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Transcript of Andrew Wolfe, Ph.D.

Date: August 28, 2025
Case: Shenzhen Tuozhu Technology Co., Ltd. -v- Stratasys, Inc. (PTAB)

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WORLDWIDE COURT REPORTING & LITIGATION TECHNOLOGY

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

SHENZHEN TUOZHU TECHNOLOGY CO., LTD., Petitioner, v. STRATASYS, INC., Patent Owner.

Case No. IPR2025-00311
U.S. Patent No. 8,562,324

Deposition of ANDREW WOLFE, Ph.D.
Conducted Virtually
Thursday, August 28, 2025
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Pages 1 - 118
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Deposition of ANDREW WOLFE, Ph.D., conducted virtually.

Pursuant to notice, before Debra Ann Whitehead, E-Notary Public in and for the Commonwealth of Virginia.

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C O N T E N T S

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EXHIBITS MARKED IN TODAY'S SESSION
(None marked)

EXHIBITS MARKED IN PRIOR SESSIONS
(Not attached)

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PROCEEDINGS

ANDREW WOLFE, Ph.D.,

having been duly sworn, testified as follows:

EXAMINATION BY COUNSEL FOR PATENT OWNER

BY MR. KAPADIA:

Q Dr. Wolfe, can you please state your full name.

A Andrew Wolfe.

Q Thank you. Dr. Wolfe, we're conducting a remote deposition today. And since you and I are not in the same room, I'm going to ask you a few questions about your environment.

Do you have any materials, whether written or electronic, with you today?

A Yes.

Q And what materials do you have with you?

A I have printed copies of some of the exhibits from this matter, and then I'm on my ordinary computer. I don't have any documents open, but there are millions of documents actually on the computer.

Q And other than the paper copies that you

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mentioned, do you intend to open any of the electronic documents on your computer?

A No, not unless you ask me to.

Q If you have any materials that you may want to open, whether written or electronic, that are accessible to you, just let us know so that we can keep the record clean as to what you're looking at, and, you know, whether it's the same as exhibits in the proceeding. Okay?

A Sure.

Q Do you have any access to any chat or messaging applications, besides this particular Zoom application that we're using?

A Nothing active, no.

Q Will you let us know if you receive any chats or messages during this deposition outside of Zoom?

A I will. But that's not going to happen.

Q Do you have any access to email applications?

A Again, it's on my computer, but it's not running.

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Q And will you let us know if you do receive any emails during the deposition?

A I'm not going to check my emails during the deposition.

Q Is there anyone else in the room with you today?

A No.

Q Will you let us know if anyone enters the room?

A Yes.

Q Dr. Wolfe, you have been deposed before. Right?

A Yes.

Q Approximately how many times?

A More than a hundred.

Q If you need a break at any point -- I think you know the drill -- just let us know, we'll take a break. All I ask is that you finish responding to the pending question before we take the break.

Does that make sense?

A Sure.

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Q Is there any reason why you can't testify truthfully today to the best of your ability?

A No.

Q Dr. Wolfe, you're here today because you offered a declaration in support of a petition for inter partes review, IPR2025-00311.

Is that right?

A I don't have the IPR number in front of me, but I did offer one with respect to U.S. Patent 8,562,324, and I've just looked at the patent.

Q And in the inter partes review that you just mentioned, or for the patent that you just mentioned, is the petitioner Zhenzhen Touzhu Technology Company Limited?

A I believe so.

MR. KAPADIA: I am uploading to the chat Exhibit 1003. As filed in the IPR.

(Exhibit 1003, previously marked, not attached.)

Q Let me know when you've received it and opened it.

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A Okay, I have. I have a paper copy of that as well.
Q Is Exhibit 1003 a copy of your declaration in this IPR?
A It appears to be. I mean, I can't check every word while we're sitting here, but yes.
Q Was anyone, besides yourself of course, involved in creating this declaration?
A Yes.
Q Who else was involved?
A After I had initially prepared my opinions, the counsel for -- for Bambu was involved in editing back and forth to tune the language.
Q Besides counsel, did anyone else contribute to the work or analysis for your opinions in this declaration?
A I'm just trying to understand how broad the question is.
I didn't interact with anyone else other than counsel, but there are quotes in the declaration from many different inventors.

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Q Let's stay on Page 1 of your declaration.
Do you see the page number at the bottom of the page?
A Yes.
Q Throughout today when referring to page numbers in an exhibit, I am going to refer to the page number that appears at the bottom of the page in the center.
Does that make sense?
A That's fine.
Q Dr. Wolfe, how much were you paid for this declaration?
A I bill hourly at $750 an hour. I don't know how many hours.
Q And you don't know how many hours you spent in preparing this declaration.
Is that correct?
A Yeah, I don't recall.
Q Are you working for the petitioner on any other matters?
A There is related litigation that I'm working on as well.

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Q Are you working for Bambu Lab Limited on other matters?
A Yes.
Q Are you working for Shanghai Lunkuo Technology Company Limited on other matters?
A I don't understand the relationship between those parties, so I would have to go look at the actual retention letter. But whoever the parties are to the district court litigation.
Q Besides the parties to the district court litigation, are you working for any companies related to petitioner on other matters?
A Matters other than this, than related to this particular litigation?
Q Yes.
A Not currently, no.
Q Dr. Wolfe, I'd like to discuss your background a little bit.
A Okay.
Q What industry experience do you have in relation to 3D printing?
A I'm sorry, what's the question?

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Q What industry experience do you have in relation to 3D printing?
A So my expertise is in embedded computing and automation, so I've done a lot of academic work related to the core technologies.
I started working in additive manufacturing in early to mid '80s and through at least the -- most of the '90s, where I designed products to be built with additive manufacturing, machinery, helped set up a factory. So those were specialized machines that would perform additive manufacturing and also subtractive manufacturing tasks.
And then when 3D printers became commercially viable, I started to read about them, eventually started to use them somewhere around the beginning of the 2010s, integrated them into my teaching at Santa Clara University starting in 2014, and have been teaching students to use them ever since then.
I have also done litigation consulting for other 3D printer manufacturers.

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Q I think in your declaration you mentioned that you work with two undergraduate teams, design and construct the material extruders for the 3D printing.
Is that right?
A Yes.
Q Was this in relation to your teaching at Santa Clara University?
A Yes.
Q And how many people were on each team, approximately?
A Somewhere around four. Now, again, I have taught hundreds of students how to use commercial 3D printers and used them myself for many, many years, more than ten years. But in terms of actually building one, those were the times that we actually built them.
Q So you built a 3D printer around -- with those students?
A Yes. I mean, not one that uses plastic, because those are commercially available. But in a research environment using other materials.

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Q And what materials did you use in that environment?
A The first one actually I think used frosting, and it would print decorations out of frosting. And the second one used clay, and it would print pottery out of clay.
Q Do you have any experience academically in material deposition with plastic?
A Teaching it, but not building it. I mean, you know, it's a -- it's an ordinary commercial product today, so we don't build them at the university. We buy them. We've been buying them for years, certainly since I started at Santa Clara in 2013. And I teach students to use them.
Q In your declaration I think you mentioned earlier that you expressed opinions regarding U.S. Patent Number 8,562,324. Right?
A Yes.
MR. KAPADIA: I'm going to upload to the chat Exhibit 1001.
(Exhibit 1001, previously marked, not attached.)

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Q Let me know when you receive it and have opened it.
A Okay, I have opened it. And I have a paper copy with me as well.
Q Do you recognize Exhibit 1001 as U.S. Patent Number 8,562,324?
A It does appear to be that, yes.
Q You'll understand if I refer to "the '324 patent" today that I'm talking about this patent shown in Exhibit 1001?
A Yes.
Q Let's switch back to your declaration.
If you could, please, turn to Page 14.
A Okay.
Q In your declaration don't you express opinions involving U.S. Patent Number 6,580,959 to Mazumder?
A That is one of the prior art references that I have opined on, yes.
MR. KAPADIA: I'm going to drop Exhibit 1004 into the chat.

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(Exhibit 1004, previously marked, not attached.)
Q Let me know when you've received and opened it.
A Okay, I have that. And I have a paper copy as well.
Q Excellent.
Do you recognize Exhibit 1004 as U.S. Patent Number 6,580,959 to Mazumder?
A It appears to be.
Q And you'll understand, if I refer to "Mazumder" today, that I'm talking about this document here shown as Exhibit 1004?
A Yes.
Q Doesn't Mazumder disclose a local computer that communicates with a remote computer?
A Among other things, it does.
Q And doesn't Mazumder's local computer receive instructions from the remote computer for controlling the deposition process?
A Well, it has its own instructions, but it also receives commands or instructions from the

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remote computer under some circumstances. That's one of the things it's actually even claimed in the -- in the '324 patent.

Q Would a person of ordinary skill in the art have understood that those instructions in Mazumder represent a three-dimensional model of the object to be fabricated?

A I don't know what you mean by "those instructions."

Q Would a person of ordinary skill in the art have understood that the instructions received from the remote computer at the local computer represent a three-dimensional model of the object to be fabricated?

A Not necessarily all of the instructions.

Q Which instructions would a person of ordinary skill in the art have understood to represent a three-dimensional model of an object to be fabricated?

A Let me look at what I identified in my declaration.

Mazumder describes generating having a

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CAD file that defines the geometry of the product to be manufactured. I talk about that in Paragraph 99 and also in Paragraph 100 and also 101.

Q Besides the CAD file that defines the geometry of the product to be manufactured, are there any instructions that a person of ordinary skill in the art would have understood to represent a three-dimensional model of an object to be fabricated?

A I don't know. I'd have to look at the particular circumstances.

Q So you haven't analyzed Mazumder to determine whether anything besides the CAD file defines -- strike that.

You haven't analyzed anything in Mazumder to determine whether anything besides the CAD file would have been understood by a person of ordinary skill in the art to represent a three-dimensional model of an object to be fabricated?

A Not at this time, because the disclosure of the CAD file is clear.

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Q Did you analyze whether a CAM file of the product description that's received at the local computer is a three-dimensional model?

A No. I would have needed a more specific claim construction I think to do that. And again, that was just not necessary, because Mazumder discloses sending the CAD file itself, which is clearly a 3D model, to the local computer.

Q I want to direct your attention to the last sentence on Page 71 of your declaration. It starts with, "In this example."

A Yes.

Q And you state there -- this is on Page 71, continuing on Page 72 -- "In this example, a POSITA would have recognized that 'the CAM file of the product description' that is received at the local computer is a three-dimensional model."

What did you mean by that?

A So again, in my overall opinions I looked at the claim scope primarily as plain meaning, but with the assumption that at least what's been alleged to infringe is present in the prior art.

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And my understanding from looking at the infringement allegations is that Stratasys has alleged that a CAM file is also a 3D model. So I wanted to explain that that was also disclosed in the prior art.

Q In Paragraph 100 of your declaration, do you refer to any infringement allegations?

A Not in this particular paragraph, no.

Q In any of the paragraphs adjacent to Paragraph 100, do you mention or refer to any infringement allegations?

A I don't think they're in those particular paragraphs. I do discuss them as one of the things that I relied on.

Q Is there any paragraph in your declaration that discusses or refers to infringement allegations with respect to whether a CAM file is also a 3D model?

A I don't think specifically, no. But that would be the basis for the claim scope being that wide.

Q Can you explain in your own words,

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Dr. Wolfe, what is a 3D -- or a three-dimensional model?

A I want to be really careful here because I -- I don't want to reveal the discussions I've had with counsel with respect to claim construction in the district court case because those have not been finalized.

I was asked to apply plain meaning for this declaration, and -- and also to consider the scope of the infringement allegations.

I think that the appropriate plain meaning of a three-dimensional model is a data structure that describes the geometry of something.

Q Did the inventors of the '324 patent define three-dimensional model?

A In some way other than plain meaning? Not that I can recall. But I can look, if you'd like.

Q Well, let's start with the following: Did the inventors of the '324 patent define three-dimensional model in the specification?

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A Again, not that I recall, but I would have to look to be sure.

Q Why don't we turn to Exhibit 1001.

A Okay.

Q Are there any portions of the specification in Exhibit 1001 that you had previously analyzed with respect to the meaning of three-dimensional model?

A Well, I read the entirety of the specification and the claims.

Q In reading the entirety of the specification and the claims, did you identify any portions of the specification in Exhibit 1001 that defined three-dimensional model?

A Not that I can recall. Again, for purposes of this proceeding, a plain and ordinary meaning should be adequate.

Q Is it your opinion that the term "three-dimensional model" as used in the claims of the '324 patent should have a plain and ordinary meaning?

A Claim construction is a matter of law, so I can only tell you what I think a person of ordinary skill would think.

It's clear that what's in the prior art is a three-dimensional model, so I didn't need to get into a whole bunch of detail. And I will note that I don't think in their POPR the patent owners have requested any different construction.

Again, you know, with respect to what we talked about before, you know, I noticed in Column 11 there -- there's a distinction between the three-dimensional model and the tool instructions. So I do think that the plain and ordinary meaning is narrower than the -- than something that would include the tool instructions.

And I don't recall any definition or any usage other than plain and ordinary meaning in the specification. If there's a particular part of the specification you'd like me to review again, I'm happy to do that.

Q Earlier you had mentioned Column 11. Where in Column 11 were you pointing to?

A Lines 24 and 25.

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Q You mentioned that there is a distinction in your opinion between three-dimensional model and tool instructions on Lines 24 and 25 of Column 11?

A I think the ordinary reading of that would be that those are two different things.

Q Is the meaning that you ascribe to three-dimensional model consistent with Lines 24 and 25 of Column 11 different than plain meaning of three-dimensional model?

A No; I think it's consistent with the plain meaning of three-dimensional model.

Q Did the inventors of the '324 patent disclaim anything from the scope of three-dimensional model in the specification?

A Again, that's kind of a legal judgment. As I understand it, I don't think they've -- they've disclaimed anything; but they did differentiate it from tool instructions, which, as I said, would be the ordinary definition.

Q And did the inventors of the '324 patent disclaim anything from the three-dimensional model

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in the file history?
A Not that I can recall, but I'd have to go back and look.
Q Earlier you mentioned that a three-dimensional model relates to a data structure.
Does a three-dimensional model that's described in the '324 patent have to be a data structure?
A That's the ordinary meaning, and that's what I found in the prior art. So for purposes of this proceeding I didn't have to investigate any further.
Q And where in the specification in the '324 patent does it say that a three-dimensional model has to be a -- or has to have a data structure?
A Well, that's the ordinary meaning.
Q Is it your opinion that the specification of the '324 patent does not say that a three-dimensional model has to have a data structure?

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A I don't recall, but it's consistent with that. And that is the ordinary meaning. The '324 patent in general doesn't describe every -- or doesn't define every term that it uses in an ordinary way.
Q What would a person of ordinary skill in the art have understood a data structure to be at the time of the '324 patent?
A An organized collection of data.
Q Would the organized collection of data have to be in electronic form?
A Within this art we would usually use the word "data structure" to refer to something that's in electronic form.
Again, I didn't have to do that kind of nuanced claim construction to render my opinions. But, you know, a stack of papers is not something that in this context I would normally call a data structure.
And we have to be very careful to always consider context in this patent when we talk about models, because in this art the physical object

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that's being constructed is sometimes called a model as well, and that's not what we're talking about here.
Q And why is it that we're not talking about that here?
A Just based on the context. Right? In other words, you don't -- you don't operate the printer based on the physical three-dimensional object that's being constructed. It's not the basis of -- of operations.
You have to -- you have to look at the word "model" in this art and in all these references in context to understand whether or not they're talking about a physical object, like a -- like a model truck or a model plane, or a mathematical model, which is what would be contained in the data structures.
Q Would a three-dimensional model have to be a mathematical model?
A Again, it depends on context. But in the cases where -- where the context is the same as what's in the claim -- the claims, it would be a

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mathematical model. It would be a mathematical model that's being described in a data structure.
Q And how would someone of skill in the art create a three-dimensional model?
A It would be done in various ways. But the most common way is to use computer-aided design software.
Q Would they always use a data structure to create that three-dimensional model?
A You don't use the data structure to create it; you use it to represent it. So typically I would, for example, draw a cube in a CAD software program, and the CAD software program would then convert that into a three-dimensional mathematical model.
Q And when the CAD software program converts, for example, a cube in your example, and converts it into a three-dimensional mathematical model, would a person of ordinary skill in the art have understood the output from the CAD program to be the three-dimensional model?
A CAD programs can output in various ways,

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but that is typically one of the ways in which a CAD program can output -- can output some type of a representation of the three-dimensional model, a representation of the data structure.

Q Earlier you mentioned that you don't operate the printer based on the physical three-dimensional object that's being instructed, as in it's not the basis of operations.

With respect to the mathematical three-dimensional model, what is the basis of operations for a three-dimensional printer?

A They work in a variety of ways. But what's typical is that at some point a processor somewhere will convert the three-dimensional model into a tool path. And then the tool path is then used to operate the tool, and the three-dimensional printer essentially is the tool. Depending on what the technology is, sometimes that's called a slicer, that conversion.

Q If that's the typical way in which the basis of operations for the three-dimensional printer operates, what are some other ways in

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which the three-dimensional printer operates?

A I'm not really prepared to testify on that right now. Again, I didn't have to find every possible way in which one could operate a 3D printer in order to opine on obviousness in this case. I just had to find the ones that were disclosed in the art.

Q Is it your opinion that "three-dimensional model" has a meaning consistent with the typical way that you just described?

A Yes.

Now, again, depending on the particular system, some systems do send the three-dimensional model to a printer; some systems don't. But systems that I've identified in the prior art either do send a three-dimensional model or make it obvious to do so.

Q Have you analyzed whether a person of ordinary skill in the art would have understood "three-dimensional model" to have a meaning consistent with other ways in which the three-dimensional printer operates, besides the

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typical way that you just described?

A I haven't done that analysis. Again, this is a field where there's quite a bit of creativity. There may be many, many different ways in which 3D printers operate, some of which I might -- I'm probably familiar with, and many of which I'm probably not familiar with.

Q Okay. If you could please turn to Page 171 of your declaration, and in particular Paragraph 227. Let me know when you're there.

A Okay.

Q Do you see the last sentence on Page 171, starting with, "As shown in Figure 8 of Henke"?

A Yes.

Q If you turn to the next page, 172, do you see Figure 8?

A I do.

Q Doesn't Henke show a user interface?

A The question is, does Henke show a user interface?

Q Yes.

A Henke does show a user interface, yes.

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Q Does that user interface have a video image of the actual automated process?

A It does.

Q And does that user interface have a model of the process?

A Yes.

Q If you turn to Paragraph 229 of your declaration on Page 175, do you annotate Figure 8 of Henke?

A Yes.

Q Does the lower of the two annotations state, "Virtual images of automated process based on model"?

A Yes.

Q You're referring to the model shown in the user interface. Right?

A No. The virtual image is shown in the user interface. The model is some underlying data structure.

Q And what is the model in that underlying data structure?

A I don't know the details of it, but again

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I'm not suggesting that we would employ Henke's model in a combination. It would be the display of the image related to the model, that concept that would be brought into the Kritchman-Tay combination, and the Kritchman-Tay combination, the model is a 3D model.

Q How do you know that the virtual images in Figure 8 are of the model or based on the model?

A Because there's a -- if you read Henke, there's an underlying simulation that's going on, and a simulation is a mathematical model. And -- in this context.

And it describes that visualization as being a visualization of that simulation.

Q Is the simulation the model that you're referring to?

A In Henke itself, the simulation is the model. But in the combination, the model is the 3D model that would be underlying the construction in the Kritchman-Tay combination. I show that on Page 171.

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Q Does the upper of the two annotations on Page 175 of your declaration state, "Actual images of device performing automated process"?

A Yes.

Q And with that annotation are you referring to the device that the upper annotation is pointing to?

A Well, it's pointing to the video image of the device.

Q Is the automated process a water level control?

A In Henke itself, it is.

Q And is that process a model?

A The physical process? Again, "model" can be used in different contexts, but it's not a -- it's not a mathematical model. It's a -- it's a physical device.

Q Is the video image on the top of the figure a two-dimensional image or a three-dimensional image?

A The image is a two-dimensional image of a three-dimensional physical object, an ordinary

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video camera image.

Q And what is the three-dimensional physical object?

A It is a water-pumping apparatus in -- on Page 175.

Q Is the image on the top of the figure a three-dimensional computerized model?

A No. There may be a corresponding three-dimensional computerized model, but it's not something I discussed.

Q Is the virtual image at the bottom of the figure derived from a computerized model?

A Yes, it is -- the virtual image on the bottom of the Figure 8 on Page 175 is derived from a computerized model, although not from a computerized 3D model. The computerized 3D model would come from Kritchman and Tay.

Q Would a person of ordinary skill have understood that in the Kritchman-Tay-Henke combination Henke teaches a two-dimensional projection of a three-dimensional model?

A I didn't even consider that. Kritchman

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and Tay teach that. Henke teaches putting them side-by-side on the screen.

Q What does Henke teach putting side-by-side on the screen?

A An image, a video image of a device and a virtual image based on a model from the same perspective.

Q Can you explain in your own words what is a two-dimensional projection of a three-dimensional model?

A Here's my problem. We have a claim construction briefing coming up in another case very soon, and I am still in discussions about what positions this party is going to take.

For the purposes of this proceeding, it's plain and ordinary meaning of those words.

Q Is your testimony today that a person of ordinary skill in the art would understand "two-dimensional projection of a three-dimensional model" to have a plain and ordinary meaning?

A I believe so.

Q And what is the plain meaning of

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"two-dimensional projection of a three-dimensional model" to someone of ordinary skill in the art?

A With respect to the '324 patent?

Q Yes.

A Again, that's a legal question as to what the proper claim construction is. It's a little bit complicated here.

I think that the plain and ordinary meaning is that it would be a two-dimensional representation that is derived from the three-dimensional model. But the patent, both in its specification and in its claims, says that it can also be the claimed video image from the video camera. That's also what's been accused in the district court case.

So, again, it's a matter of law, but it certainly could be broad enough to include those things as well.

Q So in your view, did the inventor of the '324 patent define the term "two-dimensional projection of the three-dimensional model"?

A No. But they did give us teachings in

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the specification and in the claims that would indicate that for purposes of this patent the inventors seem to believe that it was broader than the plain and ordinary meaning.

Q Did the applicant of the '324 patent define the term two-dimensional model of the three-dimensional -- strike that.

Did the applicant of the '324 patent define the term "two-dimensional projection of the three-dimensional model" in the file history?

A I don't recall.

Q What does the term "derived from" mean in the context of a two-dimensional representation that is derived from the three-dimensional model?

A It's the ordinary meanings of those words, one was used to produce the other.

Q In what manner would a person of ordinary skill in the art have understood the three-dimensional model to have been used to produce a two-dimensional representation?

A Well, the word is "projection." I mean, that's a mathematical term for converting

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something in a higher number of dimensions to a lower number of dimensions.

Q Would a person of ordinary skill in the art have understood that the three-dimensional model would have been converted from three dimensions into two dimensions to produce a two-dimensional representation?

A Through a means of a projection, because that's literally what it says in the claim.

Q Are there other ways in which you can convert a three-dimensional model into two dimensions, a two-dimensional dimension -- strike that.

Are there other ways in which you can convert a three-dimensional model with three dimensions into two dimensions without using a projection?

A I don't know, because that's not what it says in the claims, so I didn't consider that.

Q Did the inventors of the '324 patent disclaim anything about the scope of the two-dimensional projection of the

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three-dimensional model?

A Not that I can recall. But again, that wasn't something I had to determine for this proceeding.

Q Have you reviewed the specification of the '324 patent to determine whether the inventors disclaimed anything about the scope of two-dimensional projection of the three-dimensional model?

A Not for that specific purpose. Again, wasn't necessary for this proceeding. But I have read it. I don't recall seeing that.

Q Have you reviewed the file history of the '324 patent to determine whether the applicants disclaimed anything about the scope of two-dimensional projection of the three-dimensional model?

A I reviewed it. I don't recall anything like that being there, but it could be. It simply wasn't an issue with respect to the art I considered in this proceeding.

Q Earlier you mentioned that a

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two-dimensional representation is derived from a three-dimensional model in the context of a two-dimensional projection.

Where is that understanding supported in the intrinsic record of the '324 patent?

A It's the ordinary meaning. If they didn't intend to use the ordinary meaning, then it would be indefinite.

Q Have you reviewed the specification of the '324 patent to determine whether it describes that ordinary meaning?

A It's consistent with that ordinary meaning, with the exception of the places where it says that it could be the video from the video camera. But again, I don't recall it defining the term.

Q And why is a video camera not a two-dimensional representation derived from a three-dimensional model?

A But that's not what the claim says. It says "the three-dimensional model." The three-dimensional model is the one that was sent

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to the printing device. So the camera can't -- showing you what's on the build platform is not a representation of the model that was sent to the printing device.

But again, in this patent it says that it can be, which is confusing, but ...

Q Why is the camera showing you what's on the build platform not a representation of the model that was sent to the device?

A Because it's not derived from the model. The device -- I mean, as -- you know, the whole purpose of putting a video on there is to figure out whether or not in fact the physical device, the physical object, was being built correctly or not correctly. It may not be a representation of the model.

Q Why is it not derived from the three-dimensional model?

A Why is the physical -- is the two-dimensional video not derived from the three-dimensional model?

Q Yes.

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A Among other things, it includes all kinds of extraneous stuff, and both the prior art and the patent itself teach that -- that 3D printing is -- is not highly reliable. And the whole point of -- of the claim is to allow one to distinguish differences between the two things.

If the two things are the same, then -- then the claim doesn't make any sense. But to the extent that we're talking about the question of obviousness, building something on a 3D platform from a 3D model and having a video of it is all over the prior art.

Q Earlier you mentioned that the two-dimensional video includes all kinds of extraneous stuff.

Is it your opinion that a person of ordinary skill in the art would understand a two-dimensional projection of a three-dimensional model to exclude those kinds of extraneous stuff?

A It depends what's in the model. It certainly wouldn't have things that are not in the model.

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Now, you may display more than the 2D projection, but -- but the video image wouldn't really be -- I mean, I guess a person could distinguish the physical object from the rest of the printer, but there's certainly no teachings in the '324 patent about how to do that.

Q Is it your opinion that the person of ordinary skill in the art would understand the plain meaning of two-dimensional projection of a three-dimensional model to exclude those kinds of extraneous stuff?

A Plain meaning of two-dimensional projection of a three-dimensional model is that it is of the model. Now, so the actual two-dimensional projection of a three-dimensional model would only include things that came from the model because that's what it's a projection of.

Q Would a person of ordinary skill in the art have understood that a two-dimensional projection of a three-dimensional model would not have been derived from anything except for the three-dimensional model?

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A I don't know. I didn't have to get into that level of detail, again, in order to render the opinions in this matter.

The claims, the claim language, including, you know, the dependent claims for Claim 1 in particular, seem to allow for just showing the same video image twice.

So, you know, I'm -- there is ambiguity that makes it difficult to determine the actual boundaries of the scope of these claims. But the art is describing essentially the exact same thing as is in the '324 patent. So it's clear that the detailed questions of the claim boundaries just aren't important to the question of obviousness.

Q In rendering your opinions in this declaration, did you consider whether a person of ordinary skill in the art would have understood a two-dimensional projection of a three-dimensional model to have been derived from anything except for the three-dimensional model?

A I didn't have to consider that.

Q Did you consider the meaning of derived

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from in rendering these opinions in this declaration?

A No; those are not claim words.

Q Did you only consider the words of the claim without considering what a person of ordinary skill in the art would have understood those words to mean?

A No.

Q Did you consider what a person of ordinary skill in the art would have understood the words "two-dimensional projection of a three-dimensional model" to mean?

A Yes; to the degree that I needed to to provide the opinions in this particular declaration.

Q Let's turn to Page 14 of your declaration.

A Okay.

Q In your declaration you express opinions involving U.S. Patent Publication Number 2010/0063615, to Mori.

Is that right?

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A I did.

Q I will drop it into the chat.

(Exhibit 1005, previously marked, not attached.)

MR. BISENIUS: Counsel, if we are moving on to another document, now might be a good time for a break since we're getting to around an hour, before we get into the next line of questioning.

MR. KAPADIA: Okay. Sounds good to me.

(A recess was taken.)

BY MR. KAPADIA:

Q Dr. Wolfe, welcome back.

Did you speak to anyone during your break?

A No.

Q Did you receive any other communications during your break?

A I didn't check any of my devices, so I don't know what I received.

Q Did you open any materials during your break?

A Did I what?

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Q Did you open any materials during your break?

A Nothing new. I looked back at the ones that we've discussed.

Q Which ones did you look back at?

A Exhibit 1001.

Q Just before the break I had dropped into the chat Exhibit 1005.

Did you receive that?

A I did. And I have a paper copy as well.

Q Do you recognize Exhibit 1005 as U.S. Patent Publication Number 2010/0063615 to Mori?

A It appears to be.

Q And you'll understand, if I refer to "Mori" today, that I'm talking about the document shown in Exhibit 1005?

A Yes.

Q What's the title of Mori?

A Machining Status Monitoring Method and Machining Status Monitoring Apparatus.

Q Does the abstract of Mori state, A machining status monitoring apparatus is provided

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on a machine tool and has a plurality of actual CCD cameras, et cetera?

A Yes.

Q All right. Let's turn to Page 26 of your declaration, in Paragraph 54.

A Okay.

Q Do you see where you mention Mori's machine tool 50 includes, among other things, a control device 62 which controls operations of coolant supply device 61?

A Yes.

Q Why don't we switch back to Mori, and in particular to Page 10. Let me know when you're there.

A Okay.

Q Do you see a flow chart marked as Figure 9 on Page 10 of Mori?

A Yes.

Q And are you familiar with the symbols that are used in flow charts?

A I am, although in practice they are not used very consistently.

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Q Is the block denoted by S45 a decision block?

A Yes.

Q Block S45 says it's coolant being supplied. Right?

A Yes.

Q And if coolant is not being supplied, the flow chart proceeds to the block denoted by S46. Right?

A Correct. In this particular algorithm.

Q And what does Block 46 say?

A "Display the actual image data corresponding to the camera identification signal."

Q And if coolant is not being supplied, the flow chart proceeds to the block denoted by S46. Right?

A Correct.

Q What does S46 say?

A I just read it into the record.

Q Oh, I apologize.

If coolant is being supplied, the flow

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chart proceeds to the block denoted by S47. Right?

A If it is, if coolant is being supplied, then it proceeds to S47.

Q And what does Block S47 say?

A "Display the received virtual image data."

Q Isn't the coolant supply device in Mori for supplying coolant to the contact portion of the tool and work piece?

A Yes. I mean, if you read my opinion, clearly I'm not including the coolant supply in the combination. I'm taking the imaging capabilities that are taught in Mori and applying them to the 3D printer in Mazumder.

Q Are there any other portions of Figure 9 that you're not including in the combination?

A Again, I'm bringing in teachings about imaging from the -- from Figure 9, and the teaching would be that there are at least two different images that can be displayed, either alternately on the same remote display, or it

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would be obvious to display them simultaneously. But I'm not literally bringing this entire algorithm over.

Q In which two images would it be obvious to display simultaneously?

A Let me look at the report.

I identified the image in Figure 7, which is described as being from the same perspective as the cameras as one of the images. And then the actual camera image as the second one. That's on Page 81 of my report.

Q Is there any particular image in Figure 7 that you described as being from the same perspective as a camera?

A There are a plurality of cameras, so each of these is from the same perspective as a camera. Any one of them meets the claim limitation.

Q And are the images in Figure 7 from the same positions as an actual camera?

A I don't know what you mean by "position."

They're from the same perspective.

So Figure 3 shows the four cameras. And

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then Figure 7 shows the four corresponding 2D projections.

Q So is it your opinion that it would be obvious to display the images in Figure 3 and in Figure 7 simultaneously?

A I don't think the claim requires that, but it would be obvious to do that.

I mean, clearly the intent of Mori is to be able to compare those two things, and it would be obvious to a person of ordinary skill in the art that if you wanted to compare two images, you could -- one way to do that would be to look at them at the same time.

Q Where in Mori does it express its intent to compare the images in Figure 3 to the images in Figure 7?

A I don't know if I have all of them. But if you look at the end of Paragraph 22, it says, "Therefore, actual images in which the distal end of the tool is not hidden can always be displayed, thereby the operator can always visually recognize the machining status of a work piece through the

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displayed images where it is possible to sufficiently monitor the machining status."

I think when he refers to "monitoring the machining status," he's talking about looking at the visual operation to determine whether or not it's doing what it's supposed to do.

Q Does Paragraph 22 of Mori describe comparing actual images to the images in Figure 7?

A It doesn't literally say that, but it suggests the intent of what's going on here. But the whole point of the apparatus and the method that are being disclosed in Mori is to allow one to sufficiently monitor the machining status. I think a person of ordinary skill in the art would understand that "monitoring the machining status," which, again, that phrase appears all over Mori, is to visually assess whether or not it's doing what it's supposed to be doing.

Q And in visually assessing whether or not it's supposed to be doing as intended, does Mori suggest that the actual images should be compared to the images in Figure 7 for any particular purpose?

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A I think so. Right? Again, if you read it as a whole, right -- and again, if you look at Paragraph 25, it talks about the sectional image data being displayed on the display means. And it also talks about in all of the virtual two-dimensional images, the operator can check the machining status of a work piece.

Again, I think if you read Mori as a whole, it's very clear that the reason these various images are being displayed is to allow the operator to perform a visual check on the machining process, comparing the intended machining with the actual machining.

Q And what represents the intended machining?

A The two-dimensional projection of the three-dimensional model.

Q And what is the two-dimensional projection of the three-dimensional model in Mori?

A There are examples of it in Figure 7.

Q Are there any other examples in Mori?

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A I don't know. Again, I didn't have to find every example in order to determine that it was obvious; just one that corresponded to the claims.

Q So it's your testimony that you have not looked for any other examples in Mori besides those in Figure 7?

A Whichever ones are in my declaration. But the Figure 7 ones are sufficient.

Q Are there any other ones in your declaration?

A I don't recall. Do you want me to look through it all?

Q Earlier you pointed to Paragraph 25 of Mori and you were discussing sectional image data.

What is "sectional image data" in your understanding, as discussed in Mori?

A It's a two-dimensional projection of a partially or completely machined model.

Q What is the sectional image data in Mori intended to do?

A To provide a visualization of the

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intended machined object at its current state of completion.

Q And what type of visualization does the sectional image data provide?

A A drawing.

Q And what distinguishes a sectional image data from the images in Figure 7 of Mori?

A Well, I think the images in Figure 7 are examples of sectional image data.

Q Are there any other examples in Mori of sectional image data?

A There are. Again, I didn't have to find every example in order to render my opinions. But I think Figure 11 is probably also sectional image data.

Again, I don't really recall off the top of my head.

Q Earlier we were talking about Figure 9 of Mori. Right?

A Yes.

Q And you mentioned that you were not using all aspects of Figure 9 in the combination of

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Mazumder and Mori. Right?

A Correct. For example, the coolant is not relevant.

Q Are there any other flow charts or algorithms described in Mori that use virtual image data or sectional image data for display?

A There may be. Again, I -- once I found the disclosures that were relevant to my opinions, I included those in the report. I didn't have to figure out whether or not there were other additional disclosures that taught other things or taught the same thing.

Q Is Figure 9 of Mori consistent with the disclosures that you did rely upon for your opinions?

A Portions of it are consistent with some of the disclosures, yeah.

Q Which portions of Mori are consistent with the disclosures that you rely upon for your opinions?

A We'd have to go through them one by one.

I mean, again, there's nothing -- I'm not

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aware of anything in Figure 9 that's inconsistent with my opinions.

Q Are you aware of --

A It's not necessarily something that I needed to rely on. Again, I did not literally bring Mori's embodiment into the combination. I brought the teachings about displaying actual and virtual images from Mori into the combination with Mazumder and some other aspects of remote access, but not the details of fabrication or cooling. That wasn't necessary to combine, because Mazumder -- Mazumder discloses how to do fabrication.

Q When you brought the teachings of Mori into the combination with Mazumder, did you consider all of the teachings of Mori?

A I considered them all, but it wasn't necessary to import them all into the combination.

Q Did you consider all of the embodiments of Mori?

A I considered them all. But again, it wasn't necessary to bring every embodiment over.

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Each one has its own teachings. Each -- many of those teachings stand alone.

So it's very clear Mori teaches how to visualize a two-dimensional projection of a three-dimensional model. It is very clear that it teaches how to display that on a remote display along with a video camera image of a build space. So those teachings were used to create the combination.

Q Did you consider how Mori selects a particular camera for display?

A Not really. Because, one, the claim's not limited to how you select the camera for display. Mori clearly teaches that -- that these can be displayed sequentially. And it would clearly, as I mentioned before, be obvious at least to display them simultaneously.

I think there may have even been a mention in Mori of displaying them simultaneously.

Q Besides the paragraphs that we discussed earlier, 23 and 25 of Mori, are there any portions of Mori that mention displaying images

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simultaneously?
A I don't recall.
Q I want to return to Figure 9 of Mori.
And earlier we were talking about Block S45.
A Did I give an opinion on Figure 9 of Mori? I don't see it in my declaration.
Q Did you not consider Figure 9 of Mori in rendering your opinions in your declaration?
A I considered everything. But, again, it's not necessary to rely on every teaching of a reference.
Q What's your understanding of why Mori has a decision block for whether the coolant is being supplied?
A Because in this particular embodiment of Mori, the supply of coolant is very important to the user. And if there's a coolant problem, that would not be in the model, so it would be important to display the actual image.
But again, the claims don't have anything, any limitations, as to why or when you display the images. This is one example of how

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that decision might be made, but it certainly would not be a limiting teaching with respect to Mori.
A person of ordinary skill would understand that they could use any kind of criteria to display -- determine which image to display at any particular time. And as I mentioned before, it would certainly be obvious, if you're trying to compare two images, to display them simultaneously.
Q So is it your testimony that a person of ordinary skill in the art would understand Mori to be considering whether coolant is being supplied because there may be a coolant problem?
A That could be a reason. Again, it doesn't matter because I haven't relied on the teachings about coolant in Mori; I've relied on the teachings about how to display images. And those would be clear to a person of ordinary skill in the art, independent of the cooling issues.
Q Would there be any other reason that a person of ordinary skill in the art would

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understand Mori to be considering whether a coolant is being supplied, besides there being a coolant problem?
A There could be many. Again, I didn't rely on the supplying of coolant as part of my combination. And I don't think that the teachings of Mori with regard to showing images are in any way dependent on the way that it makes decisions related to cooling.
Q You mentioned that there could be many other reasons a person of ordinary skill in the art would understand Mori to be considering whether a coolant is being supplied.
Have you considered any of those reasons in analyzing Mori?
A Yes.
Q And which of those reasons did you consider in analyzing Mori?
A That an operator would like to monitor the machining process.
Q And if an operator is monitoring the machining process, why would the operator's

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monitoring be impacted by whether the coolant is being supplied?
A It may not be. Again, there are multiple teachings in the Mori patent. The claims don't say anything about coolant. It's just a feature of a particular embodiment.
Q I'm going to ask my question again.
If an operator is monitoring the machining process, why would the operator's monitoring be impacted by whether the coolant is being supplied?
A It may or may not. It depends on the particular situation and the particular embodiment.
Q Are there any embodiments disclosed in Mori where the operator's monitoring would not be impacted by whether the coolant is being supplied?
A Well, Mori's claims don't talk about coolant at all. Figure 6 talks about virtual images, without discussing coolant. Figure 8 talks about figuring out these images without coolant.

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The coolant is not the main teaching of Mori. And a person of ordinary skill would be able to understand all the teachings about cameras and visualization images independent of what's being done with cooling.

Q Does Figure 6 of Mori talk about displaying images?

A No, not directly in Figure 6. It's about preparing them.

Q Does Figure 8 of Mori discuss displaying images?

A Not directly.

Q Do any other figures besides Figure 9 of Mori discuss displaying images?

A Figure 1 does.

Q In Figure 1 of Mori do you see the display device 65?

A Yes.

Q What are the inputs to display device 65 in Figure 1 of Mori?

A The control device 62 and the display image switching section 25 are the ones that are

66

illustrated.

Q Did you consider display image switching section 25 of Mori in rendering your opinions?

A I considered the entirety of Mori. But again, the teachings about what can be displayed, how it can be displayed, and when it can be displayed are clear to a person of ordinary skill in the art without having to import the literal implementation in Mori.

Q I am going to ask my question again.

Did you consider display image switching section 25 of Mori in rendering your opinions?

A I answered it.

Q Yes or no, did you consider the display image switching section 25 of Mori in rendering your opinions?

MR. BISENIUS: Objection. Asked and answered.

A I gave you a yes-or-no answer.

Q What does display image switching section 25 of Mori do?

A I'll have to look at the description.

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Look at Paragraph 70. "Display image switching section 25 displays on the display device 65 the actual image data output from any one of the actual CCD cameras, 11, 12, 13, and 14; the virtual image data transmitted from the camera selection section 24; or the sectional image data transmitted from the sectional image generating section 26 and switches the image to be displayed between the actual image data, the virtual image data, and the sectional image data."

Q Why does display image switching section 25 switch the image display between the actual image data, the virtual image data, and the sectional image data?

A I'm not sure it gives us any details. It's an ordinary video switch. That's just a common -- common structure at the time.

Q In your opinion does Mori fall within the field of endeavor of the '324 patent?

A I think in actuality, yes. The '324 patent -- let me find the language.

There is not an actual Field of Endeavor

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section. If you actually read the '324 patent and look at its claims, the '324 patent is about remote monitoring of a 3D manufacturing process. And Mori also is about remote monitoring of a 3D manufacturing process. I think they are in essentially the same field of endeavor.

Q What does a 3D manufacturing process mean to someone of skill in the art?

A Anything that involves manufacturing a 3D object.

Q Are there any objects that could be manufactured that are not three-dimensional?

A Sure. I mean, literally everything in the world is three-dimensional, but we -- we speak in practice of three-dimensional in something where we have some level of control over all three dimensions.

So we wouldn't normally consider a laser printer to be 3D manufacturing. Right? That's 2D, even though the paper technically has depth.

Right?

But things where we're trying to either

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add material in three dimensions or remove material in three dimensions or both, or simply mold material in three dimensions, like injection molding, those would all be 3D manufacturing processes.

Q Dr. Wolfe, in your declaration you provide opinions about the combination of a reference known as Mazumder with Mori. Right?

A Yes.

Q If you can turn to Page 59 of your declaration. Let me know when you're there.

A I'm there.

Q Okay. And starting with I believe Paragraph 88 you say, "As a fourth reason, a POSITA would have been prompted to modify Mazumder's rapid fabrication system." And then you add some description of what that would include.

Do you see that?

A Yes.

Q And then if you go down a few lines, you'll see a phrase starting with, "Because doing

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so."

Do you see that?

A Yes.

Q And just to make sure we're on the same portion of the page, "Because doing so would be merely the application of a known technique"?

A Correct.

Q And that known technique would be applied to a known system ready for improvement to yield predictable results. Right?

A Correct.

Q And as I understand what you've written here, specifically Mazumder's rapid fabrication system would be modified to include the user interface at the remote computer, a display of virtual images of the object being fabricated.

And that is from the same perspective as images of the real images as captured by one or more video cameras at the rapid fabrication system.

Is that right?

A That's a good summary. Again, I go into it in more detail when I do the claim analysis.

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Q Would Mazumder's rapid fabrication system have needed any other modifications?

A I go through them all in detail when we go through claim by claim. But that would have been the primary one, specifically for the independent claims.

Q Do you provide any testimony whether any other modifications not provided in Paragraph 88 merely apply a known technique to a known system ready for improvement to yield predictable results?

A I don't recall specifically. But if that's -- there's probably other places where I refer to that in the -- in the declaration.

Q So the modifications to Mazumder would have required adjustments to the user interface.

Is that right?

A Yes; ordinary ones, and ones that are known within the art. But there would have been additions to the user interface to improve the remote monitoring capabilities.

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Q Okay. What do you mean by "additions to user interface to improve the remote monitoring capabilities"? What specifically would need to be adjusted?

A We would have to go through it claim by claim because there are a bunch of claims here and I gave a bunch of opinions. But the primary one would be including the display on the remote user interface of the two-dimensional projection and the actual video image the way that Mori describes doing so.

Q Would the modification to Mazumder have required adjustments to the software?

A Sure. But ordinary routine adjustments to the software.

Q What sorts of adjustments to the software would have been needed to be made?

A Any time you change a user interface, you're going to have to make some adjustments to the software, just because user interfaces on computer display screens are software-driven. But again, they're just -- they're just ordinary

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coding.
You would need to design the screen and specify the placement of the various images and call the library routines for presenting those images at the right times.
But again, that's ordinary. And in this case probably ordinary browser programming.
Q Besides software adjustments in relation to what is shown on the user interface, are there any other software adjustments that would need to be made?
A There may be. Any time you modify a system there are going to be routine adjustments to software.
Q If we could turn to Figure 1 of Mori.
That's Page 2 of Mori.
A Okay.
Q Would any of the software in Mori corresponding to the blocks in Figure 1 have been needed in making the adjustments to Mazumder?
A Not directly. Against, Mazumder has a complete 3D fabrication system. It has

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corresponding software for all of these things. It already has a remote console. So, again, ordinary modifications to Mazumder or software would be necessary to make changes because it's always necessary to make changes to software when you make changes to a user interface. But you wouldn't need to take any of the structures from Figure 1 directly into Mazumder, no.
Q Would any of the structures from Figure 1 in Mori need to have been used indirectly in making adjustments to Mazumder?
A I don't understand what that means. Mazumder already has its own display device and its own input device and its own controller. There would be teachings from Mori that you would take, but not any of the actual structures. Perhaps the actual cameras might be -- might be taken over because you're going to incorporate a camera. But it wouldn't necessarily have to be these existing cameras.
A person of ordinary skill, once they were taught to use a camera, would know where to

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get a camera and how to install it and how to operate it.
Q And how would a person of ordinary skill in the art have understood to operate a camera in the context of adjusting Mazumder?
A They would have just connected in a camera. Again, in a computer-controlled system, adding a digital camera for monitoring was extremely ordinary technology at the time. And they could have used Figure 4 for guidance, Figure 4 of Mori for guidance, as to where to position the camera or how to aim it, along with Figure 5, for example.
Although, again, a person of ordinary skill in the art would have known how to install a monitoring camera in a -- in a manufacturing system. That had been done for at least 20 years prior to 2010.
Q Would a person of ordinary skill in the art have used Figure 7 of Mori for guidance?
A They could have. Again, Figure 7 is just a visualization perhaps of where to position the

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cameras. The combination doesn't require that the cameras be positioned exactly in the same way that they are in Mori, only that they be positioned in a way that corresponds to a 2D projection. And there would have been a lot of -- a lot of room for design choices there.
But a person of ordinary skill would not have needed very much guidance as of 2010 to know how and where to position a monitoring camera for a manufacturing process. That was very ordinary at the time.
Q You mentioned that a combination requires that the cameras be positioned in a way that corresponds to a 2D projection.
What do you mean by that?
A Well, Mori teaches that the 2D virtual images should be visualized from the same perspective as the actual CCD camera.
In a traditional 2D projection software flow, you can do that no matter where you position the camera. You would just need to take that teaching from Mori and implement it.

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I mean, every -- every designer at that time would have understood that common 3D design tools all use a virtual camera, and you have a lot of choices to where to position it.

So positioning a virtual camera, just like positioning a physical camera, would have been a very common and ordinary design decision at that time.

Q In your declaration do you discuss that a person of ordinary skill in the art would have understood that every designer at the time would have understood that the common 3D design tools would all use a virtual camera?

A I don't recall mentioning that. Again, the '324 patent doesn't tell you how to do a 2D projection from the perspective of a camera, so it certainly assumes that a person of ordinary skill, reading the patent, knows how to do it.

Q Does Mazumder tell you how to do a 2D projection from the perspective of a camera?

A No. Again, textbook at the time. It was something that was very, very common and been in use for maybe 30 years.

Q Does Mori tell you how to do a 2D projection from the perspective of a camera?

A I don't think so. It tells you who does it, but it doesn't tell you how to do it. Again, just textbook map.

Q I want to turn to Page 2 of Mori. That's Figure 1. Let me know if you're there.

A Okay.

Q The very top of Figure 1, just under the title, there is a block entitled Model Data Updating Section 17.

Do you see that?

A Yes.

Q Did you consider the functionality of Model Data Updating Section 17 of Mori in rendering your opinions?

A I considered it, yes.

Q And what is your understanding of what Model Data Updating Section 17 does?

A It creates -- it keeps track of the progress of the build to allow the creation of a 2D projection that represents what the 3D object should look like at the current state of the build.

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Q So is it fair to say then that the model data that Model Data Updating Section 17 is referring to is the data for the 3D object?

A I believe so.

Q Let's turn to Page 15 of your declaration.

A Okay.

Q You express opinions involving an article authored by Henke titled Rapid Prototyping Modules for Remote Engineering Applications.

Is that right?

A Yes. We discussed that before.

Q Okay.

MR. KAPADIA: I am going to -- bear with me for a second. I'm going to drop into the chat an exhibit, Exhibit 1014.

(Exhibit 1014, previously marked, not attached.)

Q Let me know when you received it and have opened it.

A I do have it, and I have a paper copy as well.

Q Excellent.

Do you recognize Exhibit 1014 as the article authored by Henke and others?

A It does appear to be.

Q And you'll understand that if I'm referring to "Henke" today I'm talking about the document shown in Exhibit 1014?

A Yes.

Q All right. Dr. Wolfe, Henke discloses a remote lab system. Right?

A It does.

Q And doesn't Henke say that students have I guess the possibility to test the design control algorithm directly within a hardware environment?

A I don't recall the exact language. Is there a particular passage you're looking at?

Q If you turn to Page 2 of Henke.

A Okay.

Q Do you see --

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A I see that in the abstract.
Q Do you see the abstract? Okay.
And Henke mentions a microcontroller FPGA-based rapid prototyping modules?
A He mentions those, yes.
Q What would a person of ordinary skill in the art have understood a rapid prototyping module that's microcontroller FPGA-based to include?
A Well, in the particular context of Henke, he's talking about how a remote lab system controller is implemented.
Q If you turn to Page 3 of Henke, do you see Figure 1 in the left column?
A Yes.
Q Figure 1 mentions simulation on the right side of the figure. Right?
A Yes.
Q Does simulation according to Henke's teachings include visual prototyping?
A It includes rapid prototyping. And if you read the entire thing, his rapid prototyping seems to include visual prototyping.

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Q What would someone of ordinary skill in the art understand visual prototyping to be as described in Henke?
A It's his term. He points specifically to Figure 7. I think he's just generally talking about it means a prototype that you can see and visualize.
Q Do you see Figure 2 of Henke in the right-hand column of Page 3?
A Yes.
Q What is the model in Figure 2 of Henke?
A The model is the underlying simulation. This is a visualization of the model.
Q And what is the model simulating in Henke?
A Fluid storage and flow in this particular example.
Q Okay. Below Figure 2 of Henke doesn't it say -- this is the second paragraph below it -- "A fault-free design algorithm finally should be tested on real electromechanical models"?
A Yes.

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Q And what does Henke mean by "finally should be tested"?
A So again, we did not -- I did not adopt every teaching of Henke into the combination. But if you look at Henke independently, Henke is discussing a visualization methodology. And as part of that what he suggests as a good teaching mechanism is to simulate a control algorithm, and then to test it on actual hardware while comparing that to the simulation.
Q And what's the distinction to someone of skill in the art between simulating a control algorithm and testing a control algorithm?
A Again, it depends on context. But particularly in the area of fluid flow, fluid flow simulations are extraordinarily complex. They are seldom simulated with a hundred percent accuracy. So one would want to validate that simulation through physical testing.
Q Can you turn to Page 5 of Henke.
Do you see four bullet points above Figure 8?

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A Yeah. Let me read them.
Okay.
Q I am going to direct your attention to the last of the four bullet points. I think it says in part, "Watch the laboratory procedure by supervising the model and environmental variables inside an I/O monitor."
Does Figure 8 show an I/O monitor?
A I think that's just a name for one of these user interface constructs.
Q And where is the I/O monitor then in Figure 8?
A If you'll look at the figure very carefully, there are tabs labeled Input and Output. That's not the currently displayed tab, but that would be where you would monitor the input and output.
Q Are there any other tabs that correspond to the I/O monitor in Figure 8?
A I don't know. I mean, he doesn't show us what's on every tab. But clearly there's an Input tab and an Output tab.

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Q Are there any other portions of Figure 8 that represent the I/O monitor?
A I don't know. Again, the I/O monitor is not a structure that I included in my combination. It's really the display teachings of Henke that I relied on.
Q Is the I/O monitor part of the display teachings in Henke?
A It is, but it's not part of what I relied on. Again, Henke teaches a bunch of stuff about control theory that's just not relevant to the combination.
He also teaches some visualization techniques, and those are what are relevant to the combination.
Q What visualization techniques in Figure 8 of Henke did you rely on?
A So I relied on two things from Figure 8. One is the visualization techniques, and that is the visualization, a 2D visualization of a simulation model that is shown from the same perspective as an actual video camera image of a

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physical model. And they are shown simultaneously.
And also there are operational controls, Start, Pause, Stop, that are displayed in Figure 8 that correspond to some other claims.
Q Is the actual video camera image of a physical model shown in the top right of Figure 8?
A It depends where you consider the top right to be. There are a bunch of things above it. It's the thing made out of a bunch of plastic and glass parts that you can see in the video image on Figure 8.
Q Are those plastic and glass parts shown in the video image of Figure 8 representative of anything?
A I don't know what you mean by "representative of anything." They physically exist.
Q And what would a person of ordinary skill in the art observe from the video image in Figure 8?
A The operation of the physical device, its

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status, how it's changing over time.
Q In your opinion, does the video image in Figure 8 show that the physical device is in operation?
A I can't tell from a still picture. But clearly if you read Henke, that's what it's intended to do for a typical user.
Q If you had a video image or video picture of -- corresponding to Figure 8 in Henke, what would you look for to determine whether the physical device is in operation?
A Well, it depends on what particular control algorithm you're testing. But you would expect to see responses to inputs and outputs. And you would expect to see changes in water level at various places. Or not. Right? Again, it depends on what you're simulating there.
You could use Henke to simulate something that's -- that's supposed to be stable, in which case the idea would be that you would hope there are no changes over time. Or you could use it for something that is intended to change over time.

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Either way, you'd be able to see it just by looking at it.
Q You mentioned changes in water level at various places. Is there something in the physical device that would enable those sorts of changes?
A I believe there are valves and pumps.
Q And would those valves and pumps be controlled by anything?
A They would be controlled by something, yes. That's one of the teachings of Henke.
Q What would they be controlled by?
A By the students' control hardware and control algorithm. Again, that's a teaching in Henke that's very distinguishable from his visualization teachings.
Q Is a control hardware shown in Figure 8?
A It probably is if you know what you're looking for in the video. But it's really shown better in Figures 4 and 5.
Q What would you look for in the video to determine whether the control hardware is shown?

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A If you know what it looks like, you would see if you could see it. It's not that complicated.

Again, that's -- the control hardware is not a teaching that I used in the combination. Right? And the visualization techniques are what I used in the combination.

One would not expect to be taught every possible object that could appear in a video camera image in order to understand how to use a video camera.

Q Are there any visualization techniques that you used in the combination that depend on what is shown in the video image?

A No. Because Mazumder and Mori teach us what the fabricated object is, and they teach us how it's being modeled. So the only additional teaching that we may or may not need from Henke is the perspective and the simultaneous display, even though both of those would probably be obvious even without Henke.

And then again for later claims, Henke

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provides the on-screen controls, which are suggested by the other art but not illustrated.

Q In your opinion, does Henke fall within the same field of endeavor as the '324 patent?

A Yes. It's the visualization of a process through the use of a video camera and a simulated model.

Q What is the process in the '324 patent?

A Well, construction of a 3D object.

Q And what is the process in Henke?

A In general, it's the operation of a 3D physical model. But in some sense it's also a construction because we are creating various pools of liquid.

Q What is the model in the '324 patent?

A As I said, the word can be used in a number of different ways. But the '324 patent refers to -- I'll find it. It refers to the model as being the data that it receives from the host computer.

Q What's the model in Henke?

A Again, in my combination I'm not bringing

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the model in from Henke; I'm bringing the model in from Mazumder.

Q Have you considered what is the model in Henke?

A Henke has various kinds of models that it uses to perform its simulation. But again, I'm not including Henke's models in the combination. I'm including Henke's visualization in the combination, and the models come from Mazumder.

Q What models does Henke use to perform its simulation?

A It's got a set of control equations and an environmental model. But again, I have not included those into -- in the combination.

Q How is the model in the '324 patent simulated?

A The 3D model?

Q How is the 3D model in the '324 patent simulated?

A I'm not sure it is simulated. It's used for visualization, it's used for construction of a 3D object.

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Q How is the model in Henke simulated?

A Again, Henke's model is not part of my combination. But it is simulated through the hardware and software synthesis and through the simulation that are described in Figure 1. It's a set of mathematical algorithms that are simulated through -- I'm not sure I even know exactly which model it uses.

But there are fluid flow models that it can be used to simulate fluid flow. And there are control algorithm models that are typically just matrix equations that are used to simulate control algorithms.

Again, none of that is in my combination, so I didn't dig into it too deeply.

Q What would someone of skill in the art have understood a control algorithm model to be?

A Again, the control algorithm model is not part of my combination. But a control algorithm model would be any type of a mathematical system to -- to simulate control equations. There are lots of them. It depends on the situation.

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Q In your opinion, Dr. Wolfe, would Henke be reasonably pertinent to the problem the inventor of the '324 patent was trying to solve?

A Yes. The problem that the '324 inventors were trying to solve -- inventor was trying to solve, was how to -- basically how to effectively visualize a 3D object that is changing over time, particularly from a remote environment.

Q How does Henke visualize a 3D object that's changing over time?

A In two different ways. It provides a simulation of the control algorithms that are shown on the screen, and he also provides a visualization of the apparatus that is performing the control algorithms.

Q And what would someone of skill in the art have understood about the simulation of control algorithms as it relates to visualization of a 3D object?

A It creates a 3D object that changes over time, sometimes in ways that are difficult for a human being to project -- to -- what's the right

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word there? Sometimes in ways that are difficult for a human being to determine without having to use something more sophisticated than their own mind to predict the behavior.

Q So is it fair to say that a simulation of an control algorithm assists a human being in visualizing a 3D object?

A If you take Henke as a whole, that's true. Again, I did not include all aspects of Henke in my combination.

Q Did you include Henke's teaching about the simulation of a control algorithm in your combination?

A I included the visualization of the simulation of the behavior of the system, but not any of the details about control algorithms.

Again, I took the teachings about visualization from Henke. There was no need or reason to look into how control algorithms are being performed.

Q So if you're including a visualization of the system of the behavior -- strike that.

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If you include the visualization of the simulation of the behavior of the system, does the behavior of the system represent the control algorithm?

A In particular embodiments, it does. But again, that's not a teaching that I need to take.

Right?

The idea, the teaching that you would want to display a visualization of a simulated system that is changing over time, was an idea that I took. And again, I didn't really need to take that from Henke alone, because that's also in Mori. All I really relied on in Henke was, for Claim 1, was the perspective of the camera and the simultaneous display of the two images. Both of which would have been obvious without Henke as well.

Q All right. Let's navigate to Page 15 of your declaration.

A Okay.

Q You express opinions involving an article authored by Tay as well as others, titled

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Distributed Rapid Computing - A Framework for Internet Prototyping and Manufacturing.

Is that right?

A Yes.

MR. KAPADIA: I'm going to drop into the chat Exhibit 1013.

(Exhibit 1013, previously marked, not attached.)

Q Let me know when you received it and pulled it up.

A Okay, I have it. And I have a paper copy as well.

Q Do you recognize Exhibit 1013 as the article authored by Tay and others?

A It appears to be.

Q And you'll understand, if I refer to "Tay" today, that I'm talking about the document shown in Exhibit 1013?

A Yes.

Q All right. Let's turn to Page 5 of Tay.

A Okay.

Q Do you see Figure 3?

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A I do.
Q And do you specifically see I guess Figure 3A, which says, "File conversion to machine format"?
A Yes.
Q And I'm going to refer to this as Figure 3A of Tay.
Is that understandable to you?
A Okay.
Q Do you see the image in Figure 3A of Tay with a white background?
A Yes.
Q What is this image?
A That's a visualization of the 3D model, along with kind of a progress visualization of its conversion into a tool path.
Q How does the image show progress visualization of its conversion into a tool path?
A My understanding would be that the black portion had been converted to the tool path.
Q Keeping with this image with the white background in Figure 3 of Tay, do you see the

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three black lines that intersect to the left?
A Yes.
Q What do these three black lines represent?
A They are visualization of axes. They're probably somewhat arbitrary with respect to the model.
Q What would a person of ordinary skill in the art in your opinion understand these three axes to represent?
A The three dimensions of space.
Q And what would those three dimensions be?
A Again, there are many ways to express them. The most common way is to use a Cartesian coordinate system, where they're all at right angles and to call them X, Y, and Z.
Q Let's keep with this whole image with the white background in Figure 3 of Tay.
Do you see the two black lines that continue toward the right of the point of intersection?
A Yes.

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Q Would those two black lines correspond, for example, to the X and Y dimensions?
A The assignment of letters is arbitrary. Let me see if there's a marking that I can read. I can't read the marking.
Q What does the plane formed by these two black lines represent?
A A plane. I mean, you can arbitrarily define any plane, and it's typical just for convenience to define a zero plane in a particular representation format, so that is likely what that is.
Q What does a zero plane represent?
A It just means that in whatever coordinate system you have chosen to use for your mathematical model, that's the point at which two of the three dimensions are -- have the value zero.
Q And what does the value zero represent?
A Technically, nothing. I mean, a starting point from which to make measurements. Just like if you're measuring something with a tape measure,

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you can put the zero wherever you'd like.
Q In your experience, does software that creates tool paths provide a starting point from which to make measurements?
A Usually, but it's not always in the same place between different pieces of the software. So, for example, I've had one 3D printer that would make the zero, zero plane at the bottom, another one that would make it at the top. Same thing with subtractive fabrication devices.
Q And what does the zero plane in those examples represent?
A Again, it's just the points within a 3D space where two of the three dimensions have the value zero using the scale and coordinate system that you have chosen to use.
Q I want to return to Figure 3 of Tay.
Do you see an arrow that points to Figure 3A?
A Yes.
Q And is the source of that arrow a box that says, QuickSlice Access?

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A Yes.
Q Have you ever used a piece of software known as QuickSlice Access?
A Not to my knowledge, no.
Q Have you ever come across a piece of software known as QuickSlice Access?
A I'm not familiar with anything by that name.
Q All right. Let's navigate to Page 14 of your declaration.
A Okay.
Q In forming your opinions in the declaration, Dr. Wolfe, did you review excerpts of the prosecution history of the '324 patent?
A I did.
MR. KAPADIA: I am going to drop an exhibit into the chat.
(Exhibit 1002, previously marked, not attached.)
Q Let me know when you received it and pulled up Exhibit 1002.
A Okay.

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Q Do you recognize Exhibit 1002 as the excerpts of the prosecution history of the '324 patent that you considered in your declaration?
A It appears to be.
Q And do you have a paper copy of Exhibit 1002 in front of you?
A I do not.
Q You'll understand that if I refer to "the prosecution history" today that I'm talking about the document shown in Exhibit 1002?
A Okay.
Q Let's turn to Page 160.
A One six zero?
Q Yes, one six zero.
A Okay.
Q Do you agree that the applicant described the invention during prosecution as providing a user interface with both a two-dimensional projection of the three-dimensional model and an image of the build volume at the same time and from the same point of view?
MR. BISENIUS: Objection. Relevance.

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A I don't see that exact language. Is that at the end of this big paragraph?
Q Well, didn't the applicant during prosecution say that "in order for a remote user to monitor progress of fabrication in a meaningful way, the three-dimensional model is rendered in a user interface from the perspective of the video camera that provides the image"?
MR. BISENIUS: Objection. Relevance.
A That language is here.
Q And doesn't the applicant also go on to say, "Thus, advantageously permitting side-by-side comparison by a remote user of the model of the resulting object"?
MR. BISENIUS: Objection. Relevance.
A Yeah, I'm pulling this out of context.
Q I'll ask the question again.
A That does -- that does seem to be a statement from the applicant.
Q So I will return to my question from earlier. Do you agree that the applicant described the invention during prosecution as

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providing a user interface with both a two-dimensional projection and a three-dimensional model and an image of the build volume at the same time and from the same perspective?
MR. BISENIUS: Objection. Scope.
A I do not. I do not.
Q And why do you not agree that the applicant described the invention in that way?
MR. BISENIUS: Objection. Scope.
A It's not a discussion of the invention; it's a discussion of a feature.
Q And what is your -- in your opinion, the distinction between the invention and a feature?
A A feature may not be -- an invention is a claim with respect to a patent. A feature may or may not be a claim.
I also, again, I'm hitting this out of context. I don't recall whether or not the discussion here represents a claim that actually issued for the patent.
Q Let's turn to Page 161 of the prosecution history.

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A Okay.
Q And specifically in the middle paragraph on Page 161, in the last sentence, starting with the reference "Taminger cannot anticipate the invention of Claim 1."
Do you see that language?
A Yes.
Q And the applicant goes on to say, "because Taminger does not" reach a process -- "does not teach a processor configured to provide user interface to a remote user that includes an image of a build volume from a video camera and a two-dimensional projection of a three-dimensional model from the point of view of the video camera."
Do you see that statement?
A I do.
Q Do you agree with the applicant's statement?
MR. BISENIUS: Objection. Scope.
A I haven't reviewed Taminger. I don't know whether or not the statement is correct or not.

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Q Do you agree that the invention in Claim 1 includes a processor configured to provide a user interface?
A Yes, it's narrowed by other portions of the claim, but it does include a processor configured to provide a user interface.
Q And do you agree that that user interface includes an image of a build volume from a video camera?
A Of the build volume from the video camera.
Q And do you agree that the user interface includes a two-dimensional projection of a three-dimensional model from the point of view of the video camera?
A It does say that. But it needs to also be read in the context of dependent Claim 6 and also the specification.
Q Do you agree with the applicant that the user interface has both the two-dimensional projection of the three-dimensional model and an image of the build volume?

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A That's really ambiguous. Right? The -- I think that's the plain meaning of Claim 1, if you read it in isolation. But Claim 6 says that the two-dimensional projection is a video image from the video camera, which would be from the same video camera. And the text of the specification says the same thing.
So -- and there's nothing that says that they need to be simultaneously displayed. So certainly the spec and a claim seem to say that two sequential images from the same video camera meet the claim specification -- or meet the claim language.
Q Would two sequential images permit side-by-side comparison by a remote user?
A Sure.
Q Why?
A I can put the image at Time T on the screen and the image at Time T plus delta on the screen.
Q Would the image at Time T and the image at Time T plus delta be shown simultaneously?

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A Sure. Sure. I mean, yeah, you can show them.
Again, the claim doesn't say that they need to be shown simultaneously. I don't think any of the claims say that. And the claims themselves don't say the purpose of putting these two images up.
So I have to go with what the claims actually say. And the claims actually say that both of these can be a video image from the same video camera.
Q I'm going to ask the question that I had posed to you earlier.
Do you agree with the applicant that the user interface has both the two-dimensional projection of the three-dimensional model and an image of the build volume so as to enable their comparison?
MR. BISENIUS: Objection. Scope.
A For Claim 1 I do agree with that, but it needs to be taken in consideration of the specification and the claim language, which does

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not require that they be provided simultaneously and allows for the fact that they could simply be two different images from the same video camera.

Q All right. Let's turn to Page 56 of your declaration.

A Okay.

Q And specifically let's talk about Paragraph 85. Let me point you to maybe a portion of that.

A Give me a second to read it.

Q Okay.

A Okay.

Q If you go down maybe, let's see, one, two, three -- the fifth line of Paragraph 85 it says, "A POSITA would have recognized that including both the real," do you see that portion of Paragraph 85?

A I do.

Q Okay. If you go down four lines further it says, Would have advantageously allowed the user to easily visually compare the, quote, visual images of the product being fabricated, end quote,

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to the virtual images of, quote, the three-dimensional models of the ... workpiece W.

Do you see that?

A Yes.

Q Okay. Does the Mazumder-Mori combination teach a user interface that includes both the two-dimensional projection and an image from the same perspective at the same time?

A I think it certainly teaches them at different times on the same screen, which is all that the claims seem to require.

But to the extent that it would be better to display them at the same time, again I think that's just obvious, based on common sense. That if you have two images that you want to compare, a person of ordinary skill would have known at the time that one of the best ways to compare them is to show them at the same time.

Q And you cite to Paragraph 62 and -- sorry, 61 and 62 of Mori at the very end of that sentence. Right? In your declaration.

A I do.

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Q Do Paragraphs 61 and 62 of Mori teach comparing visual images to virtual images?

A Not in so many words. We talked about where that appears previously. But it does talk about how to create the visualization that enables comparison.

Again, the claims don't require the actual comparison be made. A person of ordinary skill, reading those paragraphs, would understand why Mori is doing that.

Q And how would the visualization be created to enable comparison, according to Paragraphs 61 and 62 of Mori?

A By creating images both from the video cameras and also from underlying mathematical models that are projected from the same perspective.

Q And how are those images able to be compared?

A Well, again, the comparing is not part of the claims. But a person can look at one and look at the other. I mean, it's pretty simple.

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In many cases you're looking for gross defects, a hole.

Q In Paragraph 85 of your declaration you give an example just after your citation to Paragraphs 61 and 62 of Mori. It reads -- and this is Page 56 of your declaration -- "such as a side-by-side comparison of the actual fabrication process."

Do you see that?

A Yes.

Q So in that example are you describing a side-by-side comparison between two images being displayed sequentially?

A Either sequentially, one after another, or simultaneously. It doesn't matter. They both would be obvious. Right?

At this time understanding how to compare -- how to display two computer images to a user for comparison was not novel; it was something that was done in all kinds of software. And a person of ordinary skill in the art would know several different ways to do it, and they

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would all be obvious.
Q Are there any teachings in Mazumder that support either the sequential or simultaneous display of images?
A Again, I can't recall off the top of my head everything that I cited in my declaration. But I'll just look at what was cited right here.
Now, Mazumder just talks about multiple images, but it doesn't actually talk about the two specific images that would be displayed. That's something that is motivated and described by Mori.
Q Dr. Wolfe, I just have a few additional questions.
Did you receive any chats or messages during your deposition today?
A Again, I didn't check any communications, so I don't know what I received, but I haven't seen any.
Q Did anyone enter the room in which you are in today?
A No.
Q All right.

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MR. KAPADIA: I don't have any further questions, so I will pass the witness.
MR. BISENIUS: If everyone is okay, I'd prefer just roll right into what I've got, pretty much just one question.
EXAMINATION BY COUNSEL FOR PETITIONER
BY MR. BISENIUS:
Q Dr. Wolfe, do you recall earlier today discussing or answering questions regarding Henke's disclosure of a model?
A Yeah, I think with respect to the underlying simulation model. Yes.
Q At one point you stated, The models don't come from Henke; the models come from Mazumder. And I wanted to just clarify.
In your declaration did you ever propose modifying the Mazumder reference based on Henke?
A Let me look.
I'm sorry, I misspoke. So in those particular combinations the models came from Kritchman and Tay. As I had mentioned in my previous testimony, Mazumder and Mori already have

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the display teachings in them or render them obvious.
Q So just to clarify. When you were talking about Henke and you say that the models don't come from Henke, in that combination did you mean to refer to the Tay and Kritchman references?
A Well, in both cases.
So in the Mazumder-Mori combinations, I don't include anything from Henke. And in the Kritchman and Tay combinations, I include visualization teachings from Henke, but not the model.
MR. BISENIUS: No further questions.
MR. KAPADIA: Nothing further.
(Off the record at 1:52 p.m. EDT.)

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ACKNOWLEDGMENT OF DEPONENT
I, ANDREW WOLFE, Ph.D., do hereby acknowledge that I have read and examined the foregoing testimony, and the same is a true, correct and complete transcription of the testimony given by me, and any corrections appear on the attached Errata sheet signed by me.

_____ _____
(DATE) (SIGNATURE)

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CERTIFICATE

I, Debra Ann Whitehead, E-Notary Public in and for the Commonwealth of Virginia, do hereby certify:

That ANDREW WOLFE, Ph.D., the witness whose deposition is hereinbefore set forth, was duly sworn by me before the commencement of such deposition and that such deposition was taken virtually and is a true record of the testimony given by such witness.

I further certify that the adverse party, SHENZHEN TUOZHU TECHNOLOGY COMPANY, LTD., was represented by counsel at the deposition.

I further certify that the deposition of ANDREW WOLFE, Ph.D., occurred virtually, on Thursday, August 28th, 2025, from 10:57 a.m. to 1:52 p.m. EDT.

I further certify that I am not related to any of the parties to this action by blood or marriage, I am not employed by or an attorney to any of the parties to this action, and that I am in no way interested, financially or otherwise, in the outcome of this matter.

IN WITNESS WHEREOF, I have hereunto set my hand this 4th day of September, 2025.

My commission expires:
October 31, 2027

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