently in 6.3, which is about object proposals
20 for object detection.
21 A. Right.
22 Q. The COB has to be combined with other known
23 networks, like Dilated Network, PSP Net and Fast
24 R-CNN, correct?
25 A. That's what they suggested to do, yes.

1 Q. Okay. And if you look at 6.3, do you see the
2 second paragraph starting "we evaluate"?
3 A. Yes.
4 Q. It says, "We evaluate the bounding box
5 proposals generated by COB by feeding them into the
6 Fast R-CNN pipeline for object detection."
7 A. Um-hum, yes.
8 Q. So is it your understanding that for the
9 object detection results described in 6.3, COB would
10 need to be run, box proposals generated, and then fed
11 into Fast R-CNN?
12 A. No, they say that for evaluating, to see how
13 good the results are. They -- they -- they are
14 feeding them into Fast R-CNN. So this matches the
15 figure we see on the same page, Figure 16. So you can
16 put bounding boxes around them. And then we can see
17 how well it matches the ground truth. And they're
18 saying for the evaluation of that, they're using Fast
19 C-RNN.
20 Q. I see.
21 A. They're evaluating against Fast C-RNN for
22 object detection.
23 Q. Do you see that the sentence running between
24 pages 12 and 13 are -- let me get this right.
25 Okay. Never mind.

1 Let's turn back to page 6. In that middle
2 paragraph towards the end, do you see the reference to
3 Caffe? We use the publicly-available Caffe 46.
4 A. Which column are you talking about?
5 Q. The left-hand column.
6 A. Left-hand column.
7 Q. Just before "training details."
8 A. I see -- yes, we use the publicly-available
9 Caffe, yes.
10 Q. Are you familiar with Caffe?
11 A. Yes, some of my products are on Caffe.
12 Q. Do you know whether Caffe runs on any
13 operating system compatible with a mobile phone in
14 July of 2017?
15 A. Not for Caffe maybe. But that doesn't mean
16 that the learning cannot run on -- on a cell phone.
17 Q. Just a smaller question than that. So --
18 A. Um-hum.
19 Q. Okay.
20 A. Actually on that, no, it -- Caffe is, by
21 now -- I think by the priority date, I would say that
22 was starting to get out of fashion, and people were
23 starting to use other platforms.
24 Q. Sorry. Starting to use other platforms?
25 A. Other -- Caffe is basically a software

1 platform developed to make easier for others to
2 develop models.
3 Q. Right.
4 Is it your understanding that if the --
5 what's the word -- the model, the COB network were to
6 run on a different framework, would there need to be
7 any translations to that model?
8 A. What do you mean by "a different framework"?
9 Q. Never mind. I don't want to waste our time
10 on that.
11 Let's look at -- next to Table 3, just above
12 it, in fact. And this is on page 9.
13 A. Yes.
14 Q. Do you see it describes in the second
15 paragraph, the GPU that was used during the testing in
16 Table 3?
17 A. Yes.
18 Q. Are you familiar with the Nvidia type next
19 GPU?
20 A. Yes.
21 Q. Would you agree that that was a cutting edge
22 GPU in 2017?
23 A. Might have been at that time. I don't
24 recall.
25 Q. Are you aware of whether the Nvidia type next

1 GPU was expensive as far as GPUs go?
2 A. I don't remember the costs.
3 Q. Okay. Maninis, the authors don't identify
4 any of the other parameters of the system that they
5 ran their evaluation on, other than the GPU, correct?
6 A. Yes, Maninis does not do that.
7 Q. It was routine to use GPUs for deep learning
8 techniques in 2017, correct?
9 A. Not really.
10 Q. Okay. What was more typical in 2017?
11 A. Both CPUs and GPUs were available. In fact,
12 prior to the priority date of 2017, there were many
13 techniques that were developing to perform deep
14 learning on CPU.
15 Q. Maninis doesn't refer to performing a
16 technique on a CPU, correct?
17 A. Correct. But Maninis is not concerned with
18 that. Maninis is concerned with improving the
19 efficiency of some problem in the context of deep
20 learning. Maninis is not concerned about whether
21 their model can be trained on a CPU or GPU. They just
22 wanted to show that more efficient way of doing
23 contour detection, and more specifically category
24 specific contour detection. They were not bothered by
25 that issue at all. But by the priority date of 2017,

1 many people were working on doing this, making this
2 possible. Including myself, that performing deep
3 learning on a CPU.
4 MR. BLYTHE: Let's take a break.
5 (A recess was taken beginning at 3:56 p.m.,
6 and ending at 4:09 p.m.)
7 BY MR. BLYTHE:
8 Q. Okay. Dr. Foroosh, would you turn back to
9 your declaration?
10 A. Yes.
11 Q. In particular, page 93.
12 A. Yes.
13 Q. On page 93, you're starting to address '409
14 patent's Claim 8; is that correct?
15 A. Yes.
16 Q. '409 patent's Claim 8 is the method as
17 claimed in Claim 1 in which the learning base is
18 composed according to a set of steps; is that right?
19 A. Yes.
20 Q. So, in other words, Claim 8 is addressing how
21 the learning base is formed; is that right?
22 A. Yes.
23 Q. And in your analysis, I want to make sure I
24 understand what the proposal is here. So let's turn
25 to -- starting at page 102.

1 (Phone interruption.)
2 A. Page 102 of my declaration?
3 BY MR. BLYTHE:
4 Q. Yes, of your declaration.
5 A. Yes.
6 Q. And in paragraph 196, you summarize steps A,
7 D, E, and F, correct?
8 A. Yes.
9 Q. And that summary is that any updated image
10 being a real image of teeth, and the reference image
11 being a virtual image generated from Salah's arch
12 model to optimally match the updated image, matching
13 zones containing a corresponding tooth model are
14 identified, correct?
15 A. Yes.
16 Q. And then, tooth model attribute value is
17 assigned to that zone in the updated image, correct?
18 A. Yes.
19 Q. And that process is used to essentially
20 generate a historical image that's added to the
21 learning base, correct?
22 A. No, that process is used to generate labeled
23 images.
24 Q. Okay. Sure. Historical image that is
25 labeled?

1 A. Labeled.
2 Q. Okay. In order to -- as we discussed, and as
3 required in Claim 1, in order to analyze an image with
4 the deep learning device, it has to already have been
5 trained by means of a learning base, correct?
6 A. Yes, that's correct.
7 Q. So, in Claim 8, in your combination, would a
8 person of skill be using to perform the steps of
9 Claim 1, a, you know, Maninis as already trained on
10 the 10,000 historical images we discussed earlier, and
11 is now generating additional historical images?
12 A. Yes.
13 MR. ARGENTI: Objection, form.
14 BY MR. BLYTHE:
15 Q. Okay. It is not your proposal that a person
16 of skill would be using the method in Salah on its own
17 prior to having a trained CNN from Maninis, in order
18 to generate the original learning base on which the
19 Maninis CNN is trained, such that it can analyze
20 images?
21 A. I'm confused here --
22 Q. Yeah.
23 A. -- by your question.
24 Q. Sorry. Let me try to break it down.
25 A. Yes.

1 Q. I'll break that down.
2 Salah -- with or without combination with
3 Carrier and Maninis, Salah discloses updating 3D
4 models, correct?
5 A. That's right, yes.
6 Q. And in Claim 8, steps D, E, and F, what I
7 wanted to confirm is whether your proposal is that
8 these new historical images that have been labeled are
9 being generated before Maninis is trained, or after
10 Maninis is trained?
11 A. If you're using Maninis --
12 Q. Um-hum.
13 A. -- of course, obviously, Maninis is trained.
14 There's no other way around this.
15 Q. Sure.
16 A. So there's a portion of learning base, as
17 Maninis refers to. The learning base is created
18 before training the Maninis' network on dental
19 imagery. And then once it's trained, we can take
20 advantage of it to create a updated learning base.
21 Q. Okay. So, you're not proposing that a Person
22 of Skill in the Art would use Salah on its own in
23 order to generate a learning base, in order to train
24 Maninis in order to use Maninis with Salah and
25 Carrier?

1 A. Yes, I'm saying that the person of ordinary
2 skill can do that.
3 Q. Okay. So there are two ways that you're
4 saying a person of skill could use this disclosure.
5 One being generate additional images after training,
6 and the other being generate the images that
7 originally trained Maninis?
8 MR. ARGENTI: Objection to form.
9 A. I'm saying that when Maninis -- in order to
10 train Maninis, we could use either Carrier or Salah to
11 create the learning base.
12 BY MR. BLYTHE:
13 Q. Um-hum.
14 A. And Maninis is teaching us that the learning
15 base needs to include, you know, attributes and so on
16 and so forth, so that teaching the creation of
17 learning base with labels --
18 Q. Um-hum.
19 A. -- is in Maninis. And the methods that
20 Carrier and Salah provide would allow us to do that.
21 Because I've been saying somewhere in my -- in my
22 declaration that, for instance, we can take -- in the
23 case of Carrier, we can take the overlay as the ground
24 truth. So we can transfer the labels directly; and
25 therefore, create the learning base.

1 Q. Okay. So if I'm understanding in that
2 situation, a person of skill would be motivated to use
3 Salah and/or Carrier without Maninis first, correct?
4 A. To train Maninis.
5 Q. Yes.
6 And Salah and Carrier produce sufficient
7 results without Maninis, at least sufficient enough to
8 obtain images that can be used to train Maninis,
9 correct?
10 A. What do you mean sufficient results? I'm
11 not -- I don't know what you mean by sufficient
12 results.
13 Q. Sure.
14 I -- I will just put it this way: Your
15 opinion is that a person of skill would be motivated
16 to -- let me rephrase that.
17 In your opinion, a Person of Skill in the Art
18 attempting to build a learning base for Maninis would
19 be motivated to use Carrier and Salah as they are?
20 A. So I think there's a confusion between two
21 things.
22 Q. Okay.
23 A. So, before -- prior to training of Maninis --
24 Q. Um-hum.
25 A. -- in dental imagery, so it -- learning base

1 is -- the learning base on historical images.
2 Q. Right.
3 A. This can be done -- the alignment process is
4 based on edges. This can be done based exactly like
5 Carrier or Salah setting. And -- which do not produce
6 category-specific edges, but they produce edges that
7 can be used for alignment.
8 Q. Um-hum.
9 A. And there was alignment. Upon those
10 alignments, we can transfer the ground truth. For
11 instance, in the case of Carrier, the ground truth is
12 coming from predefined overlay orientations.
13 So, we know exactly which tooth are present,
14 where the contours are exactly. We can transfer that
15 to the images. So that would -- that's a process that
16 would allow us to create a learning base to train
17 machine learning model that would subsequently create
18 in combination with Maninis. And --
19 I'm sorry, in combination with Salah and
20 Carrier, to create the proposed combination that I
21 have suggested.
22 Q. When the person of skill who is motivated to
23 do what you just described sets out, are they starting
24 with the goal of ultimately combining Salah, Carrier,
25 and Maninis?

1 A. That's the ultimate goal to achieve what '409
2 patent is claiming.
3 Q. Is the goal to achieve what the '409 patent's
4 claiming?
5 A. The goal to -- to achieve that same
6 combination that would yield '409 patent.
7 Q. Okay.
8 A. Or shall I say that the combination would
9 make '409 patent, of course, obvious in that case.
10 Q. You said "in that case." So, to clarify,
11 what is it that the person of skill is setting out to
12 achieve when they arrive at the combination of Salah,
13 Carrier, and Maninis?
14 A. The same set of objectives that '409 patent
15 has.
16 Q. Okay.
17 A. I'm saying that they would have been obvious
18 prior to the priority date of '409 patent, by
19 combining these three prior arts.
20 Q. When you say the same set of objectives that
21 the '409 patent has, you mean the objectives of the
22 method set forth in the claims of the '409 patent?
23 A. The claim. And also in the abstract, they
24 say that this is a system for -- this is acquiring
25 images, doing analysis of the images, and use those

1 analysis of the images to align with some
2 predetermined models, which would be 3D model, in the
3 case of Salah, or overlay in the case of Carrier. And
4 then -- and then compare that to a preset value to
5 determine whether the image that is being acquired is
6 good enough to capture or not.
7 Basically sending a message to the user, yes,
8 capture this, it's good image, or no, do not capture.
9 Or with arrows, or other means directing the user to
10 perform additional acquiring. So, yeah, I mean,
11 you're right, the claims of '409 patent.
12 Q. Could you take a look at paragraph -- well,
13 let me -- let me back up.
14 Why would a Person of Skill in the Art want
15 to achieve the claims on the '409 patent?
16 MR. ARGENTI: Objection, form.
17 A. I -- I'm not saying that the person of
18 ordinary skill would say, okay, let me achieve that.
19 But I'm saying that by looking at -- the person of
20 ordinary skill, by looking at three prior arts, would
21 come up with the same objectives as the '409 patent.
22 BY MR. BLYTHE:
23 Q. So the Person of Skill in the Art forms their
24 objective after becoming aware of Carrier, Salah, and
25 Maninis?

1 A. You want to call it after, but I would call
2 it by thinking that by combining these, I can achieve
3 set of goals. And I'm saying that those set of goals,
4 basically -- the claims that are '409 patent have put
5 in the claims sections.
6 Q. And so, what are the set of goals that the
7 person of skill is trying to achieve, when, and why?
8 A. As I said, the system that performs the same
9 tasks that '409 patent is claiming, I'm saying that
10 the person of ordinary skills, by combining these
11 three prior arts, could have come to that -- to the
12 same -- to the same set of objectives. And which
13 match exactly the '409 patent claims.
14 Q. Okay. Okay. So, can we take a look at
15 paragraph 198 of your declaration?
16 A. Yes.
17 Q. I want to just check one thing here. This is
18 talking about the labels that are being applied to the
19 historical images; is that correct?
20 A. Yes.
21 Q. And in the fourth line, you say this
22 identification could be done manually. Do you see
23 that?
24 A. Yes.
25 Q. By "manually," you mean hand, human annotated

1 pixel by pixel?
2 A. Yes, that's one possibility that we look at
3 when we're looking at deep learning, manual
4 manipulation.
5 Q. Okay. So, the other would be assistance of
6 edge detection algorithms, such as a pre-trained
7 version of Maninis. And I think we were talking about
8 that earlier --
9 A. Um-hum.
10 Q. -- right?
11 A. That's right.
12 Q. And the last is, or it could be done using
13 additional tools or registering tooth locations?
14 That's the third one you identified?
15 A. Um-hum.
16 Q. Which of these would a person of skill be
17 motivated to use to accomplish this?
18 MR. ARGENTI: Objection, form.
19 A. If I'm saying those are possibilities, any
20 one of them, the person of ordinary skill would be
21 motivated to do. Any one of those achieves the goal,
22 which is building a learning base.
23 BY MR. BLYTHE:
24 Q. Okay. Could you please turn to page 31 of
25 your declaration?

1 A. Yes.
2 Q. Okay. In paragraphs 62 to 67, you're
3 describing other evidence that's associated with the
4 public availability of the Maninis reference; is that
5 correct?
6 A. Yes.
7 Q. And it's your understanding that the Maninis
8 reference needs to have been publicly available prior
9 to the July 2017 priority date of the '409 patent?
10 A. Yes.
11 Q. Just to confirm, are you familiar with the
12 Wayback Machine or Internet Archive?
13 A. Yes.
14 Q. Have you ever worked for or at the Internet
15 Archive?
16 A. No.
17 Q. Okay. Have you ever worked for -- is it
18 pronounced archive.org?
19 A. I pronounce it archive.
20 Q. Okay. Me, too.
21 Have you ever worked for archive.org?
22 A. No.
23 Q. Okay.
24 A. However, I have published at archive.org. I
25 have submitted papers to archive.

1 Q. Have you ever participated in their process
2 in which they review submissions?
3 A. By "participation," you mean submitting
4 papers?
5 Q. No, I mean reviewing papers that are
6 submitted by others.
7 A. No, this is not peer review platform.
8 Q. Right.
9 A. When they say "review," they mean complying
10 with different things. Not the peer review in terms
11 of the scientific review.
12 Q. Right.
13 But they are reviewed by members of
14 archive.org prior to publication, right?
15 A. For different things, yes.
16 Q. Okay. And you have never been a reviewer at
17 archive.org?
18 A. (Shakes head negatively.)
19 Q. Sorry that was a "no"?
20 A. No, I have never worked for archive.org.
21 Q. Okay. Do you know whether a publication has
22 ever been removed from archive.org after it was
23 initially published?
24 A. I -- I'm not aware of any such action taking
25 place. The only reason I can imagine, if you did

1 something against the rules.
2 Q. So, not to -- not to ask for your
3 speculation. I just want to know if you are aware of
4 such an instance.
5 A. No, I have never seen any paper being
6 removed.
7 Q. Okay.
8 A. In fact, they have a rule that even authors
9 themselves cannot remove the paper.
10 Q. Your familiarity with archive.org's rules is
11 from your review of their policies when submitting
12 their papers?
13 A. Yes.
14 Q. Sorry.
15 Your review of their policies when submitting
16 your papers.
17 A. My papers.
18 Q. Okay. Do you know who the archive.org
19 administrators were in April of 2017?
20 A. You mean knowing their personal names? No, I
21 don't know. I don't know them.
22 Q. No problem.
23 A. I can add one more thing to that, is that
24 even archive.org rules, in my personal experience, we
25 can refer back on -- on internet -- oh, I use my

1 word -- the history to find out that, in fact, the
2 rules back then prior to -- prior to priority, what
3 were the set of rules that were published.
4 Q. Um-hum.
5 A. The way that machine was referring to.
6 Q. You have no personal knowledge of whether any
7 of archive's policies were actually applied to the
8 publication and submission of the Maninis publication,
9 correct?
10 A. I don't think -- I don't have any --
11 either -- opposite knowledge either, you know. I can
12 image that they apply equally. When they apply the
13 rules, they apply them equally to everybody.
14 Q. I know these questions seem unnecessary, but
15 just bear with me.
16 To confirm, you don't have personal knowledge
17 of how the Maninis paper was treated by archive.org,
18 right?
19 A. I wasn't a co-author on that paper, so I
20 cannot have a personal knowledge. Only co-authors and
21 the -- probably administrators of archive.org would
22 have known that.
23 Q. Okay. So you do not have personal knowledge?
24 A. Not personal knowledge.
25 Q. Okay. If you turn to paragraph 67 in your

1 report.
2 A. Paragraph 67?
3 Q. Yes, on page 34.
4 A. Yes. Yes.
5 Q. You're referring to a archived web page of
6 the authors of Maninis, correct?
7 A. Yes.
8 Q. And that is -- sorry.
9 Exhibit 1024, I have a copy if you want to
10 take a look.
11 A. I'm sorry. What was your question?
12 Q. My question is: You were referring to the --
13 what you're calling an archived web page of the
14 authors of Maninis?
15 A. Um-hum. Yes.
16 Q. That's Exhibit 1024?
17 A. Yes.
18 Q. And you note that there is a link to
19 https://arxiv.org, etcetera. Do you see that?
20 A. Yes.
21 Q. And that link ends with a number indicating
22 the article number of the Maninis paper, correct?
23 A. Yes.
24 Q. And if you look at paragraph 62 in your
25 declaration, do you see -- do you acknowledge that

1 there are two versions of the Maninis publication?
2 A. Yes, they have an earlier version, and then
3 they submitted a second one.
4 Q. Right.
5 And as you indicate, the -- both versions are
6 available at the link that you have identified as
7 linked on the author's website, correct?
8 A. Yes.
9 Q. Okay. So --
10 A. And also, there were minor differences
11 between those two versions.
12 Q. You haven't cited or relied on version 1 --
13 A. No.
14 Q. -- of Maninis in your declaration, correct?
15 A. Actually, everything I cited, it is on
16 version 1, too, but I used version 2, yes.
17 Q. Okay. And you agree that the markings on the
18 side of Exhibit 1007 that are horizontal, that begin
19 "arxiv:" and ends "28APR2017," it's your opinion that
20 that is a submission date, not a publication date,
21 correct?
22 A. Yes. And the policy was at the time that
23 within a couple of days, it would be appearing on the
24 archive website, available worldwide.
25 MR. BLYTHE: Let me go off the record and

1 gather up what I have left. I think we're getting
2 close. I will try to finish this up.
3 MR. ARGENTI: Sounds good.
4 MR. BLYTHE: Okay.
5 (A recess was taken beginning at 4:38 p.m.,
6 and ending at 4:51 p.m.)
7 BY MR. BLYTHE:
8 Q. So, I want to go back briefly to something we
9 were discussing earlier, Dr. Foroosh. You had
10 previously mentioned that you had identified Carrier
11 and Salah by searching for dental imaging, correct?
12 A. I said that it was kind of a interactive
13 between the counsel and myself.
14 Q. Okay.
15 A. It's not just my own going and searching and
16 looking at the prior arts. We came up with these
17 prior arts.
18 Q. You indicated that you had done some
19 searching of your own on the internet, right?
20 A. When you say on my own, yes, I was on my own
21 when doing searching. But the -- going through the
22 collection of, you know, prior arts, and zeroing down
23 was, you know, in collaboration with counsel.
24 Q. Okay. How did you identify the Maninis
25 reference?

1 A. I don't remember whether I was the person who
2 identified, or was it counsel. But the -- I don't
3 remember that. But once identified, fairly quickly, I
4 agree.
5 Q. Maninis is not in the field of dental
6 imaging, correct?
7 A. Correct.
8 Q. A search for dental imaging publications or
9 patents would not return the Maninis reference, right?
10 MR. ARGENTI: Objection, form.
11 A. I don't know whether it would return or not.
12 Some of them might have said, well, you can use this
13 Maninis dental imaging, and it would return this for
14 you. I don't know.
15 But I believe that -- as I said, most
16 probably that, you know, that counsel actually
17 recommended, and it was coming from WSGR. And I said,
18 yeah, that is very good reference.
19 MR. ARGENTI: I'm going to instruct you not
20 to discuss communications that you had with us when
21 you were developing your opinions in this case.
22 BY MR. BLYTHE:
23 Q. What was the search that you did to identify
24 Maninis?
25 MR. ARGENTI: Objection, form.

1 A. Looking for something to do with edge
2 detection, but semantic segmentation. And that's an
3 area I'm working on.
4 BY MR. BLYTHE:
5 Q. Okay. Would a search for semantics
6 segmentation discover Salah and Carrier?
7 MR. ARGENTI: Objection, to form.
8 A. I don't know. As I said, you're talking
9 about many months ago. This is not something -- I
10 don't do recordkeeping of -- I'm on the computer and
11 internet on daily, hourly, every minute. I don't -- I
12 cannot remember everything I do.
13 BY MR. BLYTHE:
14 Q. Is it fair to say that you did not identify
15 Salah and Carrier in the same search as you did
16 Maninis?
17 MR. ARGENTI: Objection, form.
18 A. Again, I don't know. I might have. I don't
19 know.
20 BY MR. BLYTHE:
21 Q. Okay. Did you do anything to prepare for
22 your deposition today?
23 A. Yes. We had a meeting yesterday.
24 Q. Sorry?
25 A. Yes, we had a meeting yesterday.

1 Q. Did you only have a meeting yesterday?
2 A. Not -- you mean for preparation of this?
3 Q. Yeah.
4 A. Yes.
5 Q. Okay. For how long did you meet?
6 A. I don't remember off the top of my head.
7 Q. Was it all day?
8 A. Something along that line, yes.
9 Q. Who was in attendance at that meeting?
10 A. The counsel.
11 Q. Okay. Anyone besides Mr. Argenti?
12 A. Online, a second person from WSGR.
13 Q. Do you recall that person's name?
14 A. Yes, Patrick Medley.
15 Q. And that meeting took place in Orlando?
16 A. Yes, in Orlando.
17 Q. In preparing your declaration, do you recall
18 how many hours approximately you spent in forming and
19 preparing your opinions in this case?
20 A. For preparation today's --
21 Q. No, sorry.
22 For preparing your declaration and the
23 opinions in your declaration.
24 A. Oh, I don't remember off the top of my head
25 the number of hours.

1 Q. Okay. Order of magnitude, do you have a
2 sense of whether it's closer to 10 hours or 50 hours?
3 A. Somewhere in between, maybe.
4 Q. Okay. Other than meeting with counsel and
5 WSGR yesterday, did you speak with anyone else in
6 preparing for today's deposition?
7 A. No.
8 MR. BLYTHE: Okay. So, I think I'm going to
9 end that there, subject to any recross. So I will
10 turn the witness over.
11 MR. ARGENTI: Nothing from me.
12 (Proceedings concluded at 4:59 p.m.)
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1 CERTIFICATE OF OATH

2

3 THE STATE OF FLORIDA)

4 COUNTY OF ORANGE)

5

6

7 I, Tosha S. Seaney, Registered Professional

8 Reporter, certify that HASSAN FOROOSH, PHD personally

9 appeared before me, and was duly sworn on the 17th of

10 May, 2024.

11 Signed this 17th of May, 2024.

12

13

14

15 _____

TOSHA S. SEANEY, RPR, FCR, CCR, GRL

16 Notary Public, State of Florida

My Commission # GG 105516

17 My Commission Expires: June 1, 2025

18

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1 CERTIFICATE OF REPORTER

2

3 THE STATE OF FLORIDA)

4 COUNTY OF ORANGE)

5

6 I, TOSHA S. SEANEY, Registered Professional

7 Reporter, do hereby certify that I was authorized to,

8 and did stenographically report the foregoing

9 deposition of HASSAN FOROOSH, PHD; that a review of

10 the transcript was requested; and that the foregoing

11 transcript, pages 1 through 240, is a true and

12 complete record of my stenographic notes.

13 I FURTHER CERTIFY that I am not a relative,

14 employee, attorney, or counsel of any of the parties,

15 nor am I a relative or employee of any of the parties'

16 attorney or counsel connected with the action, nor am

17 I financially interested in the action.

18

19 DATED this 22nd day of May, 2024.

20

21

22 _____

TOSHA S. SEANEY, RPR, FPR, CCR, GRL

23 Registered Professional Reporter

Florida Professional Reporter

24 Certified Court Reporter

Georgia Realtime License

25

1
ACKNOWLEDGMENT
2
3 STATE OF FLORIDA)
4 COUNTY OF ORANGE)
5
6
7 I, HASSAN FOROOSH, PhD, hereby certify that I
8 have read the transcript of my testimony taken under
9 oath in my deposition on May 17, 2024; that the
10 transcript is a true, complete, and correct record of
11 my testimony, and that the answers on the record as
12 given by me are true and correct.
13
14 _____
HASSAN FOROOSH, PhD
15
16
17 Signed and subscribed to before me
18 this _____ day of _____, 2024.
19
20
21 _____
Notary Public, Florida
22
23
24
25

1 *** ERRATA SHEET ***
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NEW YORK, NEW YORK 10017
3 (212) 400-8845

4 CASE: ALIGN TECHNOLOGY vs. DENTAL MONITORING SAS
DATE: May 17, 2024
5 WITNESS: HASSAN FOROOSH, PhD REF: #SY009164

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23 Under penalties of perjury, I declare that I have read the foregoing document and that the facts stated
24 in it are true.

25 _____ _____
Date HASSAN FOROOSH, PhD
Date HASSAN FOROOSH, PhD

A

a' 46:18,25 56:6
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