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2 UNITED STATES PATENT AND TRADEMARK OFFICE

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5 BEFORE THE PATENT TRIAL AND APPEAL BOARD

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GOOGLE LLC

Petitioner

v.

CYWEE GROUP, LTD.
(record) Patent Owner

IPR2018-01257 and

IPR2018-01258

D E P O S I T I O N

o f

DR. JOSEPH LAVIOLA
taken on behalf of Petitioner

DATE: May 22, 2019

TIME: 9:22 a.m. to 3:40 p.m.

PLACE: Crowne Plaza Orlando Downtown
304 West Colonial Drive
Orlando, Florida 32801

BEFORE: Dawn A. Hillier, RMR, CRR, CLR
Notary Public - State of
Florida, at Large

JOB NO: 161006

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INDEX

PAGE

WITNESS - DR. JOSEPH LAVIOLA	6
DIRECT EXAMINATION BY MR. SMITH	6
CROSS EXAMINATION BY MR. KEY	130
CERTIFICATE OF OATH	138
REPORTER'S CERTIFICATE	139

EXHIBITS

Exhibit 2004 Expert declaration of Dr. Joseph LaViola, Ph.D., in support of patent owner response for Patent No. 8,552,978	10
Exhibit 2011 Expert declaration of Dr. Joseph LaViola, Ph.D., in support of patent owner's motion to amend for Patent No. 8,552,978	10
Exhibit 1001 United States Patent No. 8,441,438	12
Exhibit 1004 United States Patent No. 7,089,148 B1, Bachmann et al.	105
Exhibit 1005 United States Patent Application Publication for the Zhang patent	118
Exhibit 1006 United States Patent No. 7,158,118	123

NOTE TO REPORTER: All exhibits retained by counsel.

REPORTER'S KEY TO PUNCTUATION:

-- At end of question or answer references
interruption.

... References a trail-off by the speaker.

No testimony omitted.

"Uh-huh" "Um-hum" References affirmative sound.

"Huh-uh" "Um-um" References negative sound.

1 DR. JOSEPH LAVIOLA

2 THE VIDEOGRAPHER: Good morning. This is the
3 start of media file number one of the deposition of
4 Joseph LaViola, Ph.D. in the matter of Google, LLC
5 as petitioner versus CyWee Group, Limited, as
6 record patent owner before the Patent Trial and
7 Appeal Board of the United States patent and
8 trademark office, Case Nos. IPR2018-01257 and
9 IPR2018-01258. This deposition is being held at
10 the Crowne Plaza Orlando Downtown, 304 West
11 Colonial Drive, Orlando, Florida, on Wednesday,
12 May 22nd, 2019 at approximately 9:22 in the
13 morning.

14 My name is Rick Spector. I am a legal video
15 specialist from TSG Reporting, Inc. headquartered
16 at 747 Third Avenue, New York, New York. The court
17 reporter is Dawn Hillier in association with TSG
18 Reporting.

19 At this time, I'll ask counsel to please
20 introduce themselves.

21 MR. SMITH: This is Matthew Smith for the
22 petitioner, Google, LLC.

23 MR. KEY: And this is Cecil Key for patent
24 owners CyWee Group. And with me are Jay Kesan and
25 Arlen Papazian and also Ari Rafilson of Shore Chan

1 DR. JOSEPH LAVIOLA

2 and DePumpo.

3 MR. SMITH: So, we have a couple of
4 housekeeping matters before we start. First of
5 all, as was noted by the videographer, this is a
6 combined deposition for IPR2018-01257 and 01258.
7 So, we'll be asking questions about both.

8 And second, although the notice was for
9 videotaped deposition, we've agreed that the video
10 will be shut off during this deposition and there
11 will be no video for other witnesses with respect
12 to these IPRs, although we're leaving the audio
13 recording on today.

14 Any objections, Cecil?

15 MR. KEY: No. We confirm that agreement.

16 DR. JOSEPH LAVIOLA,
17 was called as a witness, and having first been duly
18 sworn, was examined and testified as follows:

19 THE WITNESS: I do.

20 COURT REPORTER: Thank you.

21 DIRECT EXAMINATION

22 BY MR. SMITH:

23 Q Now, could you state your name for the record,
24 sir?

25 A Joseph J. LaViola, Junior.

1 DR. JOSEPH LAVIOLA

2 Q And can I call you Dr. LaViola? Is that okay?

3 A Sure.

4 Q Okay. You've been deposed before; right?

5 A Yes.

6 Q Okay. And in connection with these patents at
7 all?

8 A Yes.

9 Q And when was that, sir?

10 A I was deposed -- I don't remember the exact
11 dates. Perhaps it was last year, sometime in the
12 spring. And I believe also last year, sometime in the
13 fall. And then I had another one that was actually in
14 January of this year.

15 Q Do you remember which cases those were in
16 connection with or who the parties were?

17 A One of them was CyWee versus sam -- or Samsung
18 versus CyWee, whatever, whichever way it is. And the
19 other one was with Huawei.

20 Q And you mentioned a third, though.

21 A I had two depositions with Samsung.

22 Q I see. So, by now, you're probably familiar
23 with the rules of depositions?

24 A Yes.

25 Q I will ask you questions. You need to answer

1 DR. JOSEPH LAVIOLA

2 the questions unless CyWee's attorney instructs you to
3 do that for reason of privilege. Do you understand
4 that?

5 A Yes.

6 Q You understand you're under oath and need to
7 testify accurately?

8 A Yes.

9 Q Is there any reason you can't testify
10 accurately today?

11 A No.

12 Q Any medications or anything that would
13 interfere with your testimony?

14 A I have a medical condition that causes me to
15 get sleepy from time to time.

16 Q Okay.

17 A It may occur today. It may not.

18 Q Understood.

19 If you want to take a break at any time, just
20 let us know. We can do that.

21 A Okay.

22 Q Did you prepare for the deposition today?

23 A Yes.

24 Q And how did you do that, sir?

25 A I went through the various documents, which

1 DR. JOSEPH LAVIOLA

2 include my reports, the reports of Google's expert, the
3 patents, the '438, '978 patent as well as the patents
4 for Liberty, Zhang, and Bachmann.

5 Q And did you meet with anybody while you were
6 preparing?

7 A Yes.

8 Q And with whom did you meet, sir?

9 A I met with counsel, DiMuro.

10 Q Which attorney, specifically?

11 A Cecil and Jay and also Arlen. And I also met
12 with Ari as well.

13 Q Okay. And about how long did you meet with
14 these attorneys?

15 A I would say about 12 hours.

16 Q I'm going to hand you copies of two documents.
17 Can you identify those, sir?

18 A This is my expert declaration in the -- for
19 the '978 patent. This is my expert declaration in
20 support of CyWee's motion to amend for the '978 patent.

21 MR. KEY: Before going, can I see those,
22 please?

23 THE WITNESS: Yes.

24 MR. SMITH: I'll just note for the record that
25 the expert declaration for the '978 patent is

1 DR. JOSEPH LAVIOLA

2 Exhibit 2004, and the expert declaration for the
3 motion to amend for the '978 patent is Exhibit
4 2011. It's not actually marked on the documents.
5 But just how they were filed.

6 MR. RAFILSON: Counsel, do you have copies?

7 MR. SMITH: No. We arranged beforehand to use
8 electronic copies for previously filed documents.

9 (Exhibit 2004 was marked.)

10 (Exhibit 2011 was marked.)

11 BY MR. SMITH:

12 Q While Mr. Key is looking through those, I'll
13 hand you a second set of declarations. Could you
14 identify those for the record, Dr. LaViola?

15 A This is my expert declaration for the -- for
16 CyWee for the '438 patent. And this one is my
17 declaration to support patent owner's motion to amend
18 the '438 patent.

19 MR. KEY: I also want to look at these.

20 Counsel, I'd suggest we mark these in some way,
21 otherwise, when we get going forward, I think it's
22 going to be very confusing about which document is
23 which, even for those of us that are looking
24 electronically.

25 MR. SMITH: I assume you're suggesting marking

DR. JOSEPH LAVIOLA

them with the exhibit numbers?

MR. KEY: Right. Right. We can use the existing exhibit number.

MR. SMITH: Sure.

MR. KEY: But having some marking to help refer to I think would be very helpful.

MR. SMITH: That's fine. They're still going to be some ambiguity because they're both Exhibit 2004 and 2011; right?

MR. KEY: Well, that's fair enough.

MR. SMITH: So, Dr. LaViola, how should we refer to these to keep them straight? Would the '978 main declaration and the '978 motion to amend declaration be fine? And then '438 main and '438 motion to amend? Do you understand?

THE WITNESS: Yes, that's fine. Yes.

BY MR. SMITH:

Q Okay. Great. And you are the Dr. LaViola who signed those four declarations; correct?

A I am.

Q And you signed them under oath?

A Yes.

Q And we have mentioned today the '978 patent. Does that refer to US Patent No. 8,552,978?

1 DR. JOSEPH LAVIOLA

2 A Yes.

3 Q And it's okay if we refer to the '978 patent,
4 you know what that means, by now, I hope?

5 A Yes. Um-hum.

6 Q And the '438 patent is US Patent No.
7 8,441,438; correct?

8 A Yes.

9 Q And you understand that to be the '438 patent?

10 A Yes.

11 Q Okay. I'm handing you a copy of Exhibit 1001
12 in IPR2018-01258. Can you identify that for me?

13 (Exhibit 1001 was marked.)

14 THE WITNESS: This is the '438 patent.

15 BY MR. SMITH:

16 Q I'm also going to hand you a copy of
17 Exhibit 1001 from IPR2018-01257. Can you identify that
18 one?

19 A This is the '978 patent.

20 Q Do you understand that there are two
21 interparties review proceedings, one relating to the
22 '438 patent and one relating to the '978 patent?

23 A Yes.

24 Q And are you familiar with the case numbers
25 that I've been using, IPR2018-01257 and IPR2018-01258?

1 DR. JOSEPH LAVIOLA

2 A No.

3 Q We have declarations in both of these IPRs.
4 And there's a little bit of overlap between the
5 declarations; right?

6 A Yes.

7 Q Okay. If, just to save time, you have similar
8 passages in both declarations, and we can talk about
9 both at once so I don't have to ask you twice, is there
10 any easy way for me to identify those to you?

11 A I mean, I don't really see an easy way to do
12 it other than just to say, you know, '438, '978, or just
13 '438 or just '978.

14 Q Okay. So, it's easiest just to refer to the
15 proceedings by the patent number they concern?

16 A Um-hum.

17 Q Yes? Okay.

18 And do you know what the PTAB is? PTAB?

19 A PTAB?

20 Q Um-hum.

21 A I think that's the -- isn't that the patent
22 board that decides whether or not a patent is going to
23 be invalid or not, based on the evidence given?

24 Q Yeah. That's pretty accurate. I may refer to
25 it as the board. Do you know that the board issued

1 DR. JOSEPH LAVIOLA

2 preliminary decisions they call institution decisions in
3 this case?

4 A Yes.

5 Q And have you reviewed those?

6 A I've looked at them.

7 Q Okay. In your main declarations, Exhibit 2004
8 for the '438 patent and the '978 patent, you make
9 determinations about the obviousness of some of the
10 claims; right?

11 A Yes.

12 Q And do you know what the relevant time frame
13 is for making that determination of obviousness?

14 MR. KEY: Objection. It's vague.

15 THE WITNESS: Well, I know that -- that the
16 time frame has to go with the first instantiation
17 of any related work or related patents that are
18 being challenged or that are challenging, the
19 patents in suit. So, you would need to go before
20 that.

21 So, for example, if a patent was issued or
22 first applied for in 2001 -- right? -- then in
23 order to determine the obviousness from that, you
24 would go back as far as that. That's to the best
25 of my knowledge.

1 DR. JOSEPH LAVIOLA

2 BY MR. SMITH:

3 Q And do you know specifically what that time
4 is, in this case?

5 A No, not specifically.

6 MR. KEY: Objection.

7 BY MR. SMITH:

8 Q Is it in your declaration, do you know?

9 A No.

10 Q It's not in your declaration or you don't
11 know?

12 A I don't know.

13 Q Okay. When you determined whether the claims
14 were obvious or not, what time frame were you using to
15 make that determination?

16 MR. KEY: Same objection as to vagueness.

17 THE WITNESS: Are you talking about the claims
18 from the '438 and '978 patents?

19 BY MR. SMITH:

20 Q Yes, I am.

21 A Okay. So, I looked at basically the dates of
22 the issued patents from the -- that are being used
23 specifically Liberty, Bachmann, and Zhang.

24 So, from those dates, I based my opinions on
25 whether something was obvious or not.

1 DR. JOSEPH LAVIOLA

2 Q I'm going to try to rephrase what you just
3 said and just tell me if I get it wrong; okay?

4 A Okay.

5 Q So, where do you -- actually, withdrawal. I'm
6 not going to rephrase what you just said. I'm just
7 going to ask you a question. When you were doing your
8 determination of obviousness for the claims on the '438
9 and '978 patents, were you trying to do that from the
10 perspective of a person with ordinary skill in the art?

11 A Yes.

12 Q And that would have been at the time of the
13 dates of the prior art references that were being used
14 for your determination?

15 A No. That would have been the dates of the
16 prior -- the dates from the patents-in-suit.

17 Q Okay. And you have the patents-in-suit in
18 front of you; right?

19 A Yes. Um-hum.

20 Q Okay. And can you determine what those dates
21 were from the patents?

22 A November 2010 and July 2011. Actually, it was
23 a prior publication. It was October 2011. So, it was
24 first filed. Basically July of 2011 and November 2010.

25 Q So, you were looking at the obviousness or not

DR. JOSEPH LAVIOLA

from the perspective of a person with ordinary skill in the art either, you said, November of 2010 or July of 2011?

A Um-hum.

Q Depending on the patent?

A Yes.

Q Okay. And just to be clear, you weren't using the date of the provisional application that was filed for either of those patents; correct?

MR. KEY: Objection.

Answer, if you can understand it.

THE WITNESS: I'm not familiar with the -- those dates.

MR. SMITH: Cecil, could you limit your objections to non-speaking objections? That sounds like you're asking the witness to say he doesn't understand the question.

MR. KEY: No. I'm telling him to answer if he understands it. That's all.

MR. SMITH: You've read the cross-examination guidelines; right?

MR. KEY: Have you?

MR. SMITH: Yeah, absolutely.

MR. KEY: Okay. Then you know what I'm doing

1 DR. JOSEPH LAVIOLA

2 is okay.

3 MR. SMITH: What they say is consistent with
4 the policy expressed in Rule 1 of the Federal Rules
5 of Civil Procedure and corresponding with 41 --
6 42.1(b) unnecessary objections, speaking objection,
7 and coaching the witnesses and proceedings before
8 the board is strictly prohibited.

9 MR. KEY: Yeah.

10 MR. SMITH: Okay.

11 MR. KEY: Okay. You've got the rule right.
12 You just don't have the application right.

13 MR. SMITH: I see.

14 MR. KEY: Okay. But, at any rate. Go ahead.

15 MR. SMITH: You might want to review those
16 during a break.

17 MR. KEY: Okay. I will if you will. How's
18 that?

19 MR. SMITH: Agreed.

20 BY MR. SMITH:

21 Q The declarations that you have in front of
22 you, so the '978 patent and the '438 patent, the two
23 declarations in each case, did you write those
24 declarations?

25 A Yes.

1 DR. JOSEPH LAVIOLA

2 Q So, you were the one who did the mental act of
3 composing the words that appear on the page?

4 A I did some of the mental act of composing the
5 words on the page. Some of it was done by counsel. And
6 then I confirmed or denied that that -- those words
7 should be or should not be in my declaration.

8 Q So, did counsel do a first draft which you
9 then reviewed?

10 A I believe I put together -- well, they put
11 together a rough draft. And then -- it was a iterative
12 process.

13 Any time a change was made or something was
14 added, I read it. And if I didn't like it, I changed
15 it. And if I did like it, I approved it.

16 Q And with whom were you working to draft the
17 declarations?

18 A DiMuro. Specifically Cecil, Jay.

19 Q Anyone else?

20 A Arlen. That's it.

21 Q Okay. And that's for all four declarations;
22 right?

23 A Yes.

24 Q Is there anything about the testimony in your
25 declarations that you think is incorrect, sitting here

1 DR. JOSEPH LAVIOLA

2 today?

3 MR. KEY: Objection.

4 THE WITNESS: Yes.

5 BY MR. SMITH:

6 Q Which document are you looking at, sir?

7 A I'm looking at the '438 patent -- the '438
8 declaration. Yes. And both of them -- both the '978
9 and the '438 says I'm being compensated at 375 an hour.
10 That actually is 400 an hour. That's it.

11 Q Thank you.

12 Now, you said you reread the '438 and '978
13 patents in your preparation; correct?

14 A Yes.

15 Q How familiar are you with the contents of
16 those patents, as you sit here?

17 MR. KEY: Objection.

18 THE WITNESS: I think I'm pretty familiar with
19 it.

20 BY MR. SMITH:

21 Q You've also worked on them in the context of
22 various litigations going on; right?

23 A Yes.

24 Q Is claim one of the '438 patent obvious, in
25 your opinion?

1 DR. JOSEPH LAVIOLA

2 A No, it's not obvious.

3 Q And you did an analysis of obviousness in your
4 declaration for the '438 patent, the main declaration,
5 Exhibit 2004; correct?

6 A Yes.

7 Q What is your understanding of the concept of a
8 person of ordinary skill in the art?

9 MR. KEY: Objection.

10 Go ahead and answer.

11 THE WITNESS: So, I would say a person of
12 ordinary skill in the art would be capable of
13 understanding the scientific engineering principles
14 applicable to the pertinent art and would have
15 ordinary creativity.

16 BY MR. SMITH:

17 Q And how does that person figure into the
18 obviousness analysis that you did?

19 A Well, we have to look at the obviousness
20 argument through the eyes of someone of ordinary skill
21 in the art at the time of the invention.

22 Q You testified that a person of ordinary skill
23 in the art would be capable of understanding the
24 scientific engineering principles applicable to the
25 pertinent art and would have ordinary creativity.

1 DR. JOSEPH LAVIOLA

2 What is the pertinent art that you were
3 referring to?

4 MR. KEY: Objection.

5 THE WITNESS: The pertinent art in this case
6 is general knowledge in computer science,
7 electrical engineering, mechanical engineering, or
8 physics, or some equivalent work experience, also
9 an understanding of sensors such as accelerometers,
10 gyroscopes, and magnetometers.

11 I also believe that the pertinent art would be
12 items related to common filtering and other types
13 of filtering mechanisms that are used in data
14 fusion and/or the reduction of errors in noise and
15 signals.

16 BY MR. SMITH:

17 Q And what is data fusion that you just referred
18 to?

19 A Data fusion is a term that describes the
20 process of taking multiple sources of data from various
21 sensors and using that data to come up with an answer,
22 if you will, of some kind, or a new signal, if you want,
23 that takes the best elements of that data so that you
24 can get a more accurate result.

25 Q Is that also called sensor fusion?

1 DR. JOSEPH LAVIOLA

2 A Yes.

3 Q Okay. Is the point to take different types of
4 sensors or different numbers of sensors and combine that
5 data to make it more accurate?

6 A It can be different types of sensors. It can
7 be a number of sensors. There are a number of ways in
8 which you can do sensor fusion.

9 Q And why would you want to do sensor fusion, if
10 at all?

11 A You would want to do sensor fusion if the
12 sensors that you have available to you have flaws under
13 given characteristics, or they don't provide the
14 complete information that one needs in order to get a
15 result. The purpose is then to take those different
16 sensors or the information of those sensors and combine
17 them together so that you can get a more accurate result
18 than if you were to try to use any of them individually.

19 Q I asked you that question in the present
20 tense. But would your answer also be accurate for, say,
21 the 2009 time frame?

22 A Yes.

23 Q Do you consider yourself to be a person of
24 ordinary skill in the art?

25 A I believe qualified to be a person of ordinary

DR. JOSEPH LAVIOLA

skill in the art.

Q And would that have been true also just before the patents were filed -- I'm going to call that 2009. Is that okay?

A That's fine.

Q Okay. Would that also have been true in 2009?

A Yes.

Q Were you working in the field of the patents in around that time frame, around 2009?

A I believe I was.

Q Were you designing sensor fusion systems in 2009 or thereabouts?

A Yes.

Q Okay. And can you describe specifically what you're basing that answer on, the work that you were doing that leads you to say that?

A Actually, looking at the '438, '978 as well --

Q The declaration, Exhibit 2004?

A Yes. Um-hum.

There are some papers that I published, specifically the RealNav, Exploring Natural User Interfaces for Locomotion in Video Games which was published in 2010.

And The Wii Remote and Beyond: Using

1 DR. JOSEPH LAVIOLA

2 Spatially Convenient Devices for 3DUIs, which was
3 published also in 2010.

4 Those two publications, as well as the
5 Breaking of Status Quo -- well, that was really a
6 recognition paper.

7 So it really wasn't about sensor fusion. But,
8 the first two that I mentioned were, had elements of
9 sensor fusion in them.

10 Q And what specifically were you working on in
11 relation to these products -- projects, I should say?

12 A Well, the RealNav, I was supervising a master
13 student. And the second one, the Wii remote -- Wii
14 Remote and Beyond paper, I was supervising the writing
15 of that project based on work that my students and I had
16 been doing, exploring the capabilities of a Nintendo
17 remote.

18 Q Were you working on the sensor fusion
19 algorithms themselves in either of those two projects?

20 A Yes.

21 Q And were you working on the hardware design,
22 for example, the sensors or the controllers or anything
23 else that would have been needed?

24 A I can't recall if we were doing hardware, but
25 I know we were doing software.

1 DR. JOSEPH LAVIOLA

2 Q Have you worked on hardware design as it
3 relates to motion sensors before?

4 A My students have.

5 Q Have you personally?

6 A No.

7 Q Have you ever designed, say, a sensor module?

8 A I don't believe so.

9 Q Were you following the literature in the field
10 of the patents, as you described it earlier in the 2009
11 time frame?

12 A Yes.

13 Q And what comes to your mind as being the
14 literature you were following in that time frame that's
15 relevant to the field of the patents?

16 MR. KEY: Objection. Definitely vague.

17 THE WITNESS: It's hard to say without having
18 the papers in front of me because obviously in
19 these papers, we refer to related work and how that
20 related work differentiates between our own. But
21 that was almost ten years ago, so, I'd have to have
22 the papers in front of me to give you a complete
23 comprehensive answer to that question.

24 BY MR. SMITH:

25 Q Understood.

DR. JOSEPH LAVIOLA

Were you reading any journals regularly or anything like that that would have kept you up to date?

A I was -- I'm always reading journal articles and conference papers.

Q Including in the 2009 time frame?

A Yes.

Q When did you first hear of the '438 and '978 patents?

A I believe it was two years ago in, I want to say, April, May, something like that.

Q And was that in connection with the litigations that are going...

A Yes.

Q Do you know the inventors of the '438 or '978 patents?

A I do not.

Q Okay. And do you know whether the inventors ever published a technical article relating to the contents of their patents?

A To the best of my knowledge, they did not.

Q When did you first hear of the company CyWee?

A About two years ago, May, April, May time frame.

Q When you were contacted to consult in the

1 DR. JOSEPH LAVIOLA

2 litigations?

3 A Yes.

4 Q Do you think the '438 and '978 patents are
5 important patents?

6 MR. KEY: Objection.

7 THE WITNESS: I do.

8 BY MR. SMITH:

9 Q Why is that, sir?

10 A The main reason is because they were able to
11 show significant capability of determining orientation
12 with inertial sensors, specifically related to 3D input
13 devices.

14 3D pointing devices. Excuse me.

15 Q And was that something that people in the art
16 had been trying to do before but couldn't do?

17 A People have been trying to do 3D pointing
18 devices, but in the past, were using other sensing
19 technologies. This was the first that I am aware of
20 that used these inertial sensing devices -- I mean,
21 these inertial sensors for 3D pointing devices.

22 Q And we talked a little bit earlier about
23 sensor fusion and why people did sensor fusion, why they
24 do sensor fusion.

25 A Um-hum.

1 DR. JOSEPH LAVIOLA

2 Q The '438 patent describes using six sensors;
3 right?

4 A Well, it describes -- it describes two sensors
5 that have three axes each.

6 Q I see. And is the '978 patent then describing
7 three sensors with three axes each?

8 A Yes.

9 Q If the '438 patent with two sensors and three
10 axes could be used for determining orientation for 3D
11 pointing devices, why would the 978 add another sensor
12 with three additional axes?

13 A It would add an additional set of sensors, or
14 in this case, the magnetometer, three-axis magnetometer
15 to potentially improve the accuracy of the determination
16 of the orientation of the handheld 3D pointing device.

17 Q Why would adding an additional set of sensors
18 potentially improve the accuracy of the determination of
19 the orientation of the handheld 3D pointing device?

20 A Because -- well, each type of sensor has a
21 limitation. And adding a magnetometer would help to
22 mitigate one of those limitations. Therefore, enabling
23 a more accurate result in the calculation of the
24 orientation for the handheld 3D pointing device.

25 Q I'm not referring to the specific way of

1 DR. JOSEPH LAVIOLA

2 calculating in the '438 or '978 patents. But was that
3 concept that you just articulated known in 2009 or not?

4 A The concept of -- are you asking me, has the
5 concept of adding multiple sensors or different sensors
6 together to get a more accurate result?

7 Q Yes.

8 A Was that known at that time?

9 Q Um-hum.

10 A Yes, it was.

11 Q I'm wondering if you could turn to your '438
12 main declaration, which is Exhibit 2004.

13 A Um-hum.

14 Q And look at page 15, paragraphs 36 and 37.
15 And that's also, I think, the same paragraph numbers in
16 the '978 declaration.

17 MR. KEY: Sorry, counsel. Did you say 37 and
18 38?

19 MR. SMITH: Thirty-six and 37.

20 BY MR. SMITH:

21 Q Are you there, Dr. LaViola?

22 A Yes.

23 Q Paragraph 36, you refer to the invention of
24 the '438 patent as correcting for errors using its novel
25 enhanced comparison method; right?

1 DR. JOSEPH LAVIOLA

2 A Yes.

3 Q Can you describe what that method does, just
4 generally?

5 A In general, it utilizes the angular velocity
6 from a gyroscope and the axial acceleration from an
7 accelerometer across each of the X, Y, and Z axes to
8 compute the orientation of the handheld 3D pointing
9 device.

10 Q And what is orientation in this case?

11 A Orientation is -- what do you mean, what is
12 orientation?

13 Q Well, what is it computing, specifically? You
14 said it computes orientation. I'm just wondering what
15 it computes.

16 A Oh. So, you want to know the type of -- like,
17 the actual numbers or the format of the orientation?

18 Q Well, what does orientation tell you about the
19 device, if anything?

20 A Okay. It tells you -- it tells you its
21 orientation in 3D space. And how it's -- we could say
22 it tells you about its pose in 3D space without the
23 notion of where it's located.

24 Q So, not an absolute position in space, but the
25 offset angles from some coordinate system?

1 DR. JOSEPH LAVIOLA

2 A Yeah.

3 Q In the novel-enhanced comparison method of the
4 '438 patent that you're referring to in paragraph 36,
5 and also I believe in paragraph 36 of the '978
6 declaration, is orientation expressed as a quaternion?

7 A Yes, it is.

8 Q What is a quaternion, sir?

9 A Quaternion is a mathematical representation
10 for orientation that uses four numbers. A three-element
11 vector and a scaler quantity. And it makes certain
12 computations easier to do as opposed to other
13 orientation representations.

14 Q Can you derive the offset angles to some
15 coordinate system that you established from an
16 orientation quaternion?

17 A So, given a quaternion, I should be able to
18 tell you or would be able to determine what the
19 orientation or the -- let's say, if you have the offset
20 angles. If you want to talk about -- talk about a
21 coordinate system and X, Y, and Z axes, it would be able
22 to tell you the amount of the rotation about the X axis,
23 about the Y axis and about the Z axis.

24 Q Is that yaw, pitch, and roll?

25 A That is another way of describing it, yes.

1 DR. JOSEPH LAVIOLA

2 Q And just to be clear, quaternions are an old
3 concept; right?

4 A Yes.

5 Q Well before the '438 and '978 patents?

6 A Yes.

7 Q Were they known to persons of ordinary skill
8 in this art for this kind of angular transformation
9 work?

10 MR. KEY: Objection.

11 THE WITNESS: I believe that they would be
12 known to someone of ordinary skill in the art.

13 BY MR. SMITH:

14 Q Are quaternions, in fact, widely used in
15 graphics applications?

16 A Yes.

17 Q And was that also true in 2009?

18 A Yes.

19 Q Now, in paragraphs 36 and 37 that you were
20 just looking at, in Exhibit 2004, you refer to equations
21 one through 11 of the '438 patent. And I think
22 paragraph 37 refers to questions five through 11 and 36,
23 one through four.

24 Do those equations represent the
25 novel-enhanced comparison method that you're referring

1 DR. JOSEPH LAVIOLA

2 to?

3 A If you use all those equations appropriately,
4 given the appropriate inputs and parameters and then
5 that would be considered the enhanced comparison method.

6 Q Are there other ways to implement the enhanced
7 comparison method?

8 A I suppose it's possible.

9 Q But the one you're referring to in this
10 declaration is represented by equations one through 11?

11 A Yes.

12 Q Paragraph 37, you testified that equations
13 five through 11 -- and I'm skipping down to the third
14 line here --

15 A Um-hum.

16 Q -- combine elements of an extended common
17 filter coupled with a weighted vector norm.

18 Do you see that?

19 A Yes.

20 Q And what is a weighted vector norm, sir?

21 A A weighted vector norm, it's a term that --
22 well, first thing is that it's a vector of some length.
23 The vector is weighted, based on values that come from
24 the measurements of the sensors as well as any
25 underlying mottling that goes on. And it's normalized,

1 DR. JOSEPH LAVIOLA

2 which means it's a number between zero and one. And
3 that number then tells you how close or, you know,
4 approximately -- it gives you a sense of accuracy in
5 terms of the orientation that's being calculated.

6 Q Is that, to your knowledge, a standard
7 definition of -- I'm going to withdraw that question
8 because it wasn't very clear.

9 Is the term "vector norm," in your
10 declaration, being used in a standard way?

11 A I believe that it is.

12 Q And where is the weighted vector norm that
13 you're talking about in equations five to 11?

14 A Well, the weighted vector norm is going to be
15 represented as D sub T in equation 11. And that
16 equation takes advantage -- what it does is it utilizes
17 the covariance or the variability that's calculated
18 between the measurements, which would be the sensor
19 data, and the prediction for the orientation given the
20 angular velocities.

21 And what it does effectively is it subtracts
22 those two numbers and then multiplies it by the --
23 that's where there are variances in weight. It just
24 gives you the weight. The smaller the variance, the
25 closer you are to feeling that there's no difference

1 DR. JOSEPH LAVIOLA

2 between the measurement and the -- and the predicted
3 value, the higher the variance, so on and so forth.

4 Q Were extended Kalman filters being used for
5 sensor fusion in the 2009 time frame or earlier?

6 A Yes.

7 Q Was it typical to use a weighted vector norm
8 with extended Kalman filters for sensor fusion in the
9 2009 time frame or earlier?

10 A No.

11 Q Is the use of the weighted vector norm what
12 you see as the principle difference between an extended
13 Kalman filter and what the '438 patent is describing in
14 its novel-enhanced comparison method?

15 A So, you're asking me if I think that the
16 weighted vector norm coupled with the extended Kalman
17 filter or equations from the extended Kalman filter
18 represent what I would consider to be the novelty of the
19 enhanced comparison method?

20 Q Yes.

21 A That represents part of the novelty. The
22 other part being the ability to combine angular velocity
23 data and axial acceleration data to produce a quaternion
24 estimate for the 3D -- handheld 3D pointing device.

25 Q Is it your opinion that one of ordinary skill

1 DR. JOSEPH LAVIOLA

2 in the art could not have combined angular velocity data
3 and axial acceleration data to produce an orientation
4 quaternion for a 3D pointing device by using an extended
5 Kalman filter in the 2009 time frame?

6 A I believe that up until the patent came along
7 that there wasn't anybody doing orientation calculations
8 using -- for a handheld 3D pointing device using the
9 equations in said calculations in the patent.

10 Q Is there any technical reason why angular
11 velocity data and axial acceleration data could not be
12 used via an extended Kalman filter to produce an
13 orientation result, even without using the methods of
14 the '438 and '978 patent?

15 A So, when computing orientation such as this,
16 using any type of sensor, you're going to get an
17 accuracy. How accurate you are to the ground truth,
18 let's say.

19 Someone could have used an accelerometer and a
20 gyroscope together and only a accelerometer and
21 gyroscope together to compute an orientation for a 3D
22 pointing device. However, it would not be very
23 accurate.

24 Q Even if that person used an extended Kalman
25 filter to fuse the data?

1 DR. JOSEPH LAVIOLA

2 A If the person used an extended Kalman filter,
3 they would get a more accurate result.

4 Q And are you aware of any characterization of
5 the improvement in accuracy over prior attempts to
6 calculate the orientation for the '438 and '978 patents?

7 MR. KEY: Objection.

8 THE WITNESS: To the best of my knowledge, I
9 have not seen any accuracy testing that was done in
10 relation to the patents.

11 BY MR. SMITH:

12 Q Is it your opinion that the patents would be
13 more accurate than prior art attempts to calculate
14 orientation using axial and angular acceleration
15 sensors?

16 A Yes.

17 Q You just don't know by how much?

18 A Yes. That's right.

19 Q Can you take a look at claim one of the '438
20 patent? Just let me know when you're there.

21 A Um-hum.

22 Q Are you, by now, comfortable reading patent
23 claims and applying them?

24 A Applying them as to what?

25 Q For example, determining whether a patent

1 DR. JOSEPH LAVIOLA

2 claim would cover prior art or cover a device.

3 A I believe that I can speak to this claim.
4 Yeah.

5 Q Now, does claim one of the '438 patent have
6 elements in it that are directed to the enhanced
7 comparison method you talk about in your declaration?

8 A It talks about the essential high-level pieces
9 that are needed to perform an enhanced comparison method
10 for the 3D pointing device.

11 Q And what do you think are the essential
12 high-level pieces needed to perform the enhanced
13 comparative -- comparison method for the 3D pointing
14 device that are recited in this claim?

15 A Well, first, you have to have a processing and
16 transmitting module. You have to have the signal sets,
17 the first and second signal sets. The first signal set
18 is angular velocity. The second signal set is axial
19 acceleration. You have to have a update program that
20 does the actual calculations, and the notion of having a
21 previous state associated with the first signal set and
22 a measured state associated with the second signal set.

23 Those are the main elements.

24 Q Are any of those elements that you just
25 mentioned directed to what you said was the novelty of

1 DR. JOSEPH LAVIOLA

2 the enhanced comparison method as versus an extended
3 Kalman filter?

4 A I think all of the elements that I talked
5 about, all together, represent the novelty for a -- for
6 this particular 3D pointing device.

7 Q Is there anything in this claim that requires
8 a weighted vector norm?

9 A There's nothing in the claim that mentions the
10 weighted vector norm.

11 Q Is there anything you can see in this claim
12 that would clearly rule out a device that has the
13 requisite sensors and merely uses an extended Kalman
14 filter to fuse the data and produce an orientation as
15 opposed to using the method that is described in the
16 specification of the '438 patent?

17 MR. KEY: Objection.

18 THE WITNESS: Well, you have to look at the
19 totality of the claim. So, if you look at the
20 claim in its entirety -- right? -- we're talking
21 about an apparatus here, which is the handheld 3D
22 pointing device, and then the various processing
23 that goes into computing the orientation. If you
24 look at that in its totality, then you can -- I
25 would say that that represents a novel -- a novel

1 DR. JOSEPH LAVIOLA

2 entity or whatever you want to call it.

3 BY MR. SMITH:

4 Q What is it in the claim that would exclude the
5 use of an extended Kalman filter, if anything?

6 A I mean, there's nothing in particular that
7 would exclude the use of an extended Kalman filter or
8 components of it.

9 Q Is there anything that would require the
10 novelties as versus an extended Kalman filter that you
11 think are inherent in the method of the '438 patent?

12 A Could you repeat that?

13 Q I can change it for you.

14 A Okay.

15 Q Would that be easier?

16 A Yes, please.

17 Q The method of the '438 patent, the
18 novel-enhanced comparison method, that's not an extended
19 Kalman filter as it was known in 2009 and earlier;
20 correct?

21 A I mean, to the -- as far as I can tell, that
22 is correct.

23 Q And is there anything in claim one of the '438
24 patent that would exclude the extended Kalman filter as
25 used in 2009 and earlier?

1 DR. JOSEPH LAVIOLA

2 MR. KEY: Objection.

3 THE WITNESS: Okay. There is -- when you're
4 talking about an extended Kalman filter, you know,
5 an extended Kalman filter is a framework -- all
6 right? -- for supporting -- you know, of creating
7 estimates or predictions of signals. And because
8 it's a framework, there are a number of different
9 ways in which one can instantiate that extended
10 Kalman filter.

11 Typically in an extended Kalman filter, you
12 have a process model and a measurement model. The
13 process model describes the overall behavior of the
14 system that you're trying to model. In this case,
15 it would describe, you know, how the orientation
16 would be calculated from a sort of theoretical
17 point of view.

18 The measurement model uses the data, the
19 actual sensor information, that you have at your
20 disposal to create an estimate -- right? -- at some
21 point in time.

22 And then what typically happens is that
23 there's a combination of the prediction that you
24 have from the process model with the measurement
25 you've taken from the sensors that you have at your

1 DR. JOSEPH LAVIOLA

2 disposal. And then depending on the covariance
3 that you calculate will determine the weight of the
4 prediction or of the measurement that you get. And
5 it's basically how it works.

6 In this case, in this particular claim, you'll
7 see that it says -- let me see if I can find where
8 it says in here. [As read]: Update program to
9 obtain an updated state based on a previous state
10 associated with the first signal set and a measured
11 state associated with a second signal set, or in
12 the measured state includes a measurement of said
13 second signal set and a predicted measurement
14 obtained based on the first signal set.

15 Right there, that implies that what you are
16 doing is taking a measurement -- all right? -- from
17 a sensor and integrating it into your process
18 model; okay?

19 That is typically not done. So, what we have
20 here is something that is novel because of the fact
21 that they are mixing and matching the measurements
22 within the context of the process model and
23 measurement model.

24 BY MR. SMITH:

25 Q And when you say "that is typically not done,"

1 DR. JOSEPH LAVIOLA

2 did you mean that is typically not done in an extended
3 Kalman filter?

4 A Yes.

5 Q Can I ask you to look at claim ten of the '978
6 patent?

7 A Claim ten, '978 patent? Okay.

8 Q I'm going to ask you the same question with
9 respect to claim ten of the '978 patent.

10 A I would say that claim ten represents or
11 describes the same type of phenomenon that occurs in the
12 '438 patent.

13 Q Are you referring to any specific language in
14 claim ten?

15 A Generating the orientation output based on the
16 first signal set.

17 Q Is that something in your mind that is not
18 typically done in an extended Kalman filter?

19 A Yes.

20 Q Dr. LaViola, we've been going for a little
21 over an hour. Just let me know if you want to take a
22 break.

23 A I can take five minutes.

24 Q Okay. Is it okay with you, Cecil?

25 MR. KEY: Yeah. Actually, I was going to ask

DR. JOSEPH LAVIOLA

for five minutes.

MR. SMITH: Let's go off the record.

THE VIDEOGRAPHER: It's 10:35. We're going off the record.

(A brief recess is had from 10:35 a.m. to 10:49 a.m.)

THE VIDEOGRAPHER: This is the beginning of media file number two of the deposition of Joseph LaViola, Ph.D. It's 10:49. We are back on the record.

BY MR. SMITH:

Q Dr. LaViola, during the break, did you communicate with anyone about your testimony today?

A No.

Q In paragraph 36 of both declarations that are Exhibit 2004 -- I will correct that. Actually only in the declaration that relates to the '438 patent, you refer to figures seven and eight of the '438 patent?

A Yes.

Q I wonder if you could open those figures up. If I'm not mistaken, figure eight is identical to figure seven, except for the last box; is that right?

A Yes, it is.

Q So, do figures seven and eight show a diagram

1 DR. JOSEPH LAVIOLA

2 of the, as you put it, novel-enhanced comparison method
3 of the '438 patent?

4 A It shows a general overview.

5 Q Of that method?

6 A Yes.

7 Q And is the orientation quaternion that is
8 output by the method the third quaternion that's shown
9 in box 740?

10 A Yes.

11 Q And then in box 745, it shows that you can get
12 the yaw, pitch, and roll angles from that?

13 A Yes.

14 Q Does the novel-enhanced comparison method
15 track movement along the axes, so, you know, movement
16 from one position in space to another?

17 A No.

18 Q So, just orientation angles?

19 A Yes.

20 Q Does the '438 patent teach how to -- how to
21 track this translation-type movement along the axes?

22 A No.

23 Q Now, in figure eight, this last box, 750, says
24 [as read]: Obtain displayed data and translate the
25 results and angles to movement pattern in the display

1 DR. JOSEPH LAVIOLA

2 reference frame.

3 Do you see that?

4 A Yes.

5 Q Does the '438 patent teach a person of
6 ordinary skill how to do that last step? You're looking
7 through the '438 patent now?

8 A Yes, I am.

9 Q Okay. Take your time.

10 A It looks like it provides some general
11 guidelines for how one would do that.

12 Q Are you referring to a specific section of the
13 '438 patent, sir?

14 A Well, I mean, there are a number of different
15 ways that you can do it. So, I was looking at -- I
16 mean, if you go to -- if you look at column 15, line 36,
17 it says figure eight may be represented by the
18 additional mapping step, 750, as shown in figure eight.

19 And then flow [as read]: Step 750 performs
20 the mapping process for a 3D pointing device. And it
21 says [as read]: The computing processor may include a
22 mapping program that performs the mapping step. And it
23 says [as read]: At step 750 the processing and
24 transmitting module may obtain display data such as the
25 screen size, such as the boundary information, and

1 DR. JOSEPH LAVIOLA

2 translates the resultant angles of the resulting
3 deviation associated with the spatial pointer reference
4 frame. Preferably about each of the three orthogonal
5 axes of the spatial pointer reference frame to a
6 movement pattern in a mapping area in a display
7 reference frame based on the sensitivity input
8 correlated to the display reference frame.

9 So, basically, I mean, it gives you a basic --
10 I mean, anyone -- I believe anyone of ordinary skill in
11 the art would be able to take that orientation and map
12 it to a 2D display, or map it as a -- whatever pattern
13 that they would want, they would -- they would be so
14 choose in doing.

15 Q Is that because it's just a geometric
16 calculation or why do you say that?

17 A Yeah. Because it was simply just a geometric
18 calculation.

19 Q Doesn't the calculation, though, depend on the
20 method you used to determine the object's orientation?

21 A I don't see why it would.

22 Q Are they completely uncoupled?

23 A I mean, once you have a orientation in a given
24 coordinate system, it doesn't really matter how you got
25 it. You simply can map that into a different coordinate

1 DR. JOSEPH LAVIOLA

2 system, in this case, the display coordinate system to
3 get some type of movement pattern on the screen.

4 Q So, are you saying that that's not something
5 the '438 patent would have to tell you how to do because
6 a person of ordinary skill in the art, you know, in the
7 2009 time frame, already knew how to do that?

8 A I mean, at that time, it's pretty well known
9 how to in interactive computer graphics, how to
10 transform points and/or orientation information from one
11 coordinate system to another.

12 Q Now, the '978 patent was filed a little bit
13 later. So, would the same thing also be true for the
14 '978 patent? And just to be clear, because I see you're
15 picking up the patent. I'm asking you whether the
16 person of ordinary skill would have had the same
17 knowledge with the '978 patent.

18 A Oh. Yeah, I mean, a person of ordinary skill
19 in the art would roughly have the same knowledge for
20 the -- if they were looking at the '438 and the '978
21 patent. I don't see any difference.

22 Q And does the mapping or the ability of a
23 person of ordinary skill in the art to do the mapping,
24 does that depend on whether it's a built-in display or a
25 display that is, say, somewhere across the room from the

1 DR. JOSEPH LAVIOLA

2 3D pointing device?

3 A It does make a difference as to where the
4 quote, unquote, display reference frame is. If it's
5 coupled with the 3D -- by the handheld 3D pointing
6 device versus some screen somewhere in some distance
7 away, you have to understand the relationship between
8 the two coordinate systems in order to properly perform
9 the mapping.

10 Q So, would your answer be different than
11 specifically to the question, did a person of ordinary
12 skill in the art in the 2009 or earlier time frame have
13 the ability to do that transformation, if it's a
14 built-in display?

15 A A person of ordinary skill in the art would be
16 able to do that.

17 Q Would it require a lot of experimentation?

18 A It's hard to say. I mean, there's various
19 levels of skill in the art, so...

20 I would say if that person was following
21 proper procedure for how you do transformations from one
22 coordinate system to another, then there wouldn't be a
23 lot of experimentation needed.

24 Q Is that the kind of thing you could have
25 looked up?

1 DR. JOSEPH LAVIOLA

2 A Well, no. I mean, you could look up the
3 general principle of coordinate transformation, but you
4 would have to have understanding of the actual
5 coordinate systems that you were dealing with and then
6 how you, how you would go from one to the another.

7 Q I see.

8 Could you go to your declaration for the '438
9 patent, Exhibit 2004, and take a look at paragraph 38
10 this time. And it's also paragraph 38 of the '978
11 declaration.

12 A Okay.

13 Q And there, you say [as read]: The orientation
14 information output by the claimed invention of the '438
15 patent has various potential applications particularly
16 when applied to mobile cellular devices. These
17 applications can include navigation, gaming, and
18 augmented and virtual reality simulation.

19 Do you see that?

20 A Yes.

21 Q Don't you need a different method of
22 determining orientation for each of these applications?

23 A As far as I'm aware, you would not.

24 Q Why not?

25 A Because you're computing the orientation of

1 DR. JOSEPH LAVIOLA

2 the device. And that orientation is the same,
3 regardless of what application you use.

4 Q So, these applications are sort of agnostic to
5 how you arrived at the orientation, as long as the
6 orientation itself is accurate?

7 A Yes.

8 Q And in paragraph 39 of this declaration, in
9 both of the declarations that are labeled Exhibit 2004,
10 so for the '438 patent and the '978 patent, you say, in
11 the first sentence [as read]: Quote, before 2010,
12 technological hurdles severely limited the applicability
13 of motion sensors to portable electronic devices.

14 Do you see that?

15 A Yes.

16 Q Are you referring here to using motion sensors
17 to determine a device's orientation?

18 A Yes.

19 Q Did you write this paragraph, by the way?

20 A Yes.

21 Q Okay. So, when you say technological hurdles
22 severely limited the applicability of motion sensors to
23 portable electronic devices, that sounds like people
24 before the '438 and '978 patents wanted to do it, but
25 there were technological things holding them back.

1 DR. JOSEPH LAVIOLA

2 Although you don't exactly say that here. Is that what
3 you were intending to imply?

4 A No.

5 MR. KEY: Objection.

6 Go ahead.

7 THE WITNESS: It's exactly what I said. I
8 mean, before 2010, there were hurdles having to do
9 with the -- you know, the motion sensors,
10 specifically the errors that were generated and the
11 kinds of data that you would get from the sensors
12 that made it difficult, challenging to get accurate
13 orientation results.

14 BY MR. SMITH:

15 Q Were you aware of people actually trying to do
16 that in the 2009 or earlier time frame? Or published
17 reports of people trying to do that?

18 A Well, I was trying to do that, actually. And
19 in point of fact, I couldn't make it work unless I had a
20 third sensor. In this case, it was a vision sensor.
21 And then I was able to take a vision sensor and the
22 accelerometer and the gyroscope and put them -- do --
23 perform data fusion, sensor fusion on them to get
24 accurate orientation and position, for that matter.

25 Q Which project are you referring to,

1 DR. JOSEPH LAVIOLA

2 specifically?

3 A This was the RealNav paper of March 2010
4 Exploring Natural User Interfaces for Locomotion in
5 Video Games.

6 Q And what was the application of determining
7 orientation in that context? What were you using the
8 orientation for?

9 A Using it to determine things like juking and
10 spinning on a football field, or virtual football field.

11 Q And what was the device that you were using?

12 A Using a Nintendo Wiimote.

13 Q And did you say that you started with two
14 sensors and then added a third?

15 A I said I -- start -- we tried to make it work
16 with just the accelerometer and gyro, but it was just
17 too much error. So, then we added the -- luckily you
18 have the vision sensor, the imaging sensor on the
19 Wiimote. So, we actually attached it to a baseball cap
20 and put it on your head.

21 Q What year was that?

22 A 2010 was when we published it. So we were
23 working on it in 2009.

24 Q And what gave you the idea to use a vision
25 sensor?

1 DR. JOSEPH LAVIOLA

2 A Because we knew that the vision sensor gave us
3 some sense of stability that the other sensors didn't.
4 And we could use the vision sensor as a way to help
5 correct for any measurements that were coming from the
6 gyroscope and accelerometer that we knew were going to
7 be off, as you went through your sequence of trying to
8 navigate and also calculate the orientation information.

9 Q Is that because it's just a different kind of
10 sensor with different error characteristics?

11 A Yeah.

12 Q And, so, if you take different sensors with
13 different error characteristics and combine the data,
14 it's going to have the effect of improving the overall
15 accuracy?

16 A Assuming that you combine it correctly.

17 Q Okay. And when did you add the vision sensor?

18 A Oh, I don't remember when it was exactly when
19 we did it. You know, it may have been -- I mean, I
20 don't really want to speculate as to the exact time
21 frame because I wouldn't want to be wrong.

22 Q Was that reported in your 2010 publication?

23 A I believe so, yes.

24 Q Are you saying, with this first sentence in
25 paragraph 39, that after 2010, people were better able

1 DR. JOSEPH LAVIOLA

2 to use motion sensors to determine the orientation of
3 portable electronic devices?

4 A What I'm trying to say here is that after 2010
5 with the introduction of the '438 patent, and later on
6 the '978 patent, that they showed that you could do this
7 calculation of orientation specifically to a 3D handheld
8 pointing device and get good results.

9 Q And did you notice any sort of change in the
10 art or the way people reported these kinds of sensor
11 fusion projects and the accuracy they gave you after
12 2010?

13 MR. KEY: Objection.

14 THE WITNESS: Not right away. Academics don't
15 tend to look at patents. So, this stuff would have
16 propagated up through the -- through the, you know,
17 the research community as things -- as products
18 became available and we started seeing how they
19 were being done, and then figuring out from there,
20 based on -- on any information that, that could be
21 found.

22 So, I would say, you know, not immediately
23 after 2010, but as we moved along, there was more
24 of a -- of a sense of that if you could use
25 inertial sensors to do tracking, that would solve a

1 DR. JOSEPH LAVIOLA

2 lot of problems, other problems that other sensors
3 have, such as electromagnetic trackers which
4 require, you know, electromagnetic field that you
5 have to be within, so there's a range associated
6 with it, or vision sensors where you have to
7 actually stay out of the occlusion problems that
8 can occur.

9 With the inertial sensors, if you can have
10 them work and work accurately, there's no range
11 limitation. It can go anywhere you want. There's
12 no line-of-sight issues. So, you don't have to
13 worry about occlusion. So, that was all stuff that
14 we were starting to see come out.

15 BY MR. SMITH:

16 Q About when was that, sir?

17 A I would say maybe 2012 and on, 2013.

18 Q And do you attribute that to the CyWee
19 patents?

20 A I couldn't give you a definitive answer on
21 that. I mean, it's possible that those patents, you
22 know -- that other people -- I don't know what other
23 people looked at, so -- I only know what I looked at.

24 Q So, it could have come from the CyWee patents.
25 It could have just been the normal evolution of

DR. JOSEPH LAVIOLA

technology?

A Yeah.

Q You just don't know?

A Yes, that's correct.

Q Can I ask you to take a look at the declarations now you did for the amended claims? This would be Exhibits 2011 --

A Okay.

Q -- in both cases.

And let's start off with the 978 declaration, if you would.

A All right.

Q And could you go to page five of that declaration?

A Yes.

Q You see the proposed claim 19 starting on page five?

A Yes.

Q Okay. Great.

And in claim 19 in limitation A adds the word "handheld"; right?

A Yes.

Q And what does handheld mean to you?

A It means a device that you have to hold in

1 DR. JOSEPH LAVIOLA

2 your hand.

3 Q Now, you phrased that as mandatory, you have
4 to hold it in your hand. Would it encompass devices
5 that you can hold in your hand, but that you can also
6 set down?

7 A Well, I would argue any device, you know, that
8 I'm aware of, unless it's attached to something else,
9 you can pick up and put down.

10 Q Does that make such a device handheld? Or are
11 you saying it's not handheld because of that?

12 A I mean, if the device's intended purpose is to
13 be utilized, in this particular case, for 3D pointing,
14 then it would be something that can be handheld, and
15 that it would give you the orientation of itself while
16 you were holding it.

17 Q Now, in the main declarations you did for the
18 '438 patent and the '978 patent, you took the position
19 that 3D pointing device should be defined as something
20 that is handheld; correct?

21 A Yes.

22 Q And, so, I think you just said that something
23 that is handheld would be handheld if it's a 3D pointing
24 device; is that right?

25 A I think what I meant to say was that -- I

1 DR. JOSEPH LAVIOLA

2 mean, not all devices that are handheld are 3D pointing
3 devices; okay?

4 Q Um-hum.

5 A So, in this particular case, if we're talking
6 about a 3D pointing device, we're talking about a device
7 that is handheld.

8 Q So, after that exchange, let me just ask you,
9 again, to clarify.

10 A Okay.

11 Q In the context of these patents, what do you
12 think handheld means?

13 A I think it means exactly what it says.
14 Handheld is something that you hold in your hand.

15 Q So, my smartphone, for example, right now is
16 in my pocket. Is it a handheld device?

17 A You're getting into philosophy here. It can
18 be classified as a handheld device. You may not be
19 holding it, but it nevertheless is -- it has that
20 characteristic.

21 Q And what is the essential characteristic of a
22 handheld device if it's not that a person is holding it
23 in any particular instant?

24 A I guess the essential characteristic would
25 have to be something that was ergonomically designed so

1 DR. JOSEPH LAVIOLA

2 that one could hold it in their hand or something small
3 enough that could be held in the hand.

4 Q So, either that the designer intended it to be
5 held in the hand or that just by virtue of its shape, it
6 can be held in the hand?

7 A Yes. I think so.

8 Q And did you mean anything in particular by
9 ergonomically designed, or...

10 A So, I'll give you an example. I was looking
11 at Yeti coolers yesterday. And trying to figure out
12 which one to get. And if a Yeti cooler didn't have a
13 handle that I could hold, then it would be challenging
14 to actually hold that cooler.

15 So, the people that designed that cooler made
16 sure that ergonomically there was a way for people to
17 grab on to something that they could use to hold it; all
18 right?

19 So, I mean, people design products in ways
20 that they think they're going to be utilized and, so,
21 that it can be utilized easily with, you know -- without
22 extra encumbrance or, you know, undue strain on the
23 body.

24 Q That would be more for larger, awkward items;
25 correct?

1 DR. JOSEPH LAVIOLA

2 A Um-hum. Yeah.

3 Q Smaller things, you could just pick up?

4 A Assuming that they were reasonably -- you
5 know, I wouldn't want to pick up a small object that had
6 nothing but spikes extending out of it.

7 Q True. What about the laptops? This laptop in
8 front of me, okay, I can pick that up in my hand.

9 A You can. And you can hold it in your hand.
10 But there's a reason why they call it a laptop; all
11 right? It's designed to be put on your lap or on a
12 table.

13 Q So, it's just a little too big to be handheld,
14 I guess; is that correct?

15 A For any length of time.

16 Q For any length of time.

17 Now, on page seven of this declaration, you
18 have a section saying the proposed contingent claims are
19 supported by earlier disclosures.

20 Do you see that?

21 A Yes.

22 Q And what is the point you're trying to make
23 with this section?

24 A All I'm trying to do here is basically say
25 that these amendments that we're making to the claims or

1 DR. JOSEPH LAVIOLA

2 that, you know, counsel is making, that there is support
3 from the patents themselves to indicate that the
4 amendments make sense.

5 Q By the way, do you know who drafted the
6 amended claim language? Which individual?

7 A No, I do not.

8 Q Do you know if the specification of the '978
9 patent uses the word handheld?

10 A I would have to look at the '978 patent.
11 Would you like me to?

12 Q Please, if you want to.

13 A Okay. The '978 patent talks about how a 3D
14 pointing device may be a remote controller or a joy
15 stick or a cellular phone. And all of these devices are
16 handheld. So, a person of ordinary skill in the art
17 would understand that as such.

18 Q I see where you mention this in paragraph 15
19 of the declaration.

20 A Um-hum.

21 Q Is that what you were just reading?

22 A Yes.

23 Q Okay. And that refers to the 558 provisional;
24 right? Do you know what that is, the 558 provisional?

25 A I mean, it's provisional patent. Well, first,

1 DR. JOSEPH LAVIOLA

2 you file a provisional, and then that's the -- what's
3 used. And it's often used as a way to get your foot in
4 the door. And then you typically have some amount of
5 time to actually file the official patent.

6 Q In the next paragraph, paragraph 16, you talk
7 about the specification of the '978 patent.

8 A Um-hum. Yeah. I mean, that one also talks
9 about similar things, smartphone, tablet, PC, navigation
10 equipment, which would be, like, you know, a Garmin or
11 something like that. Those are all handheld or would be
12 considered to be handheld by a person of ordinary skill
13 in the art.

14 Q Is it safe to say that if the word handheld
15 appeared in the '978 patent, you probably would have put
16 it in paragraph 16?

17 A Yeah. I mean, if it -- I may have missed it,
18 but I definitely was able to find computer, mouse and
19 smartphone and tablet, PC, and so on.

20 Q So, you looked, but you may have missed it?

21 A It's possible.

22 Q But you did look; right?

23 A I did.

24 Q And, so, you say that the '978 patent, as
25 originally filed, and I'm reading here from paragraph

1 DR. JOSEPH LAVIOLA

2 16 --

3 A Um-hum.

4 Q -- [as read]: Discloses a, quote, portable 3D
5 pointing device, end quote, and discloses several
6 embodiments of a 3D pointing device all of which are
7 handheld, including a, quote, computer mouse, end quote;
8 quote, smartphone, tablet, PC, or navigation equipment,
9 end quote.

10 A Um-hum.

11 Q And is a portable 3D pointing device handheld,
12 in your view?

13 A I think -- I think in this case a handheld --
14 I mean, a 3D pointing device is handheld, based on these
15 patents.

16 Q What about the phrase portable 3D pointing
17 device indicates that it's handheld?

18 A Well, portability has a sense of describing
19 something that's small, that can be moved around. And
20 in order to move something of that around, you know, you
21 would have to pick it up, potentially, therefore, it
22 would have a handheld component.

23 Q What about navigation equipment?

24 A Um-hum.

25 Q Why is navigation equipment handheld?

1 DR. JOSEPH LAVIOLA

2 A Well, you could think of a digital
3 compass -- right? -- which tells you where north is and
4 so on. You know, that's something you hold in your hand
5 to be able to navigate.

6 Also, a lot of the navigation equipment that
7 is used today is a smartphone, which has navigation
8 software on it. So, that also would be considered
9 navigation equipment for, you know -- that's something
10 that's a handheld device.

11 Q One could have a digital compass built into an
12 automobile; right?

13 A Yes.

14 Q There's no reason they couldn't use the method
15 of the '438 patent or the '978 patent to determine
16 orientation; right?

17 A Well, the '978 patent, '438 patent talks
18 specifically about a handheld 3D pointing device that
19 has -- you know, that computes orientation of the
20 device. So, I think it's pretty much for -- when we're
21 talking about, you know, a 3D pointing device, I
22 don't -- I suppose it's possible you could use this
23 thing in a car.

24 Q Well, it's kind of what we're talking about.
25 I mean, the '978 patent, I don't think, uses the word

1 DR. JOSEPH LAVIOLA

2 handheld. So, we're trying to infer from navigation
3 equipment that it is handheld. And I'm just trying to
4 explore why.

5 A Um-hum.

6 Q Is there any technical reason why you couldn't
7 use the method of the '438 patent in a vehicle digital
8 compass?

9 A It's possible. But one of the issues that we
10 would -- that could come into play -- actually, it
11 probably would come into play is the fact that the
12 magnetometer would probably not work as well if there's
13 a lot of metal. And a car has a lot of metal in it.

14 Q I'm sorry. I asked about the '438 patent.

15 A Oh, I'm sorry.

16 Q Would the '438 patent method work?

17 A Well, I know that a smartphone can have a
18 navigation software. And I know you can put that
19 smartphone in your car. And you can use it to navigate.
20 So, if you're talking about, you know, having the '438
21 patent as manifested in a smartphone and placed in your
22 car, then I believe that would work.

23 Q It's an interesting example.

24 So, if the smartphone has the requisite
25 sensors and everything else required by the claim but

1 DR. JOSEPH LAVIOLA

2 is, say, used by an Uber driver exclusively as a
3 navigation device affixed to the dashboard, is that a
4 handheld device, in your view?

5 A I think a handheld device is a handheld
6 device, whether you're holding it or not.

7 Q Because the Uber driver presumably had to
8 carry it and put it on the dashboard?

9 A That's one -- one reason.

10 Q What are the other reasons?

11 A Well, I mean, if something has the capability
12 of being held in your hand, then you can classify it as
13 a handheld device. It doesn't mean you have to hold it
14 all the time.

15 Q There's also the example in paragraph 16 of
16 your declaration for the motion to amend in the '978
17 case of a computer mouse.

18 Do you see that?

19 A Yes.

20 Q And I'm using one right now; right?

21 A Yes.

22 Q Is the computer mouse typically used resting
23 on a mouse pad?

24 A Typically, but not always.

25 Q Is that a handheld device when it is resting

DR. JOSEPH LAVIOLA

on a mouse pad?

A I would say that it is. You're holding it right now.

Q Does this concept of handhelds that you've been explaining apply to both of the patents, '438 and '978?

MR. KEY: Well, objection.

THE WITNESS: Yes.

BY MR. SMITH:

Q Sir, could you turn to, in the same declaration, page seven, if you would?

A You're talking about the '978 motion to amend?

Q Exactly. Exhibit 2011 in the 1257 case.

A Okay.

Q And do you see there the proposed -- sorry -- contingent claim 20.

A Are you talking about paragraph 11?

Q Yes. And the claim language just above it.

A Okay.

Q Could you also take out your '438 motion to amend declaration?

A Yes.

Q And also look at page seven. And there's a proposed contingent claim 21.

1 DR. JOSEPH LAVIOLA

2 Do you see that?

3 A Yes.

4 Q And in proposed contingent claim 21, in the
5 '438 motion to amend declaration, the language, "wherein
6 the 3D pointing device is smartphone" has been inserted.

7 Do you see that?

8 A Um-hum.

9 Q I'm sorry to ask you philosophical questions
10 like this, but what do you mean by "smartphone" here?

11 A I think a smartphone is a device which has --
12 which can be characterized by several capabilities.
13 Those capabilities include the ability to make a phone
14 call and receive a phone call, the ability to send text
15 and receive text messages, the ability to use it for
16 navigation purposes, the ability for you to be able to
17 download applications on to the phone and use those
18 applications, and also use the -- and most importantly,
19 use the smartphone as a handheld 3D pointing device.

20 Now, when I say that, that's not -- doesn't
21 mean that the phone has to have all of those things; all
22 right? I mean, it can have some of them and still be
23 considered a smartphone. But it always has to have a 3D
24 pointing device component to it.

25 Q What is the minimum set of characteristics a

1 DR. JOSEPH LAVIOLA

2 device needs to have to be considered a smartphone? And
3 actually, let me rephrase the question because I'm
4 asking you from today's perspective, but I really should
5 be asking you from the date of the filing of these
6 patents; right? So, put yourself back in the 2010 time
7 frame. What was the minimum set of characteristics that
8 a device needed to have in order to be considered to be
9 a smartphone?

10 A A minimum set would have to be send/receive
11 calls, send/receive text messages, and contain sensors
12 that would help the phone understand something about its
13 whereabouts or where it is in the world.

14 Q Could you turn to paragraph 21 of this
15 declaration? This is the '438 motion to amend
16 declaration.

17 A The '438 motion to amend.

18 Q Exhibit 2011 in the 1258 case.

19 A Paragraph 21?

20 Q Yes. And there, you say [as read]: The 558
21 provisional discloses the 3D pointing device may be a,
22 quote, cellular phone, end quote.

23 A Um-hum.

24 Q And then [as read]: A PHOSITA would know that
25 a smartphone is a type of cellular phone?

1 DR. JOSEPH LAVIOLA

2 A Um-hum.

3 Q What is PHOSITA there, just for the court
4 reporter?

5 A A person of ordinary skill in the art.

6 Q P-H-O-S-I-T-A. And when you testify that a
7 PHOSITA would know that a smartphone is a type of
8 cellular phone, that seems to imply that there are other
9 types of cellular phones that are not smartphones; is
10 that correct?

11 A Yeah. I mean, I believe that there are
12 cellular phones that just do basic sending and receiving
13 of calls.

14 Q Would a cellular phone that sends and receives
15 calls and also sends and receives text messages be
16 considered a smartphone?

17 And I'm asking specifically in the context of
18 the '438 and '978 patents as of the 2009, 2010 time
19 frame.

20 A Um-hum. I would think that a cellular phone
21 that just had the ability to send and receive calls and
22 send and receive text messages, in the context of these
23 patents...

24 I mean, I think it could be -- I think
25 depending on who you would ask could be considered a

1 DR. JOSEPH LAVIOLA

2 smartphone. But I do believe that you would have to
3 have at least some sensors in the cellular phone that
4 give you information about the phone surroundings to be
5 considered a smartphone.

6 Q Do you know when the first smartphone, as
7 you've just defined it, was introduced?

8 A No, I don't.

9 Q Do you know if there's any definition of
10 smartphone in either the '438 or the '978 patent?

11 A I don't believe that there is a definition of
12 the term smartphone in the patents.

13 Q Do you have an opinion as to whether
14 smartphones, as they are claimed in this proposed
15 contingent claim 21 were available prior to the first
16 filing of the provisional application that led
17 ultimately to the '438 patent, which would mean prior to
18 early 2010?

19 A So, you're asking me if I think that there
20 were any smartphones, according to what the definition
21 would be with respect to these motions, before 2009 --
22 2010?

23 Q Before 2010.

24 A Before 2010. I'm not really sure. I would
25 probably have to look it up. I mean, I'm trying to

1 DR. JOSEPH LAVIOLA

2 remember when I had my BlackBerry. I mean, I would say
3 it's possible that there -- there were phones before
4 2010 that had this -- the smartphone, quote, unquote,
5 capabilities. But I can't be 100 percent sure.

6 Q What was your BlackBerry that you were
7 referring to?

8 A My BlackBerry?

9 Q Yes.

10 A I don't remember the name of it.

11 Q Do you remember what it did?

12 A It had a physical keyboard and I remember it
13 received text messages, sent text messages. That was
14 one of its big characteristics. Phone calls, obviously.
15 You would go to the BlackBerry app store and download
16 apps for it. I believe it had motion sensors in it. I
17 mean, those are the main -- I just used it mostly for
18 phone calls and text messages.

19 Q So, at some point in human history, even if
20 it's hard to remember, there were only cellular phones
21 and no smartphones yet; right?

22 MR. KEY: Objection.

23 THE WITNESS: Yeah. I mean, I would say at
24 some point, you know, I remember having a cellular
25 phone that was this big, (indicating). I was

1 DR. JOSEPH LAVIOLA

2 carrying it around in high school. So, at that
3 time, it was just a phone. So, that would have
4 been late '80s, early '90s. A long time.

5 BY MR. SMITH:

6 Q So, how is it that you know that a PHOSITA
7 would know that a smartphone is a type of cellular phone
8 in 2009, 2010?

9 A Well, I mean, I think a person of ordinary
10 skill in the art at that time, you know, who was working
11 with various sensors and mobile technologies, as we
12 define in the -- in my declarations about what a person
13 of ordinary skill in the art would have. They would
14 certainly be aware of phones that had capabilities that
15 would constitute the phone as being a smartphone.

16 Q By the time the 558 provisional application
17 was filed?

18 A Yeah. Whenever that was.

19 Q To make that precise, by January 6th, 2010?

20 A Um-hum.

21 Q Would that be correct? A person of ordinary
22 skill in the art would have been aware of phones that
23 had capabilities that would constitute the phone being a
24 smartphone?

25 A Yes.

1 DR. JOSEPH LAVIOLA

2 MR. SMITH: You guys want to break for lunch?

3 MR. KEY: Yeah, sure.

4 (Off the stenographic record.)

5 MR. SMITH: Let's go off the record.

6 THE VIDEOGRAPHER: It's 11:53. We are going
7 off the record.

8 (A luncheon recess is had from 11:53 a.m. to
9 1:09 p.m.)

10 THE VIDEOGRAPHER: It's 1:09. We are back on
11 the record.

12 BY MR. SMITH:

13 Q Welcome back, Dr. LaViola.

14 A Thank you.

15 Q During the lunch break, did you communicate
16 with anyone about your testimony today?

17 A No.

18 Q Could you take out your declaration related to
19 the motion to amend for the '438 patent?

20 A Yes.

21 Q That is Exhibit 2011 in the 1258 case. And
22 turn to paragraph four, if you would. Are you there?

23 A Yes.

24 Q Okay. About four lines down, there's a
25 sentence beginning [as read]: Quote, it is my opinion

1 DR. JOSEPH LAVIOLA

2 that the disclosure of the '438 patent sufficiently
3 enables one of ordinary skill to practice the claimed
4 inventions and discloses that the investors were in
5 possession of the claimed subject matter at the time of
6 the invention.

7 Do you see that?

8 A Yes.

9 Q And then you say [as read]: I've seen nothing
10 presented by any party that alters my views as to
11 enablement and/or written description support of either
12 the original claims of the 438 patent or the proposed
13 amendments that I've received (sic).

14 Do you see that?

15 A Yes.

16 Q Do you agree with that testimony?

17 A Yes.

18 Q I know you're not a lawyer. But I wonder if
19 you could give me your understanding of what it means
20 when you say the '438 patent sufficiently enables one of
21 ordinary skill in the art to practice the claimed
22 inventions.

23 A I believe that enablement in this case means
24 that the patent provides enough information and details
25 or specific embodiment that one in the ordinary skill in

1 DR. JOSEPH LAVIOLA

2 the art could use that information along with their
3 known knowledge to implement the said invention.

4 Q And that would be their knowledge as of just
5 before these patents were filed; right?

6 A Yes.

7 Q Now, the proposed amended claim 21 in this
8 case requires that the pointing device be a smartphone;
9 correct?

10 A Yes.

11 Q And you understand that the proposed dependent
12 claim 21 is dependent on claim one; is that right?

13 A I'm under the impression that the proposed
14 claim 20 is not dependent on claim one. It's aimed to
15 replace claim one.

16 Q My question was actually to proposed claim 21,
17 which is the next one.

18 A Oh, okay.

19 Q Would you take a look at that one?

20 A Yes. Sorry.

21 Q No problem.

22 A Okay. Yes, it is dependent on claim one.

23 Q And is it your understanding that claim 21, if
24 it became in force, would have the limitations shown on
25 page seven of your declaration in addition to all of the

1 DR. JOSEPH LAVIOLA

2 limitations of claim one?

3 A I believe that is the case.

4 Q Now, in claim one, I believe we talked earlier
5 about the claim elements that were directed to the
6 novel-enhanced comparison method.

7 A Um-hum.

8 Q You may have phrased that slightly
9 different -- right? -- the general framework of the
10 novel-enhanced comparison method. But do you recall
11 that?

12 A Yes.

13 Q Does the '438 patent ever teach a person of
14 ordinary skill how to program the novel-enhanced
15 comparison method on a smartphone?

16 A I believe that anyone of the ordinary skill in
17 the art, specifically with the skill of working with
18 portable electronic devices would be able to utilize the
19 claims one and 21 to be able to produce the apparatus,
20 if you will, that this patent is describing.

21 Q So, that would be knowledge they sort of
22 brought with them or had in the 2009 and earlier time
23 frame?

24 A Yes.

25 Q Is that right?

1 DR. JOSEPH LAVIOLA

2 A Um-hum.

3 Q So, it's your contention that a person of
4 ordinary skill in the art would have been able to access
5 the processor and memory of a smartphone to do the
6 requisite programming to program a method like that of
7 the '438 patent in, say, you know, the 2009 time frame?

8 A I believe so.

9 Q If they were given the '438 patent method?

10 A Yes.

11 Q How do you know that smartphones, in the
12 relevant time frame, had sufficient processing power to
13 perform an enhanced comparison method like that
14 disclosed in the '438 patent?

15 A Assuming the smartphone had the requisite
16 sensors, there's very little in the way of processing
17 power required to implement the '438 patent's enhanced
18 comparison method. In fact, it's quite fast because it
19 uses a recursive algorithm.

20 Q Could you just go back one page in your
21 declaration and look at the limitations of proposed
22 substitute claim 20?

23 A Um-hum.

24 Q And, in particular, limitation 20(g). And
25 that limitation says [as read]: Communicating with the

1 DR. JOSEPH LAVIOLA

2 six-axis motion sensor module to calculate a resulting
3 deviation comprising resultant angles in said spatial
4 pointer reference frame.

5 Do you see that?

6 A Yes.

7 Q Is the resulting deviation comprising
8 resulting angles the pose of the device or the
9 orientation of the device?

10 A The resulting deviation angles are the
11 orientation of the device.

12 Q And in the specific methods shown in figure
13 seven and figure eight, that would be the third
14 quaternion?

15 A Yes.

16 Q Okay. Now, element 20(j), which is the last
17 one, states [as read]: Quote, and a displayed device
18 built in to and integrated with the 3D pointing device
19 and associated with a display reference frame wherein
20 said resultant angles of the resulting deviation in the
21 spatial pointer reference frame are translated to a
22 movement pattern in the display reference frame, end
23 quote.

24 Do you see that?

25 A Yes.

1 DR. JOSEPH LAVIOLA

2 Q Does the '438 patent teach a person of
3 ordinary skill in the art how to do this for a built-in
4 display?

5 A I believe the location of the display is
6 somewhat irrelevant to the -- to whether or not somebody
7 can -- or whether the patent teaches it or not. The
8 display is going to be wherever it is in the
9 relationship to the said sensors. And as long as the
10 transformations are in place, the movement pattern can
11 be translated. So I don't think it make as difference
12 that it's built in or not to someone trying to implement
13 this.

14 Q Would a person of ordinary skill in the art in
15 the 2009 time frame have been able to implement this
16 step or this claim limitation 20(j)?

17 A Yes.

18 Q Now, I believe you testified a little bit
19 earlier that if the relevant sensors were available on
20 the smartphone, there would be sufficient processing
21 power. How would we know whether the right sensors were
22 available on a smartphone?

23 A You could look at the specifications of the
24 cell phone. And that would tell you what it had in it,
25 what its -- you know, what processor it had, what

1 DR. JOSEPH LAVIOLA

2 sensors it would have, et cetera.

3 Q Were smartphones available as of January 6,
4 2010 that had the sensors described in the '438 patent
5 in relation to the novel-enhanced comparison method?

6 A I believe that there were cell phones that had
7 that characteristic at that time frame.

8 Q Sure. Were smartphones available as of
9 January 6, 2010 that had the sensors described in the
10 '978 patent in relation to the novel-enhanced comparison
11 method of that patent?

12 A I believe that there would potentially be
13 fewer examples, but there -- nevertheless, there would
14 be smartphones that had that characteristic.

15 Q And is it your opinion that such sensors in
16 smartphones available before the first applications
17 leading to these '438, '978 patents were filed would
18 have been mounted on a printed circuit board?

19 A Yes.

20 Q Why is that?

21 A Because I don't see any other way one would
22 want to be able to do it. It's going to be a circuit
23 board within the smartphone. On that board, you would
24 have all the various components necessary to operate the
25 phone at the hardware level, aside from any input and/or

1 DR. JOSEPH LAVIOLA

2 output components. But even then, they would be
3 integrated into the main process control board.

4 Q You said there's going to be a circuit board
5 within the smartphone. Why are you so sure of that, as
6 of just before the applications leading to these patents
7 were filed?

8 A To the best of my knowledge, there wouldn't be
9 any other way to do it.

10 Q What is a printed circuit board?

11 A It's just a circuit board that has the
12 necessary components that are encased in the board
13 itself. So, it's integrated in the board.

14 Q Do you know when printed circuit boards were
15 developed?

16 A No, I don't know that information.

17 Q Was it before 2009?

18 A I can only speculate, given various other
19 electronic devices that I have seen, that they would
20 have been developed before 2009.

21 Q Now, does the '438 patent teach you how to
22 design a printed circuit board for a smartphone?

23 A This is another example where you have some
24 instructions and then a person of ordinary skill in the
25 art having other knowledge that would enable them to

1 DR. JOSEPH LAVIOLA

2 implement the said invention.

3 In this particular case, the '438 patent does
4 show a representation of what the internals of the
5 device would have showing you potential locations for
6 the sensors, for the processing unit, for the
7 transmission unit, and so forth. So, that would provide
8 at least a preliminary starting point for one of
9 ordinary skill in the art to build that circuit board.

10 Q What are you referring to, specifically, in
11 the '438 patent?

12 A Figure six, figure four.

13 Q So, does figure four show you a circuit board?

14 A Figure four doesn't show a circuit board. It
15 shows a schematic for where given components would be in
16 relation to each other, those components then being
17 shown in figure six.

18 Q So, in figure four, just to make sure we're
19 looking at the same thing --

20 A Um-hum.

21 Q -- I see reference numerals 302, 304, 342,
22 344, 346, and 348.

23 Do you see that?

24 A Yes.

25 Q And do you understand those to be actual

1 DR. JOSEPH LAVIOLA

2 physical components laid out in the arrangement shown in
3 figure four?

4 A Not necessarily physical components. But they
5 represent how the data flow and how the connections
6 would be between each of those individual components.
7 One would then be able to use that as a way to at least
8 implement the hardware components necessary to ensure
9 that those components are organized correctly and are
10 pointing to the appropriate other components.

11 Q You also referred to figure six. What do you
12 understand figure six to be?

13 A Figure six actually shows a handheld portable
14 pointing device that looks like a smartphone with the
15 various components extruded. So, you have -- on 620,
16 you've got the back of the phone. And then in 640, with
17 the constituent pieces, 622, 604, 646, 648, 644, and 642
18 being the various components necessary to support this
19 invention. 682 being, I believe -- let's see what 682
20 is.

21 682 would be the display. And then 610 would
22 be the cover to the display.

23 Q And where is the circuit board in this figure?

24 A 640.

25 Q And can you identify the components on the

1 DR. JOSEPH LAVIOLA

2 circuit board?

3 A The rotation sensor is 622. An accelerometer
4 is -- I'm sorry. It's a battery pack is 622. Rotation
5 sensor is 642. Accelerometer is 644. Data transmitting
6 unit, 646. Computing sensor, 648.

7 Q Now, the battery pack is floating above the
8 printed circuit board; right?

9 A It appears to be.

10 Q Is it your understanding it would be on the
11 board?

12 A I'm pretty sure that its connections would be
13 on the board. The battery pack may be on top of the
14 board. But it would definitely have a connection into
15 the board to support power required to use the device.

16 Q By the way, do you have any experience
17 designing printed circuit boards?

18 A A little bit.

19 Q In what context was that, sir?

20 A I played around with Arduino boards and did
21 some breadboard prototyping with them, do simple things.
22 Turn on and off switches and run servos and
23 things like that.

24 Q Is a breadboard a printed circuit board?

25 A Well, a breadboard would be a -- the device

1 DR. JOSEPH LAVIOLA

2 that you would use in order to determine how the wires
3 should be connected and so that then you could then go
4 ahead and print the circuit board.

5 Q Have you ever done the layout of a printed
6 circuit board and determined where components would
7 actually go on the board?

8 A No.

9 Q In 2009, how did designers of portable
10 electronic devices lay out circuit boards?

11 MR. KEY: Objection.

12 THE WITNESS: In my little experience
13 regarding how that is done, I would say that
14 probably they would take a series of steps to do
15 that, the first being perhaps paper, being able to
16 sketch out what the board would look like on paper.
17 Then, going to the breadboard where they can
18 prototype the functionality. Then they would
19 probably use a software program to input the
20 various connections and so forth. And then that
21 would be the software that would be used to convert
22 the specification into the printed circuit board.

23 BY MR. SMITH:

24 Q Do you happen to know what software that might
25 be?

1 DR. JOSEPH LAVIOLA

2 A I couldn't give you a definitive answer as to
3 what software it would be. I know there is software
4 such Xilinx software that puts circuit boards on to
5 field programmable gate arrays.

6 But as far as the circuit boards that we're
7 talking about for smartphones, I'm not sure.

8 Q And you said they would put probably a
9 software to put various connections and so forth. And
10 then that software would be used to convert the
11 specification into the printed circuit board.

12 A Um-hum.

13 Q Does that mean they would take connections
14 from, say, something like figure four? In other words,
15 the electrical connections between components and the
16 software would basically place enroute those connections
17 on the printed circuit board?

18 A You would use the software to specify what
19 components are -- should be put where on the circuit
20 board and the connections therein. And then presumably,
21 that would create a specification or some type of
22 representation that could be then used to do the actual
23 printing of the board.

24 Q And this is in the 2009 time frame?

25 A Um-hum.

1 DR. JOSEPH LAVIOLA

2 Q The circuit board that's shown in figure six,
3 it looks like it's only got two sets of sensors, and
4 then the unit 604 on it.

5 A Um-hum.

6 Q Is that what you need for a smartphone?

7 MR. KEY: Objection.

8 THE WITNESS: I think this would be the
9 minimum requirement you would need, along with the
10 other standard elements that one would have as part
11 of a smartphone, which is obviously the necessary
12 electronics and components to support the speaker
13 and the microphone that you would need for
14 communication, verbal communication.

15 BY MR. SMITH:

16 Q Is it your understanding in the '438 patent
17 that the sensor components 644 and 642 have to go in the
18 locations shown in figure six?

19 A I don't believe that the patent restricts the
20 placement of those two sensors. I think ideally you
21 would want to place them next to each other so that they
22 would have the same point of origin, or as close to the
23 same point of origin as possible.

24 At the time, they would have to be separate,
25 potentially. I don't believe that they were

1 DR. JOSEPH LAVIOLA

2 sophisticated IMUs that were affordable for something
3 like this in the 2009 time frame.

4 Q So, it's possible that the sensors 644 and 642
5 could have been separated on the same board?

6 A I would say it's possible, but probably
7 unlikely, given the fact that you'd want to have those
8 sensors close together.

9 Q Now, if it turns out that in 2009 there were
10 not smartphones commercially available that had the
11 requisite sensors, would it been -- would it have been
12 within the skill -- a person of ordinary skill in the
13 art in 2009 to place those sensors on a board like board
14 640 shown in figure six of the '438 patent?

15 A I believe that it would take some effort, but
16 one of ordinary skill in the art would be able to add
17 those components on to a board, a board that was
18 amenable to having those types of components installed.

19 Q And what kind of board would that be?

20 A Well, it would have to be a board that was
21 generic enough that you could place things in certain
22 places, you know, place certain components into certain
23 places on the board so that you had the freedom to at
24 least choose where they might go. Some circuit boards
25 that you use for various projects, electrical or

1 DR. JOSEPH LAVIOLA

2 computer engineering, you know, the boards are made a
3 certain way and everything is sort of situated in a --
4 in its known location or its given location based on the
5 board maker. And then you have to play with what -- or
6 manipulate what is on there. Some of them, though, you
7 can literally get the board itself with nothing on it
8 and just start adding stuff to it because it has
9 requisite places for the pins and places for the
10 individual pieces that you would want to put on it.

11 Q Is that something that the '438 patent
12 teaches? Or is that something that a person of ordinary
13 skill in the art would have known in 2009?

14 MR. KEY: Objection, asked and answered.

15 THE WITNESS: I think it's -- a person of
16 ordinary skill in the art would have known how to
17 teach -- the '438 patent is not trying to, you
18 know, teach you completely everything there is that
19 you need to know about, you know, creating a
20 smartphone. It's teaching you the elements
21 necessary to support a cell phone or smartphone's
22 ability to be a 3D -- handheld 3D pointing device.
23 The rest of the knowledge would be from the
24 experience based on building these types of device.

25 BY MR. SMITH:

1 DR. JOSEPH LAVIOLA

2 Q I'm sorry. You started that answer with I
3 think it's something a person of ordinary skill in the
4 art would have known how -- and then you trailed off and
5 went into something else. Can you finish that?

6 A Oh. So, what I was saying is that -- is that
7 I would expect that somebody of ordinary skill in the
8 art would know how to take the components in the '438
9 patent and, and use -- utilize them in a, in a circuit
10 board to practice the invention.

11 Q Would you give the same answer for the '978
12 patent? Or does the '978 patent, in fact, tell you how
13 to design a board like that?

14 A I would give the same answer for the '978
15 patent.

16 Q So, and up to now, you've sure read the '438
17 patent and '978 patents pretty carefully.

18 For the motions to amend, did you actually
19 review the original applications too?

20 A The applications to amend?

21 Q Sorry. The applications that were filed with
22 the patent office that led to the issuance of the '438
23 and '978 patents.

24 A Oh. I have looked at them in the past, but it
25 was a while ago.

1 DR. JOSEPH LAVIOLA

2 Q How would a person of ordinary skill in the
3 art at the time of the filing of those applications have
4 understood the word "module"?

5 A Depends on what type of module you're talking
6 about, software or hardware module.

7 So, module, essentially represents a set of
8 components that are unique -- no, not unique -- that are
9 integrated together to form a certain piece of
10 functionality. The hardware side, you would have a
11 module where you had individual components that would be
12 sort of put together, like the -- you could have the
13 sensor module where the sensor module contained the
14 various sensors and the communications that would go to
15 the C -- the CPU of the device. So, that would be one
16 example of one module.

17 In the software world, a module is really just
18 a set of -- it's an abstraction for a set of pieces of
19 functionality in the software that kind of fit together
20 that make up a piece of the software that can be chunked
21 together for clarity and for further software
22 engineering and testing and so forth.

23 Q For a sensor module --

24 A Um-hum.

25 Q -- what would be required for the sensors to

1 DR. JOSEPH LAVIOLA

2 be, as you say, together in a module?

3 A The only thing that would potentially be
4 required would be the designer's ability or wish to have
5 them be considered a module. So, if I wanted, you know,
6 components A, B, and C to be module A, then I would
7 design it as such.

8 Q And how would you design it to be a module as
9 opposed to not being a module?

10 MR. KEY: Objection.

11 THE WITNESS: So, for example, you could put
12 on a circuit board a -- an integrated circuit that
13 would house the different sensors. And that could
14 be considered a sensor module. And then you would
15 put that component on to the board. So, you would
16 have a sensor module which contained the sensors,
17 in its own little, like, piece. And then you would
18 take that piece and stick it on the board. And now
19 you've got a sensor module on to your main
20 processor or your printed circuit board.

21 If you were to look at a circuit board, and
22 you can see like these little chips. And those
23 chips can very often contain functionality that
24 is -- can be considered modular.

25 BY MR. SMITH:

1 DR. JOSEPH LAVIOLA

2 Q So, is it your opinion that on claim ten of
3 the '987 -- sorry, '978 patent refers to a nine-axis
4 motion sensor module, that the word module in that claim
5 requires the sensors to be physically together such that
6 they can be placed on a board at the same time?

7 I'm looking at column 37, line 17, if you're
8 looking at the '978 patent.

9 A I believe that one of ordinary skill in the
10 art would read that and come to the conclusion that the
11 three separate sensors would be coupled together as part
12 of this sensor module.

13 Q So, the three sensors are coupled together?

14 A Um-hum.

15 Q And you said as part of the sensor module.

16 A Well, no. I mean, as -- okay. Well, I mean,
17 there could be other things associated in the sensor
18 module. But at a minimum, the accelerometer, gyroscope,
19 and magnetometer would be integrated together into a
20 motion sensor module.

21 Now, keep in mind that integration would still
22 have the individual components separate, but separate in
23 a very, very, very small space, like microns.

24 Q So, the three sensors could be separate, but
25 would be within their own housing, for example?

DR. JOSEPH LAVIOLA

A Yes.

Q And that housing could be placed on the board and wired at once as opposed to three separate times?

A Yes.

Q And you believe that's required by claim ten of the '978 patent?

MR. KEY: I'm going to object to all these questions as outside the scope of direct.

THE WITNESS: Can I answer?

MR. KEY: Sure.

THE WITNESS: I don't necessarily think that it's a requirement that they be close together like that. But based on the information in the patent, one would tend to conclude that that was the intention.

BY MR. SMITH:

Q Could module in claim ten simply mean that the center -- sensors were functionally coupled in that they all contribute to the orientation output?

MR. KEY: Same objection. It's outside the scope.

THE WITNESS: I think if you look at figure four, what you see really is the coupling of the sensors together as one unit, just as you see the

1 DR. JOSEPH LAVIOLA

2 coupling of the transmission unit and the computing
3 processor coupled together as one unit. Otherwise,
4 they wouldn't have put that dotted or dashed box
5 around each of the sensors.

6 So, I'm pretty sure the intention was to keep
7 them in the -- in sort of a module that has them
8 together.

9 BY MR. SMITH:

10 Q And you're holding your hands together as if
11 it's a physical thing.

12 A Yeah.

13 Q Is that right?

14 A Um-hum.

15 Q I wonder if you could turn to your main
16 declaration for the -- it's Exhibit 2004. We can use
17 the '978 or the '438. Why don't we use the '438 and
18 turn to paragraph 53, which is the same in both
19 declarations.

20 A Yes.

21 Q Paragraph 53, you conclude that [as read]:
22 Quote, three dimensional (3D) pointing device should be
23 construed as, quote, a handheld device that detects the
24 motion of said device in three dimensions and is capable
25 of translating the detected motions to control an output

DR. JOSEPH LAVIOLA

on a display.

Do you see that?

A No.

Q Okay. Did I read something incorrectly?

A Oh, I see it. You're on the second part of the paragraph on page 26?

Q Yes.

A Okay.

Yes. Okay.

Q It's actually easier if you use the '978 declaration because it's all on one page.

A Oh, sure.

Q Page 26.

A Um-hum.

Q So, first of all, in this construction, it begins with a handheld device. And we've discussed what handheld might be before. Is a handheld device an object?

A I believe that it would be construed as such.

Q The phrase "motion in three dimensions," the exact phrase is "detects the motion of said device in three dimensions."

A Um-hum.

Q What do you understand the motion here to be?

1 DR. JOSEPH LAVIOLA

2 A In this particular instance, I believe the
3 motions would be the orientations that you would be
4 getting from the device.

5 Q In other words, changes in rotation of the
6 device around any of three special axes?

7 A It would be around one center of rotation,
8 probably the center of the device.

9 Q Does "detects the motion of said device in
10 three dimensions" require that the device detect
11 translational motion as opposed to rotation?

12 A For the purposes of this patent, I would say
13 no. It's just the orientation.

14 Q The word "motion" is broad enough to encompass
15 changes in orientation and changes in spatial position;
16 right?

17 A Well, yeah.

18 Q But in this case, it doesn't?

19 A In this case, it's just referring to motions
20 associated with or derived orientations from the sensors
21 that are sensing the motion.

22 Q Rotational changes in orientation are a kind
23 of motion?

24 A Yes.

25 Q So, if a device detected only translational

1 DR. JOSEPH LAVIOLA

2 motions in three dimensions, but not rotational motions,
3 would it be excluded by this construction?

4 A Given this construction, I think that, that
5 translation would not be part of it. So, it would just
6 be focusing on orientation.

7 MR. SMITH: Why don't we take a quick break so
8 he can change the media, if that's okay with
9 everybody.

10 THE WITNESS: All right.

11 THE VIDEOGRAPHER: This will conclude media
12 file number two of the deposition of Joseph
13 LaViola, Ph.D. It's 1:58. We are going off the
14 record.

15 (A brief recess is had from 1:58 p.m. to 2:07
16 p.m.)

17 THE VIDEOGRAPHER: This is the beginning of
18 media file number three of the deposition of Joseph
19 LaViola, Ph.D. It is 2:07. We are back on the
20 record.

21 BY MR. SMITH:

22 Q Dr. LaViola, during the break, did you
23 communicate with anyone about your testimony?

24 A No.

25 Q Let's go back to the construction that you

1 DR. JOSEPH LAVIOLA

2 believe is appropriate for the term 3D pointing
3 device --

4 A Um-hum.

5 Q -- that's reflected in paragraph 53 of your
6 declarations, Exhibit 2004.

7 The last part of the construction says [as
8 read]: Is capable of translating the detected motions
9 to control an output on a display.

10 What does it mean to control an output on a
11 display?

12 A To control an output on a display would be to
13 be able to utilize the orientation information that you
14 get from the device and use that information to
15 manipulate elements on the screen, or on the display so
16 that orientation would be affecting the movement of
17 graphical entities or text or something on, on the
18 display.

19 Q So, you basically changed the orientation of
20 the device and that changes something on the screen,
21 correspondingly?

22 MR. KEY: Objection.

23 THE WITNESS: For the -- for the part of this
24 where -- I mean, it doesn't have to do anything.

25 But if it is doing something, then -- then, yes, it

1 DR. JOSEPH LAVIOLA

2 would be changing something on the screen based on
3 the rotation that you would get.

4 BY MR. SMITH:

5 Q And you said it doesn't have to do anything.
6 Is that because the construction set is capable of?

7 A Yes.

8 Q I see. So, no actual translating of the
9 detected motions to control an output on a display has
10 to happen in order for a device to be a 3D pointing
11 device?

12 A Yes, that's true.

13 Q It just has to detect orientation in three
14 dimensions and provide that information somehow?

15 A Well, it has to -- yeah. I mean, it can
16 provide that information internally to some other
17 internal program, for example. But, you know, it has to
18 at least be capable of dealing with any type of screen
19 movement or updating.

20 Q Now, in your view, is, is a device capable of
21 doing that once it produces a value that reflects the
22 device's orientation? Or does the device actually need
23 to have, like, some sort of software that could do the
24 mapping if you wanted it to?

25 A I mean, there's going to be software at some

1 DR. JOSEPH LAVIOLA

2 level that is going to utilize the orientation for
3 whatever function you would want to have as part of the
4 transformed output or anything being held internally.

5 Q You're saying the software is likely to be
6 there. But what I'm asking is slightly different.

7 A Okay.

8 Q In order for the device to be capable of
9 translating the detected motions to control an output on
10 a display, is it sufficient for the device to just
11 generate an orientation that could be used by software
12 somewhere? Or does the device actually need to have
13 that software on it?

14 A Well, if you didn't have the software on the
15 device, then the thing would just give you those three
16 outputs and you wouldn't do anything with them. So,
17 there has to be something there that takes that, that
18 orientation as input and then processes it in some way
19 in order to, you know, make something happen.

20 Q And does that software have to be in the
21 device we're calling a 3D pointing device or could it be
22 somewhere else?

23 A At the time of the invention, it would be on
24 the device.

25 Q But as a matter of this claim term that you've

1 DR. JOSEPH LAVIOLA

2 construed in your declaration, you're saying it would
3 need to be on the device in order for you to regard it
4 as a 3D pointing device?

5 A Yes.

6 Q Okay. All right. Let's take a look at
7 Exhibit 1004, which is the Bachmann reference.

8 (Exhibit 1004 was marked.)

9 THE WITNESS: Um-hum.

10 BY MR. SMITH:

11 Q Do you recognize that?

12 A Yes.

13 Q And you've reviewed it recently?

14 A Yes.

15 Q And just for the record, this is Exhibit 1004
16 in both the 1257 and 1258 IPR. It's US patent number
17 7,089,148.

18 Dr. LaViola, the sensor arrangements in --
19 described in the '438 patent were available in the prior
20 art arising in the 2009 time frame; correct?

21 A Yes.

22 Q And the same is true for the '978 patent?

23 A Yes.

24 Q Have you ever heard of MARG sensor modules?

25 A Yes.

1 DR. JOSEPH LAVIOLA

2 Q And what are they?

3 A Basically it stands for magnetometer
4 acceleration and angular velocity data.

5 Q And MARG sensor modules with nine axes were
6 available in 2009, weren't they?

7 A Yes.

8 Q And just generally, do you know how the
9 Bachmann system works?

10 A I have a general idea, yeah.

11 Q Can you explain it?

12 A Basically, it takes data from these MARG
13 sensors and can be placed anywhere on, on the body. It
14 takes the angular -- the angular velocities and uses
15 that to compute an orientation. And then it takes the
16 accelerations and magnetometer information and uses that
17 to create an error vector which then it would combine
18 with the quaternion that you get from the angular
19 acceleration. And then puts them together into a
20 quaternion that is integrated because it's really
21 representing the derivative of the quaternion. Would be
22 integrated to give you a quaternion, and then normalized
23 to give you a normalized quaternion, which would give
24 you a valid rotation.

25 Q Could you turn to figure four of Bachmann?

DR. JOSEPH LAVIOLA

A Um-hum.

Yep.

Q Do you see the little drawing of the man labeled 402?

A Yes.

Q And he has a bunch of objects, 401, attached to him. Do you know what those are?

A I believe those are sensors.

Q Were they the MARG sensors?

A Yeah.

Q And do the sensors 401 track changes in the orientation of the sensor?

A Yes, they do.

Q Now, you've noted in your declaration that Bachmann refers to what you called props, you know, like a sword or something like that.

Would you call the sensors, 401 themselves, props?

A I don't believe that those would be called props.

Q Do you know what the point of attaching the sensors to the man in figure four is?

A It's so you can track the man's body and parts.

DR. JOSEPH LAVIOLA

Q Do you see in figure four the display 404?

A Yes.

Q You see it's got a little figure of the same man on it?

A Um-hum.

Q And you've, you've done work in virtual reality; right?

A Yes.

Q So, you must have seen body tracking setups like this before?

A Yes.

Q How would you attach the sensors 401 to the man 402?

MR. KEY: Objection, vague.

But go ahead.

THE WITNESS: Well, there's a couple ways that you could do it. You could enclose those sensors in a housing of some kind and then create a -- like a piece of Velcro or something that you could then attach to various parts of the person's clothing. Or you could use like a band, like you would have in a watch. Or you could have them associated with a suit that you wore or a glove that you wore. And then you could put them on to those things.

1 DR. JOSEPH LAVIOLA

2 BY MR. SMITH:

3 Q In that case, the sensors would be in the
4 gloves or in the suit?

5 A Not necessarily in. They could be on the
6 suit, on the glove.

7 Q Could you turn to paragraph 56 of your main
8 declaration?

9 A '978 or what?

10 Q It's actually the same, I think, in both. But
11 let's turn to the '978.

12 A Okay.

13 Q And there, you say [as read]: Quote, Bachmann
14 is directed towards a method and apparatus for motion
15 tracking of articulated rigid bodies, end quote.

16 A Um-hum.

17 Q What does that sentence mean to you?

18 A It means that the Bachmann patent focuses on
19 tracking objects that aren't necessarily malleable. So,
20 when you talk about a rigid body, generally you're
21 talking about something that's not going to, you know,
22 deform.

23 Q And what's an articulated rigid body?

24 A Articulated means that they're connected to
25 each other. So, it's really about tracking a person.

1 DR. JOSEPH LAVIOLA

2 Q So, your joints would be points of
3 articulation?

4 A Yes.

5 Q To track a person completely, where would you
6 put sensors?

7 A Oh, you'd have to put them in locations that
8 would be able to cover all the joints. So, there are a
9 lot of joints in the body. So, you have to put them,
10 you know, on your legs, arms, torso, head, fingers,
11 individual digits of the fingers, thumb, feet, so on and
12 so forth.

13 Q What does Bachmann use the orientation data
14 that's generated by these sensors for?

15 A He uses it to identify the orientation of the
16 individual sensors, which would potentially be attached
17 to a person of some kind.

18 Actually, it's just doing orientation, so it's
19 not going to really give you a good tracking of the
20 person. It's just going to give you, you know, their
21 orientation, which is -- will give you something, but if
22 you start walking around, you're not going to get it.

23 Q The orientation of their limbs?

24 A Yeah. They'll look -- yeah. It just won't
25 come out right. You have to have both position

1 DR. JOSEPH LAVIOLA

2 orientation to really track somebody to the space.

3 Q What does Bachmann do with that data? Do you
4 know?

5 A What does Bachmann do with the orientation
6 data?

7 Q Yeah.

8 A Well, it's just used simply to just track the
9 movement without mapping them on to anything.

10 Q Could you take a look at column 14, Bachmann?

11 A Um-hum.

12 Q And then starting at about line 20, Bachmann
13 says [as read]: The CPU 403 then calculates the body
14 posture and outputs a display signal to a display 404,
15 for example, virtual reality display goggles or more
16 conventional display devices such as monitors, thereby
17 enabling the movement of the articulated rigid body 402
18 to be incorporated into a synthetic or virtual
19 environment, and then displayed.

20 A Um-hum.

21 Q What does that mean to you?

22 A What that means is that first of all, it's not
23 truly calculating body posture. By definition, posture
24 requires both positioning and orientation. But outside
25 of that, what it's doing effectively is tracking someone

1 DR. JOSEPH LAVIOLA

2 so that they can be represented in a virtual
3 environment. Not only be represented, but such that the
4 information that -- or the orientation of said
5 individual will be used to help determine where that
6 individual is looking, so you can render the appropriate
7 graphics for that person.

8 Q Can you look at figure four again?

9 A Yeah.

10 Q And you see the display 404?

11 A Um-hum.

12 Q Little man on the display. He's in the same
13 posture as the man in 402; right?

14 A Um-hum.

15 Q Is Bachmann using the sensors to allow the
16 position of the body of the man 402 to be displayed on
17 the screen 404?

18 A So, it shows what the orientations would be
19 for that particular person in 3D space.

20 Q You mean the display screen 404 shows that?

21 A Um-hum.

22 Q What would happen if that particular person
23 moved?

24 A Moved, as in --

25 Q Changed posture?

1 DR. JOSEPH LAVIOLA

2 A -- changed posture? As in changed their
3 orientation?

4 Q Correct.

5 A You would see a change in the posture of the
6 person on the screen.

7 Q Could you turn to column one of Bachmann? Let
8 me know when you're there.

9 A Um-hum.

10 Q Do you see the heading that says technical
11 field?

12 A Yes.

13 Q It's about line 18, section under technical
14 field, begins with [as read]: The invention described
15 herein relates to methods and apparatus for tracking the
16 orientation, also referred to herein as posture of an
17 object?

18 A Um-hum.

19 Q Now, the technical field of Bachmann is not
20 related to tracking an articulated rigid body, is it?

21 A I believe the technical field is tracking the
22 posture of an articulated rigid body. That's what its
23 focus is.

24 Q The sentence we just read refers to tracking
25 the orientation of an object; right?

1 DR. JOSEPH LAVIOLA

2 A Um-hum.

3 Q And do you have to discount that in order to
4 say that the focus of Bachmann is tracking an
5 articulated rigid body?

6 A No. An object can be an articulated rigid
7 body.

8 Q It can also be other things; right?

9 A Potentially.

10 Q Is there any technical reason why Bachmann's
11 system can't be used to track the orientation of an
12 object?

13 A I mean, I don't see any particular reason why
14 you could not track an object with it. I mean, it says
15 it right there, that the invention described herein
16 relates to methods and apparatus for tracking the
17 orientation of an object.

18 Q In your declaration, you discussed whether
19 Bachmann was analogous art. Do you remember that?

20 A Yes.

21 Q And do you happen to understand the legal
22 standard for determining whether prior art is analogous
23 art?

24 A In order to be analogous, it has to be either
25 in the same field of endeavor or has to be -- it can be

1 DR. JOSEPH LAVIOLA

2 a different field of endeavor if it is still reasonably
3 pertinent to the particular problem addressed by the
4 challenged patent.

5 Q Could you turn to your declaration? Let's say
6 the '438 patent declaration, Exhibit 2004 in the 1257
7 case and, in particular, to paragraph 86.

8 A Um-hum.

9 Q And there, you say [as read]: I have been
10 informed that of the 20 publications in which the office
11 has cited Bachmann, not a single one of those
12 publications relates to a pointing device, let alone a
13 3D pointing device.

14 Do you see that?

15 A You said paragraph 86?

16 Q Yes.

17 A In the '438 patent?

18 Q I think I'm using the wrong declaration.
19 Apologize. It should be paragraph 80 of the '438
20 declaration. Paragraph 86 of the '978 declaration.

21 A Okay. Paragraph 80 of the '438. Yes.

22 Q All right. You see the first sentence where
23 you say [as read]: I have been informed that of the 20
24 publications in which the office has cited Bachmann, not
25 a single one of those publications relates to a pointing

1 DR. JOSEPH LAVIOLA

2 device, let alone a 3D pointing device?

3 A Yes.

4 Q Why did you include that in this part of your
5 declaration?

6 A I included it because I wanted to make the
7 point the patent office does not consider Bachmann to be
8 analogous with the '438 or '978 patents, which refers
9 specifically to the 3D -- handheld 3D pointing devices.

10 The office is -- you know, of the 20 citations
11 that have been done, none of them have focused on 3D
12 pointing devices, which, to me, provides an argument to
13 say that Bachmann is not analogous art.

14 Q When you say "I have been informed," did you
15 review those 20 publications yourself?

16 A I did not.

17 Q Did you rely on information given to you by
18 somebody else?

19 A By counsel.

20 Q And who specifically was it?

21 A It was either Cecil or Jay or Arlen.

22 Q And how did they do the review?

23 A I couldn't tell you.

24 Q Do you know how they determined that there
25 were 20 publications?

1 DR. JOSEPH LAVIOLA

2 A No, I don't.

3 Q Do you know if they reviewed each of these
4 publications in full?

5 A I do not know that.

6 Q How long does it take you to read a patent
7 like the '978 patent?

8 A A couple hours.

9 Q I think that's a sign of intelligence. It
10 takes a long time to read these things; right?

11 A Yes, it does.

12 Q So, reviewing 20 in full would have taken a
13 week?

14 A Seems to be, yeah.

15 Q Do you know if they applied the definition of
16 3D pointing device that you are advocating in your
17 declarations when reviewing those publications?

18 A I do believe that they did that.

19 Q How do you know that? Did they tell you?

20 A I can only go based on the definitions that
21 we've been using throughout this whole process. For
22 them to change the definition would be pointless.

23 Q Did any of them, whoever may have done this
24 work, ask you any questions about any particular
25 publications, like whether it might be considered a 3D

1 DR. JOSEPH LAVIOLA

2 pointing device or not?

3 A Not that I recall.

4 Q And did you subsequently review any of these
5 publications?

6 A No.

7 Q And how did the attorneys at Mr. Kesan's firm
8 communicate to you that this review had been done and
9 the results of it?

10 A Well, it was communicated based through the --
11 one of the iterative drafts that we had. And, you know,
12 and I was asked to look at it and make sure I agree with
13 everything that was said. And if something was wrong, I
14 would change it.

15 To the best of my knowledge, you know, I
16 assumed that counsel knew what they were doing when it
17 came to this particular part of the report. And I had
18 no reason to change it.

19 Q Okay. Let me give you a copy of what has been
20 marked as Exhibit 1005 in both the 1257 and 1258 IPRs.

21 (Exhibit 1005 was marked.)

22 BY MR. SMITH:

23 Q Do you recognize that?

24 A Yes.

25 Q And what is it, sir?

1 DR. JOSEPH LAVIOLA

2 A It is the Zhang patent, which is a method and
3 apparatus of universal remote pointing control for home
4 entertainment system and computer.

5 Q That's US patent publication 2004/0,095,317?

6 A Um-hum.

7 Q Could you turn to your declaration in your
8 '978 case? So, the 1257 proceeding?

9 A Um-hum.

10 Q And in particular, paragraph 87?

11 A Eighty-seven. Okay.

12 Q Yeah.

13 A Um-hum.

14 Q Just to make sure we're in the same place,
15 paragraph 87 is immediately under section A, ground one,
16 Zhang in view of Bachmann?

17 A Correct.

18 Q Okay. Now, paragraph 87, you say -- and this
19 is the second sentence -- [as read]: Quote, Zhang is
20 designed to function as a two-dimensional pointing
21 device that controls a cursor on a two-dimensional
22 reference frame. For this purpose, the device does not
23 need to sense orientation and movement along a third
24 spatial axis.

25 A Yes.

1 DR. JOSEPH LAVIOLA

2 Q And your point is presumably, this is not a 3D
3 pointing device under the construction that you
4 proposed?

5 A That is correct.

6 Q Why would Zhang need to sense orientation and
7 movement along a third spatial axis in order to be a 3D
8 pointing device?

9 A Because you would need that third degree of --
10 in this case, it would be the roll, to be able to give
11 you a three-dimensional output that specified an
12 orientation.

13 Zhang gives you two-dimensional output in
14 orientation, mainly pitch and yaw. So it's not a true
15 3D pointing device.

16 Q And what I'm trying to understand is the
17 requirement of orientation and movement. Because it
18 seemed like when we were talking before, you thought
19 that the construction required only orientation and not
20 movement, per se.

21 Is that what you meant or was this more
22 generic?

23 A I think this was more generic. I mean, in no
24 way do any of these patents, any of these that we're
25 talking about sense position. So, the other thing to

1 DR. JOSEPH LAVIOLA

2 keep in mind is certain sensors can be reliable if an
3 object or person is not moving. But once they begin to
4 move, those sensors sense information that will confuse
5 the issue causing error. So, one of the things that
6 ultimately will happen with Zhang and its particular
7 implementation, is that if you move the thing around,
8 it's not going to give you accurate results because it's
9 going to be sensing, for example, different elements of
10 gravity -- I mean, different elements of acceleration
11 besides gravity, centrifugal and axial forces, which
12 will cause problems in getting an accurate estimate.

13 But, in Zhang's defense, it's not trying to do
14 that. It's trying to simply give you a point on the
15 screen so that you can access your television. And in
16 that case, you just need the roll -- I'm sorry, the
17 pitch and the yaw.

18 Q So, Zhang senses pitch and yaw --

19 A Yes.

20 Q -- as you say.

21 A Um-hum.

22 Q And if I have something that's shaped like
23 Zhang's remote and I change both the pitch and the yaw,
24 parts of that remote are going to move in all three
25 spatial dimensions; right? They're going to change

1 DR. JOSEPH LAVIOLA

2 their X, Y, and Z coordinates?

3 A Um-hum. Yeah. That's correct.

4 Q Could you turn to paragraph 88 of your
5 declaration in the 1257 case?

6 A Um-hum.

7 Q And this is -- this corresponds to paragraph
8 82 in the 1258 case.

9 A Okay.

10 Q And there, you're discussing the person with
11 ordinary skill would have to redesign and re-fabricate
12 Zhang's PCB; right?

13 A Um-hum.

14 Q What is Zhang's PCB?

15 A If you look at figure three in Zhang's patent,
16 you can kind of see what his PCB's going to look like.
17 One hundred, with the elements 160, 170, 110, 120, 130,
18 140.

19 Q And you said you can kind of see what it's
20 going to look like. This clearly isn't a production
21 schematic or anything like that; right?

22 A Yes. That's right.

23 Q It's just a cartoon, basically.

24 Is that right? Or is this intended to be --

25 A No. This is not intended to be a

1 DR. JOSEPH LAVIOLA

2 specification for a circuit board. It tends to be a,
3 you know, a representation to illustrate the concept.

4 Q It kind of looks like figure three of the '438
5 patent, doesn't it?

6 A It has a resemblance. Actually, if you look
7 at figure five, that would be more in line with what you
8 would see for the circuit board or PCB for the -- for
9 Zhang's device.

10 Q Figure five is sort of a functional block
11 diagram; right?

12 A Um-hum.

13 Q Shows how the other one's connected?

14 A Yes.

15 Q Is figure five intended to be a circuit board
16 layout?

17 A That's closer to a circuit board layout than
18 figure three.

19 Q I'm going to hand you a copy of Exhibit 1006
20 in both proceedings.

21 (Exhibit 1006 was marked.)

22 THE WITNESS: Um-hum.

23 BY MR. SMITH:

24 Q And what is Exhibit 1006, Dr. LaViola?

25 A It's a 3D pointing device with orientation

1 DR. JOSEPH LAVIOLA

2 compensation and improved usability.

3 Q Is it US patent number 7,158,118 to Liberty?

4 A Yes.

5 Q And you recognize this, of course?

6 A Yes.

7 Q Do you have any hesitation calling this a 3D
8 pointing device, according to your construction?

9 A Liberty can be considered a 3D pointing device
10 with limitations.

11 Q Limitations being it's less accurate? Or what
12 do you mean?

13 A Well, the first thing is that it only has a
14 five-axis sensor module which means the pointing device
15 can detect its orientation in all three dimensions. But
16 it's not going to do it very accurately for roll because
17 that value has to be derived from gravitational
18 acceleration from the accelerometer. In order to get
19 pure gravitational acceleration from an accelerometer,
20 the device has to be moving. It has to be stationary.

21 So, if it moves, you no longer are going to
22 get a good representation of that information because of
23 the fact that the accelerometer is going to be detecting
24 axial and centrifugal accelerations in addition to
25 gravity.

1 DR. JOSEPH LAVIOLA

2 Q I have the same question with respect to
3 Liberty that I had to Zhang. What is Liberty's PCB?

4 A Liberty's PCB can probably be best described
5 as figure five. And it's loosely, it's described as a
6 process -- it shows you the components that are
7 required.

8 Q And the data connections between them?

9 A Yes.

10 Q If you looked at the Liberty device, assuming
11 you could get one --

12 A Um-hum.

13 Q -- and you opened it up, would you expect to
14 find components in this spatial arrangement as shown in
15 figure five on the board?

16 A You would find components -- probably what you
17 would end up finding is a circuit board and then
18 something that looks like figure four inside. You've
19 got the three sensors that make up the five-axis sensor
20 module inside the device.

21 The circuit board would -- may have a
22 reasonable correspondence to the elements in figure five
23 but doesn't necessarily have to.

24 Q There could be a lot of ways to place these
25 component; right?

1 DR. JOSEPH LAVIOLA

2 A Yes.

3 Q In your declaration -- this is only in the
4 '978 case -- in paragraph 105, which is on page 50, the
5 second part of that paragraph is on page 50.

6 A Okay.

7 Q Going down about nine -- or eight lines --

8 A Um-hum.

9 Q At the end of the eighth line, there's a
10 sentence that begins [as read]: Second, Liberty's PCB
11 would essentially have to be re-fabricated in order to
12 have a combined PCB which would be -- which would have
13 been beyond a PHOSITA's capabilities.

14 What do you mean there by re-fabricated? I
15 mean, what are you assuming is the original fabrication
16 here?

17 A I made the assumption that there isn't a
18 circuit board in that device.

19 All right. And that device is going to be
20 oriented -- the components of the device can be oriented
21 a certain way. And if I was to try to combine or try to
22 integrate Bachmann into Liberty, I wouldn't be able to
23 easily do that because the process control board and
24 associated sensors in Liberty are going to be designed
25 for the specific case of what Liberty is trying to do.

1 DR. JOSEPH LAVIOLA

2 So, what would have to be done is you would
3 have to start from scratch, which would require some
4 significant amount of redesign to create a new circuit
5 board that supported the MARG sensors and the
6 appropriate software on the board to give you an
7 effective combination of Liberty and Bachmann. And I
8 don't believe that a PHOSITA would be able to do that at
9 the time of the invention.

10 Q Could you go back to the Bachmann patent for a
11 minute?

12 A Yeah.

13 Q This is, again, Exhibit 1004 in both
14 proceedings.

15 A Yeah.

16 Q And turn to column 14.

17 A Um-hum.

18 Q Do you see the description from lines 37 to
19 49, beginning with "one example of a suitable sensor is
20 an analog MARG sensor"?

21 A Yes.

22 Q What is that describing?

23 A What are those lines describing?

24 Q Yeah.

25 A They're describing an example of an actual

1 DR. JOSEPH LAVIOLA

2 sensor or set of sensors that could be used as part of
3 your sensing device here.

4 Q And starting at about line 42, it describes
5 the actual sensors; right?

6 A Yeah. Model number CXL043, three-axis
7 magnetometer, model, blah, blah, blah, and so on and so
8 forth.

9 Q So, there's a triaxial accelerometer, a
10 three-axis magnetometer, and three miniature angular
11 rate detectors --

12 A Um-hum.

13 Q -- mounted in orthogonal configuration; right?

14 A Yes.

15 Q Okay. And then in the next sentence says [as
16 read]: The individual components can be integrated
17 using a single integrated circuit board with the
18 accelerometers mounted separately.

19 A Um-hum.

20 Q And the individual components here refer to
21 the sensors it was just talking about?

22 A The individual components, yeah, would be the
23 sensors and any other pieces that you would need for
24 communication and processing.

25 Q And those can be integrated using a single

1 DR. JOSEPH LAVIOLA

2 integrated circuit board?

3 A That's what it says.

4 Q And when it says with the accelerometers
5 mounted separately, does that mean mounted separately on
6 the same board or off the board or can't you tell?

7 A I think that it's a fairly ambiguous sentence.
8 I'm not 100 percent clear if they mean on a separate
9 board or mounted separately on the circuit board at some
10 distance from the other sensors.

11 Either way, it's telling you that you can --
12 that you're -- that you can put the accelerometers
13 separate, which is in direct contrast to the '438 and
14 '978 patents.

15 Q So, this sentence could mean mounted on a
16 separate circuit board or mounted separately on the same
17 circuit board?

18 A Could be.

19 Q When you prepared for your deposition, did you
20 review any of your deposition transcripts from the
21 litigations that you referred to earlier with Samsung
22 and Huawei?

23 A No, I did not.

24 Q In the Huawei deposition, do you remember
25 after the deposition submitting an errata form?

DR. JOSEPH LAVIOLA

A Yes.

Q And can you describe to me what an errata form is? Do you know?

A Yeah. It's a form that you use to go through a deposition's transcript and able to make corrections, factual errors, mistakes in spelling, things of that nature.

Q And when you did your errata form for the Huawei case, did you come up with the changes first? Or was that a list given to you by counsel?

A I came up with the changes, yeah.

Q All right. Pass the witness.

MR. KEY: Okay. I would like to take a break, then. And I'll take a look to organize it.

MR. SMITH: Sure. Let's take a break.

THE VIDEOGRAPHER: It's 2:59. We are going off the record.

(A brief recess is had from 2:59 p.m. to 3:30 p.m.)

THE VIDEOGRAPHER: It's 3:30. We are back on the record.

CROSS EXAMINATION

BY MR. KEY:

Q Dr. LaViola, I'm going to hand you what is

1 DR. JOSEPH LAVIOLA

2 Exhibit 1001. It's a copy of the '438 patent.

3 A Um-hum.

4 Q I believe you looked at this previously today.

5 A Yes.

6 Q Correct?

7 MR. SMITH: Is this the same copy, Cecil?

8 MR. KEY: It is.

9 MR. SMITH: Yeah.

10 MR. KEY: But if you would like to take a look
11 at it...

12 MR. SMITH: No.

13 BY MR. KEY:

14 Q And I want to direct your attention to figure
15 six of the '438.

16 A Yes.

17 Q Do you recall testifying about this figure a
18 few minutes ago?

19 A I do.

20 Q And I believe you indicated that figure six
21 shows components of the 3D pointing device of the '438
22 patent; is that correct?

23 A Yes.

24 Q Are those components mounted to a PCB?

25 A The components marked 622, 646, 648, 642, and

1 DR. JOSEPH LAVIOLA

2 644 are mounted on to the PCB.

3 Q And according to figure six, these components
4 are mounted separately, are they not?

5 A They are.

6 Q Would you consider the components mounted
7 separately to the same PCB as six-axis motion sensor?

8 A I would.

9 Q Would you also consider it a nine-axis motion
10 sensor?

11 A I would.

12 Q I also want to -- I'll show you your, I
13 believe you called it your main declaration.

14 A Um-hum.

15 Q 2004 from the '978. Make sure I've got the
16 right one.

17 All right. Take a look at this. Now, do you
18 recall some testimony earlier regarding what constitutes
19 a handheld device?

20 A Yes, I do.

21 Q Have you ever provided any other testimony
22 regarding what constitutes a handheld device other than
23 in this matter?

24 A I believe I may have.

25 Q All right. Let me -- let me direct your

1 DR. JOSEPH LAVIOLA

2 attention to paragraph 52.

3 A Fifty-two. Okay. Yes.

4 Q Bear with me while I get there. Now, in
5 paragraph 52, it indicates that the court in the case of
6 CyWee Group versus Motorola Mobility in the District of
7 Delaware held that the 3D pointing device means a
8 handheld device that detects the motion of said device
9 in three dimensions and is capable of translating the
10 detected motions to control an output on a display.

11 Do you see that?

12 A Yes.

13 Q Did you participate in any way in the claim
14 construction process in that case?

15 A I did.

16 Q Did you offer up a construction of 3D pointing
17 device in that case?

18 A I did.

19 Q Was it the construction that the court
20 adopted?

21 A It was.

22 Q As far as you understand, was the court
23 construing the claims according to the understanding of
24 one of ordinary skill at the time of the invention of
25 the patents at issue?

1 DR. JOSEPH LAVIOLA

2 MR. SMITH: Objection.

3 THE WITNESS: I believe so.

4 BY MR. KEY:

5 Q Okay. I believe there was also some testimony
6 earlier that you gave about whether or not I believe a
7 translational motion would be excluded from this -- the
8 definition that you offered for 3D pointing device. Do
9 you recall that?

10 A Yes.

11 Q What does translational motion mean?

12 A Translational motion is basically motion in
13 regards to positional movement in any of the three
14 axes -- three dimensions, X, Y, and Z. So it's -- for
15 example, positional movement would be if I move from a
16 position point A marked zero to a position B marked five
17 where zero is zero inches and five is five inches. So I
18 would have moved five inches in position along with that
19 axis.

20 Q And what is the distinction between
21 translational motion and orientation?

22 A Well, it turns out that you can get
23 translational motion from orientation. If you look at,
24 for example, a 3D pointing device, and you rotate it
25 about the yaw, then the projection of that point will

1 DR. JOSEPH LAVIOLA

2 actually be -- move along a line on the display screen
3 which, indeed, is a translational movement. So that's a
4 relationship between rotating objects and projecting or
5 translating the output as a translational component as
6 well.

7 Q Does a 3D pointing device require the ability
8 to measure orientation?

9 A Does it require the ability to measure it?
10 Yes, it requires through the orientation. I'm sorry,
11 yes, it requires through the orientation.

12 Q I'm sorry. If the 3D pointing device measures
13 orientation and also translational motion, would it
14 still be a 3D pointing device?

15 A Yes.

16 Q I would like to point you to the '438 patent.
17 I think you have it in front of you.

18 A Um-hum.

19 Q Look at specifically column six, starting
20 around line 27, I believe.

21 A Column six.

22 Q And please take your time to read that to
23 about -- about to line 42, I believe it is.

24 A Okay.

25 Q Does that passage describe what you were just

1 DR. JOSEPH LAVIOLA

2 generally testifying to about the translational motion
3 in orientation?

4 A Yes.

5 Q I want to -- I'll show you what's been marked
6 as Exhibit 1004. It's the Bachmann reference.

7 A Um-hum.

8 Q I believe you gave some testimony about the
9 Bachmann reference. Do you recall that?

10 A Yes.

11 Q And specifically, I believe you testify -- you
12 were asked questions about the technical field of
13 Bachmann.

14 A Yes.

15 Q I believe the questions you were asked focused
16 on the first sentence of the technical field.

17 A Um-hum.

18 Q Correct?

19 Can you read the sentence that follows that?

20 A [As read]: More particularly, the invention
21 relates to methods and apparatus for tracking the
22 posture of an articulated rigid body.

23 Q All right. Is that the same articulation of a
24 rigid body that you mentioned in your report?

25 A Yes.

DR. JOSEPH LAVIOLA

Q And you were also asked some questions about whether or not you know whether Bachmann was cited in references directed to pointing devices. Do you recall those questions?

A Yes.

Q Now, did counsel show you any references here today citing Bachmann that he represented as being a pointing device?

A No.

Q So, as far as you know, sitting here today, there are no such references; correct?

A Yes.

MR. SMITH: Objection, leading.

MR. KEY: No further questions at the moment.

MR. SMITH: No questions. We're adjourned.

THE WITNESS: Okay.

THE VIDEOGRAPHER: This will conclude the deposition of Joseph LaViola, Ph.D. It is 3:40. We are going off the record.

(The reading and signing of the deposition is not waived.)

(At 3:40 p.m. the deposition was concluded.)

Dr. Joseph LaViola

CERTIFICATE OF OATH

STATE OF FLORIDA)

COUNTY OF ORANGE)

I, the undersigned authority, certify that DR.
JOSEPH LAVIOLA personally appeared before me and was
duly sworn.

WITNESS my hand and official seal this 30th day of
May, 2019.



DAWN A. HILLIER, RMR, CRR, CLR

Notary Public - State of Florida

My Commission No.: GG 259309

Expires: 12-15-2022

CERTIFICATE

STATE OF FLORIDA)

COUNTY OF ORANGE)

I, DAWN A. HILLIER, RMR, CRR, CLR certify that I was authorized to and did stenographically report the deposition of DR. JOSEPH LAVIOLA; that a review of the transcript was requested; and that the transcript is a true and complete record of my stenographic notes.

I further certify that I am not a relative, employee, attorney, or counsel of any of the parties, nor am I a relative or employee of any of the parties' attorney or counsel connected with the action, nor am I financially interested in the action.

DATED this 30th day of May, 2019.



DAWN A. HILLIER, RMR, CRR, CLR

ERRATA SHEET

Case Name:

Deposition Date:

Deponent:

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Signature of Deponent

SUBSCRIBED AND SWORN BEFORE ME

THIS _____ DAY OF _____, 2019.

(Notary Public) MY COMMISSION EXPIRES: _____