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Paper 35
Date: March 6, 2024

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MEDIVIS, INC.,
Petitioner,

v.

NOVARAD CORP.,
Patent Owner.

IPR2023-00042
Patent 11,004,271 B2

Before MIRIAM L. QUINN, *Acting Vice Chief Administrative Patent Judge*, MICHAEL R. ZECHER and SCOTT RAEVSKY, *Administrative Patent Judges.*

RAEVSKY, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining No Challenged Claims Unpatentable
Dismissing Motion to Exclude
35 U.S.C. § 318(a)

I. INTRODUCTION

Medivis, Inc. ("Petitioner") filed a Petition to institute an *inter partes* review of claims 1–6 and 11–20 (the "challenged claims") of U.S. Patent No. 11,004,271 B2 ("the '271 patent," Ex. 1001). Paper 3 ("Pet."). Novarad Corp. ("Patent Owner") did not file a Preliminary Response. Based on the information presented in the Petition, we instituted an *inter partes* review of claims 1–6 and 11–20 (Paper 7, "Institution Decision" or "Dec.").

Subsequent filings include a Patent Owner Response (Paper 12, "PO Resp."), a Petitioner Reply (Paper 20, "Reply"), and a Patent Owner Sur-reply (Paper 22, "Sur-reply"). Petitioner also filed a Motion to Exclude (Paper 25, "Mot."). Patent Owner filed an Opposition to Petitioner's Motion to Exclude (Paper 26, "Opp."). Petitioner filed a Reply in Support of Petitioner's Motion to Exclude (Paper 27). We held an oral hearing on January 30, 2024, a transcript of which has been entered into the record. Paper 34 ("Tr.").

We have jurisdiction over this proceeding under 35 U.S.C. § 6(b). After considering the evidence and arguments of the parties, we determine that Petitioner has not proven by a preponderance of the evidence that any of the challenged claims are unpatentable. We also dismiss Petitioner's Motion to Exclude.

II. BACKGROUND

A. Real Parties in Interest

Each party identifies itself as the real party in interest. Paper 5, 2[1]; Paper 6, 1.

B. Related Matters

The parties identify *Novarad Corp. v. Medivis, Inc.*, No. 21-1447-GBW (D. Del. 2021) as a related matter. Paper 5, 2; Paper 6, 1. Petitioner also filed IPR2023-00045, requesting review of U.S. Patent No. 10,945,807, which Petitioner describes as listing the same inventors as the '271 patent and is generally directed to similar technology, but which is not part of the '271 patent family. Pet. 3.

C. The '271 Patent

The '271 patent relates to "[a]ugmenting real-time views of a patient with three-dimensional (3D) data." Ex. 1001, code (57). The '271 patent explains that conventional medical imaging systems can create 3D data for a patient that can be viewed on a computer display, detached from the patient, which may cause some problems. *Id.* at 2:49–55. For example, the '271 patent explains that a surgeon may view an image of a patient's brain on a computer display to determine the location of a tumor, and then shift his view to the actual patient "and attempt to identify the approximate location on the actual patient of the tumor inside the patient's brain." *Id.* at 2:56–63. The surgeon, however, "may accidentally identify the left side of the brain in the image as having the tumor when in reality the tumor is in the right side of the brain," which "may lead to the surgeon erroneously making an

[1] Patent Owner's Mandatory Notices, filed in accordance with 37 C.F.R. § 42.8, do not include page numbers. Paper 5. We consider the Title page as page 1 and then proceed from there in numerical order.

unnecessary incision on the left side of the patient's skull." *Id.* at 2:63–3:3. To avoid such errors, the '271 patent describes methods of automatically aligning or registering the 3D data "with a real-time view of the actual patient" so that "images derived from the 3D data may be projected onto the real-time view of the patient." *Id.* at 3:21–27.

Figure 1 of the '271 patent is reproduced below.

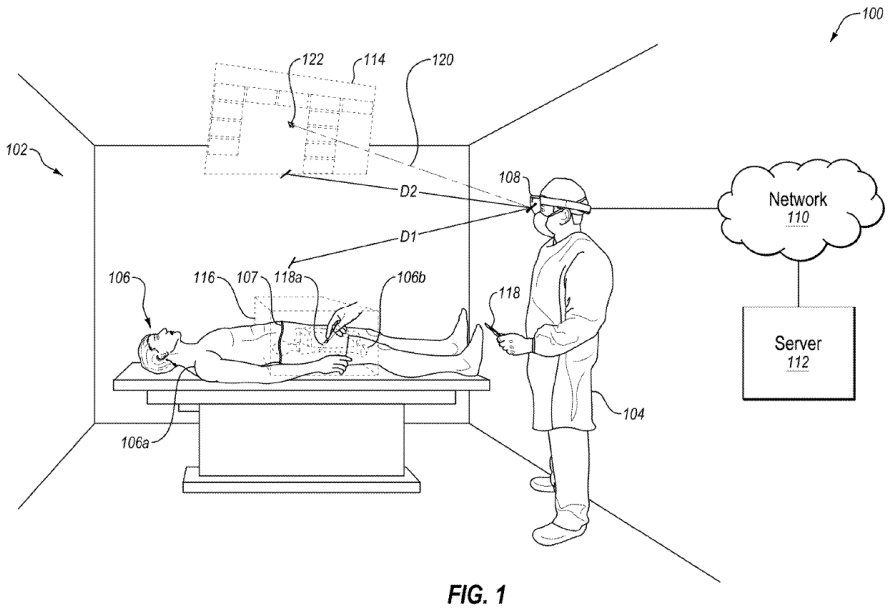


FIG. 1

Figure 1 illustrates an augmented reality (AR) environment in which real-time views of a patient may be augmented with 3D data. *Id.* at 2:26–28. Environment 100 includes 3D space 102, user 104, patient 106, and AR headset 108 in communication with server 112 over network 110. *Id.* at 3:63–67. Environment 100 also includes virtual user interface 114, virtual spatial difference box 116, virtual inserted portion 118*a* of object 118, and virtual cursor 122, "all shown in dashed lines to indicate that these virtual elements are generated by the AR headset 108 and only viewable by the user 104 through the AR headset 108." *Id.* at 4:1–7. The '271 patent discloses that "AR headset 108 may be employed by the user 104 in order to augment a real-time view of the patient 106 with one or more inner layers of

the patient 106 including, but not limited to, bones 106*b* (as illustrated in FIG. 1), muscles, organs, or fluids." *Id.* at 4:42–46.

The '271 patent further discloses that AR headset 108 may perform this augmenting of a real-time view of patient 106 regardless of the current position of user 104 in 3D space 102. *Id.* at 4:46–49. For example, user 104 may walk around operating table 103 and view patient 106 from any angle within 3D space 102 while AR headset 108 continually augments the real-time view of patient 106 with one or more inner layers of patient 106, "so that both the patient 106 and the 3D data of the patient 106 may be viewed by the user 104 from any angle within the 3D space 102." *Id.* at 4:49–57.

D. Challenged Claims

Claim 1 is representative of the challenged claims and is reproduced below.

> 1. A method for augmenting real-time, non-image actual views of a patient with three-dimensional (3D) data, the method comprising:
>
> identifying 3D data for the patient, the 3D data including an outer layer of the patient and multiple inner layers of the patient; and
>
> displaying, in an augmented reality (AR) headset, one of the inner layers of the patient from the 3D data projected onto real-time, non-image actual views of the outer layer of the patient, the projected inner layer of the patient from the 3D data being confined within the volume of a virtual 3D shape.

Ex. 1001, 18:54–65.

E. Asserted Grounds of Unpatentability

Petitioner asserts that claims 1–6 and 11–20 would have been unpatentable on the following grounds:[2]

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis[3]
1, 5, 6	102	Doo[4]
1–6, 11–20	103	Doo, Amira[5]
1–6, 11–20	103	Chen,[6] 3D Visualization,[7] 3D Slicer[8]

Pet. 31. Petitioner relies on two Declaration by Peter Kazanzides, Ph.D. (Exs. 1012, 1021) in support of its contentions. Patent Owner relies on declarations by Mahesh S. Mulumudi, M.D. (Ex. 2002) and Craig Rosenberg, Ph.D. (Ex. 2004).

[2] In the Petition's discussion of claim 1, it also mentions claim 7, but Petitioner confirmed at the hearing that this was a typographical error and that it does not intend to challenge claim 7. Pet. 34; Tr. 16:7–21.
[3] Throughout this decision, we eliminate the parties' italicization of reference names from quotations without noting "emphasis omitted."
[4] Doo, WO 2015/164402 A1, published October 29, 2015 (Ex. 1008).
[5] Excerpt of Amira 5 User's Guide, title through Chapter 2 (Visual Imaging 2009) (Ex. 1005).
[6] X. Chen et al., *Development of a Surgical Navigation System Based on Augmented Reality Using an Optical See-Through Head-Mounted Display*, 55 JOURNAL OF BIOMEDICAL INFORMATICS 124–131 (©2015) (EX. 1009).
[7] S. Pujol, Ph.D. et al., *3D Visualization of DICOM Images for Radiological Applications*, Surgical Planning Laboratory, Brigham and Women's Hospital (©2012–2014) (Ex. 1007).
[8] Main Application GUI for 3D Slicer *available at* https://www.slicer.org/wiki/Documentation/4.6/Slicer/Application/MainApplicationGUI ("last edited 7 November 2016") (Ex. 1010).

III. ANALYSIS

A. Level of Ordinary Skill in the Art

Petitioner contends that a person having ordinary skill in the art ("POSITA") would have had

> a bachelor's degree in computer science, electrical engineering, or a related field with several years of experience in the design, development, and study of augmented reality devices and either (a) familiarity with conventional medical imaging data and visualization of data for medical procedures or (b) working with a team including someone with such familiarity.

Pet. 10 (citing Ex. 1012 ¶ 25). Patent Owner does not dispute Petitioner's proposed level of skill. *See generally* PO Resp.

We adopt Petitioner's proposed level of skill, except that we excise part of Petitioner's definition to produce the following modified version:

> a bachelor's degree in computer science, electrical engineering, or a related field with several years of experience in the design, development, and study of augmented reality devices and . . . familiarity with conventional medical imaging data and visualization of data for medical procedures . . . .

Our edit removes the alternative of "working with a team including someone with such familiarity" because one's role in a team may be tangential to their personal experience with medical imaging. Regardless, had we adopted Petitioner's original definition, our decision would not have changed.

B. Claim Construction

We construe each claim "in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent." 37 C.F.R. § 42.100(b) (2022). Under this standard, claim terms are generally given their plain and ordinary meaning as would have been understood by a person of ordinary skill in the art at the time of the invention and in the context of

the entire patent disclosure. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313 (Fed. Cir. 2005) (en banc).

The parties propose constructions for the claim terms "three-dimensional (3D) data," "inner layer(s) of the patient," "confined within a virtual 3D shape," and "being having." Pet. 11–14; PO Resp. 11–18. We do not need to construe any of these claim terms in order to resolve the issues presented in this proceeding. *See Realtime Data, LLC v. Iancu*, 912 F.3d 1368 (Fed. Cir. 2019) ("The Board is required to construe 'only those terms . . . that are in controversy, and only to the extent necessary to resolve the controversy.'" (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

C. Asserted Anticipation by Doo

Petitioner contends that claims 1, 5, and 6 are anticipated by Doo. Pet. 31–40.

1. Overview of Doo

Doo is directed to "an intra-operative medical image viewing system that can allow the surgeon to maintain a viewing perspective on the patient while concurrently obtaining relevant information about the patient." Ex. 1008 ¶ 11. Doo's system "can present a selectively or variably transparent image of an anatomical feature of a patient" to a surgeon during surgery as the surgeon views, or maintains a viewing perspective generally toward, the actual anatomical feature of the patient. *Id.* ¶ 30.

Figure 2 of Doo is reproduced below.

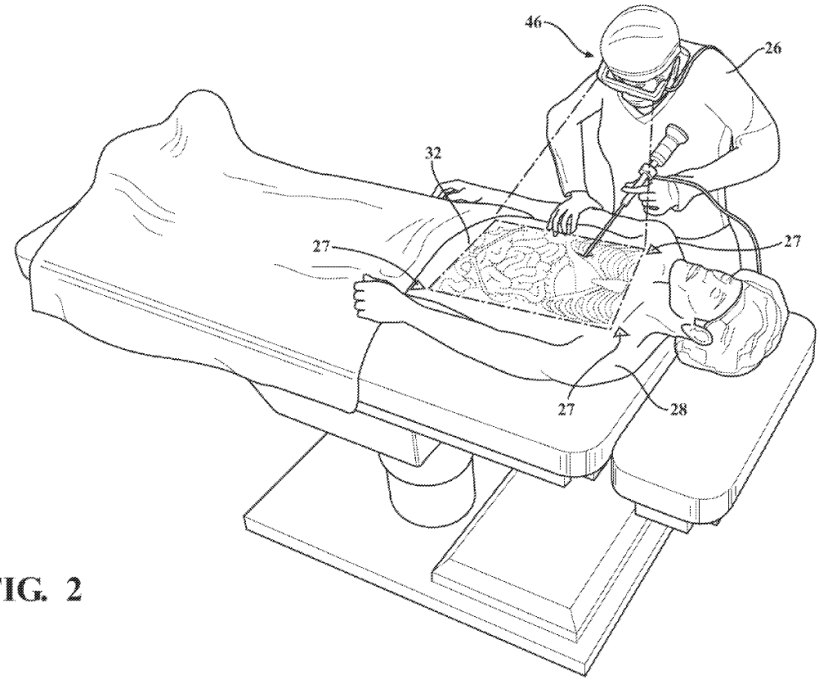


FIG. 2

Figure 2 is a perspective view of an embodiment described in Doo in a first surgical environment. *Id.* ¶ 17. Surgeon 26 wears display 30 suitable for implementing an intra-operative medical viewing system while operating on patient 28. *Id.* ¶ 38. The viewing system allows surgeon 26 to maintain a viewing perspective on patient 28, while concurrently obtaining relevant image-based information about patient 28 on demand. *Id.* Display 30 is positioned between surgeon 26 and patient 28, and is "configured to exhibit at least one medical image 32 to the surgeon 26 that is overlaid on the patient 28 (as shown in Figure 2) or that is positioned in an adjacent hovering location as perceived by the surgeon 26." *Id.* "[D]isplay 30 can be a component of a head mountable unit 46 . . . worn by the surgeon 26 while the surgeon 26 is operating on the patient 28." *Id.* ¶ 44.

2. Independent Claim 1

a. the projected inner layer of the patient from the 3D data being confined within the volume of a virtual 3D shape.

We address solely this limitation of claim 1 because it is dispositive of this ground. Petitioner presents two theories of unpatentability for this limitation, which we address in turn.

(1) Doo Figures 7–9

Petitioner's first argument relies on Doo's Figures 7–9. Pet. 36–37. Figure 7 of Doo is reproduced below:

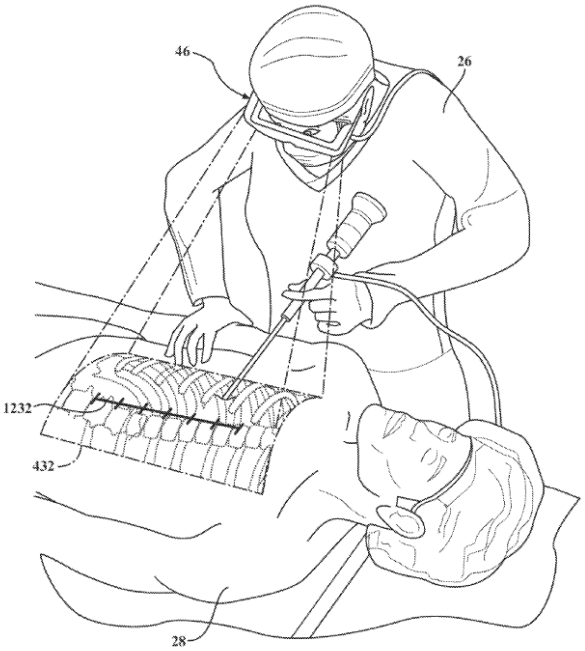


FIG. 7

According to Petitioner, Doo's Figure 7 illustrates a "false 3D" or "2.5D" modality "in which a two-dimensional image can be wrapped around a three dimensional structure, namely the body surface of the patient 28." *Id.* at 37 (citing Ex. 1008 ¶ 75).

Petitioner further points to Doo's Figures 8 and 9, reproduced below, which "illustrate the concept of image wrapping as introduced in . . . Figure 7." *Id.* (citing same).

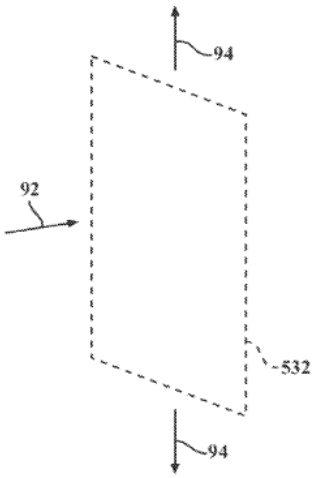


FIG. 8

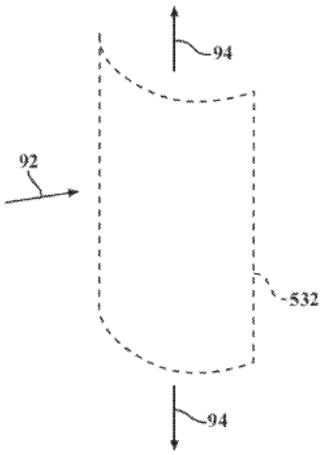


FIG. 9

Petitioner explains that "Figure 8 is a perspective view of a two dimensional image 532 in a planar configuration." *Id.* (citing same). Continuing, Petitioner explains that "Figure 9 is a perspective view of the two-dimensional image 532 shown in Figure 8 but rendered in a warped configuration to mimic the surface curvature of the patient's body." *Id.* (citing same). Petitioner further explains that "[i]n Figure 9, the image 532 has been wrapped around the axis 94." *Id.* Petitioner concludes that the resulting image of the projected inner layer of the patient in Doo's Figure 7 is confined within the volume of the virtual 3D shape illustrated in Figure 9. *Id.* (citing Ex. 1012 ¶ 75).

Patent Owner argues that Doo's curved 2D plane in Figures 7 and 9 cannot confine a 3D volume. PO Resp. 29. Patent Owner contends that "Doo's curved 2D plane, illustrated in Figures 7 and 9, is not 3D data," based on Patent Owner's construction for "3D data." *Id.* at 30. Patent

Owner also presents other arguments based on its construction for "confined within a virtual 3D shape." *Id.*

We need not determine whether Doo's curved plane constitutes "3D data" or "confined within a virtual 3D shape" as construed by Patent Owner because we agree for other reasons that Doo's curved plane does not disclose "the projected inner layer of the patient . . . being confined within a *volume* of a virtual 3D shape."[9]

First, neither the Petition nor Dr. Kazanzides explains how Doo's curved plane teaches the claimed "volume." *See* Pet. 36–37; Ex. 1012 ¶¶ 74–75 (essentially repeating the Petition). The Petition merely asserts that Doo's image in Figure 7 "is confined within the volume of the virtual 3D shape illustrated in Figure 9," without explaining how the shape of Figure 9 has a "volume." Pet. 37. The Reply does no better, asserting that "Doo's shape 532 in Figure 9 and shape 432 in Figure 7 are virtual 3D shapes." Reply 18. This statement is conclusory and does not explain how Doo's "false 3D" shapes have volume. Petitioner further attempts to establish that Doo's disclosure of Figure 9's shape 532 as "mimic[ing] the surface curvature of the patient's body" is evidence that Doo discloses a 3D shape. *Id.* (citing Ex. 1008 ¶ 76). This argument, however, is unpersuasive because it takes Doo's statement out of context. Doo explains that Figure 9's warped "*two*-dimensional image 532 . . . mimic[s] the surface curvature of the patient's body," not that it has volume. *See* Ex. 1008 ¶ 76 (emphasis added). In other words, even though Doo's shape 532 of Figure 9, when projected on a patient's body (as in Figure 7) may appear to a surgeon like a

[9] Our Institution Decision did not rely on Petitioner's theory based on Doo Figures 7–9. We discuss our Institution Decision's reasoning below under Petitioner's second theory based on Doo Figures 6 and 11.

half-cylinder shape having a volume, Doo's technique avoids rendering a 3D shape like a half-cylinder (hence calling these "*false* 3D shapes") because it instead simulates the body's curvature with a mere curved two-dimensional plane.

Second, we find that Doo's curved plane does not, in fact, have a volume.[10] Instead, Doo's curved plane is a 2D plane merely "wrapped around an axis." *See* Ex. 1008 ¶¶ 75–76. As Patent Owner persuasively argued at the hearing, Doo's curved plane is not "half of a cylinder. It's just a wrapped piece of paper." Tr. 33:14–15. Just as curving a piece of paper would not give the curved paper a half cylinder's volume, neither does curving Doo's flat 2D plane create a half cylinder with volume. Viewed another way, curving a 2D plane does not impart volume to the plane any more than curving a 1D line into a parabola would impart area to the 1D line.

During the hearing, Petitioner raised the following argument about volume in response to questioning from the panel:

> JUDGE RAEVSKY: . . . [W]hen it's curved, how does the plane have height, width, and depth in Doo?
>
> MS. FREEMAN: Well okay. If you take a plane and you curve it, then there is a distance between the closer sides and that defines another boundary.

Id. at 43:13–17. This argument is unsupported and unpersuasive. By arguing that Doo's curved plane has "a distance between the closer sides,"

[10] The parties do not dispute the meaning of the term "volume," and we view the term as having its plain and ordinary meaning. The specification uses the term "volume" consistent with its plain and ordinary meaning, describing, for example, a "virtual spatial difference box" that confines a projected inner layer of the patient "within a *volume* of the virtual spatial different box." Ex. 1001, 6:5–8 (emphasis added); *see also* Figs. 1, 2C–2F.

Petitioner attempts to convert Doo's curved plane into a half cylinder. If Doo intended to show a half cylinder, it would have, but it did not, as can be seen again in Figure 9 below:

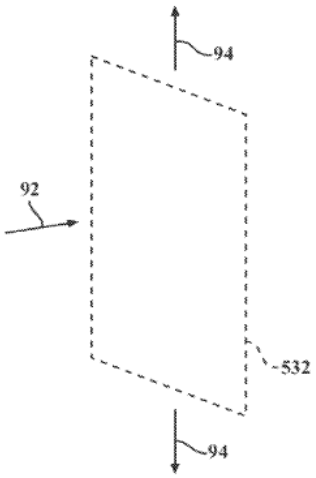


FIG. 8

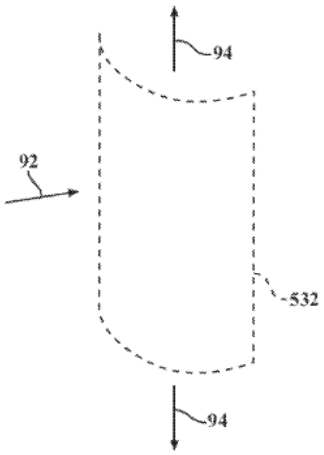


FIG. 9

Doo describes Figure 9's two-dimensional image 532 as merely the flat plane of Figure 8 "wrapped around the axis 94," not a half-cylinder. *See* Ex. 1008 ¶ 76.

Finally, Petitioner also asserted at the hearing that Patent Owner admits that 3D shapes have volume. Tr. 19:10–13 (referring to Opp. 15). In its Opposition to Petitioner's Motion to Exclude, Patent Owner states that "[a] 3D shape has a volume. 'Within a 3D shape' is therefore synonymous with 'within a volume of a 3D shape.'" Opp. 15. Elsewhere, Dr. Rosenberg clarifies that a "virtual 3D shape" is one "capable of confining within its boundaries the 3D data that is . . . superimposed[] onto a patient," so it "does more than merely outline an image projected in a 3D space." Ex. 2004 ¶¶ 89–90. In proper context, then, we do not read Patent Owner's Opposition statement to refer to all 3D shapes, but only to those 3D shapes that are capable of confining a 3D image within their boundaries. Doo

describes its shape in Figures 7 and 9 not as 3D shapes, but rather, as "false 3D" or "2.5D." *See* Ex. 1008 ¶ 75. Petitioner has not persuasively argued that Doo's curved plane is the type of 3D shape that would have volume (such as the half-cylinder as argued by Petitioner at oral argument). In sum, we do not read Patent Owner's Opposition as admitting that Doo's specific shape, the false 3D curved plane, is a 3D shape having volume.

Thus, Petitioner fails to establish that Doo's curved plane has "a volume of a virtual 3D shape" as claimed. Petitioner therefore does not establish that Doo's Figures 7–9 disclose the claimed "projected inner layer of the patient from the 3D data being confined within the volume of a virtual 3D shape."

(2) Doo Figures 6 and 11

Petitioner's second argument is based on Doo's Figures 6 and 11. Pet. 36–38. Petitioner asserts that Figure 11 illustrates "a series of three-dimensional tomographic slices of an anatomical feature of a patient," and argues that Doo discloses "a fusion of several tomographic slices can be stitched together to create a 3D image." *Id.* at 36–37 (citing Ex. 1008 ¶¶ 26, 78). Figure 6 of Doo is reproduced below:

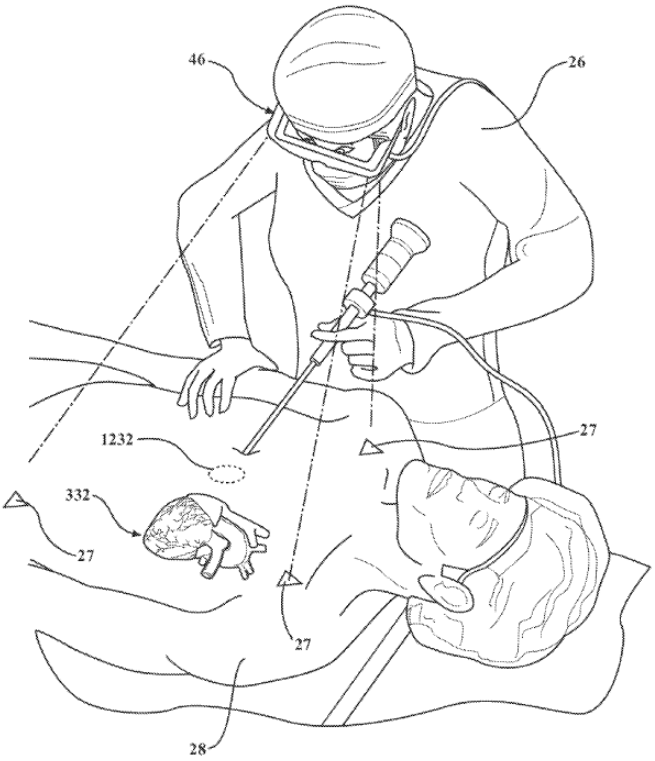
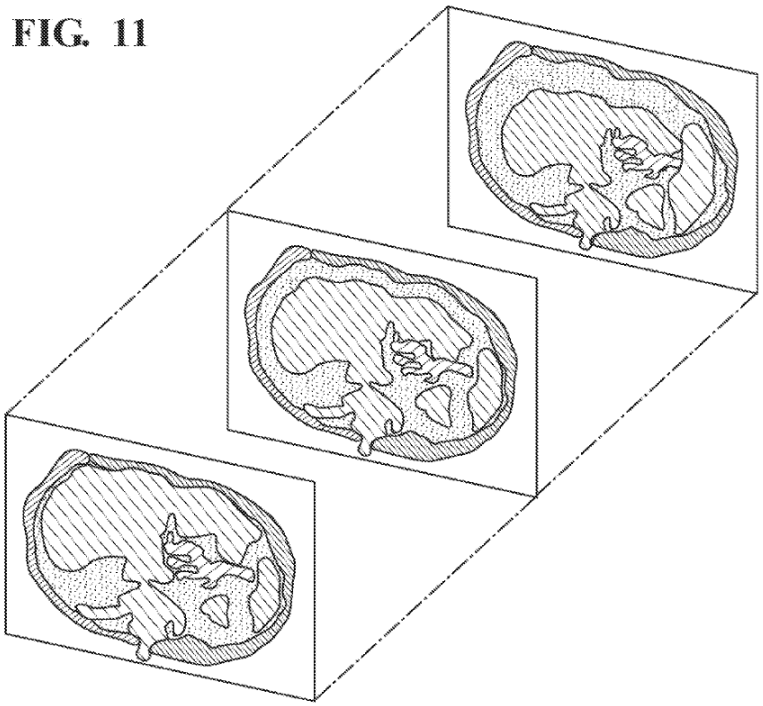


FIG. 6

Petitioner further contends that "Figure 6 illustrates the projection of a virtual heart into a patient." *Id.* "At the relevant time," Petitioner argues, "medical imaging displayed images of a patient[']s inner layers confined within a virtual 3D shape, which may or may not be displayed." *Id.* "For example," Petitioner argues, "Doo's Figure 11 is a series of [3D] tomographic slices" that can be "stitched together to create a 3D image," thereby "forming a virtual 3D shape." *Id.* (citing Ex. 1012 ¶ 76). Figure 11 of Doo is reproduced below:

FIG. 11



According to Petitioner, Figure 11 depicts a virtual 3D shape, namely "a virtual box" including sides illustrated by dashed lines. *Id.* "Each of the inner layers illustrated in Doo's Figure 11 is confined within the virtual 3D shape," Petitioner argues. *Id.* Petitioner also cites Dr. Kazanzides's testimony that a "person of ordinary skill in the art at the relevant time would [have understood] that any projected inner layer of a patient would be confined within a volume of a virtual 3D shape, whether the virtual 3D shape were displayed or not." *Id.* (citing Ex. 1012 ¶¶ 76–77).

First, we address Petitioner's argument regarding how Figure 6 projects "a virtual heart into a patient." Pet. 38. Patent Owner disputes Petitioner's assertion that, "[a]t the relevant time, medical imaging displayed images of a patient[']s inner layers confined within a virtual 3D shape, which may or may not be displayed" because neither Petitioner nor Dr. Kazanzides identifies any reference disclosing this. PO Resp. 28–29 (quoting Pet. 38). The Reply responds that the Petition's statement was not

"conjecture," but rather, that "among other features of conventional medical imaging systems, the Petition discusses the bounding boxes of Amira and 3D-Visualization," and "[b]y definition, a bounding box confines 3D data within a volume." Reply 17–18 (citing Pet. 16–23; Ex. 1005, 40). We find Petitioner's argument unpersuasive because the Reply's reference to Amira and 3D Visualization implicitly relies on obviousness over these references or over the knowledge of a person of ordinary skill in the art described in these references, which has no bearing on anticipation over Doo.[11]

Second, as for Doo Figure 6 itself, Patent Owner points out that the Petition mentions Figure 6's virtual heart projection "but make[s] no further argument on this point." PO Resp. 32. We agree. It appears that Petitioner intends to rely on Figures 6 and 11 together, but the Petition is unclear. *See* Pet. 38. The Reply also does not clarify the Petition's reliance on Figure 6 because it does not discuss Figure 6 at all for this limitation. Reply 17–18. At the hearing, Petitioner argued that "in Figure 6 there's different volumes that *could* be existing," but that is not a persuasive argument that a volume *does* exist in Figure 6. Tr. 43:18–22 (emphasis added). Petitioner further conceded that "[a] virtual 3D shape apart from the heart, and the lines coming off of the goggles is not separately shown" in Figure 6. *Id.* at 44:8–9. Nowhere does Petitioner's briefing address the "lines coming off of the

[11] Although the knowledge of one skilled in the art can be relevant to an anticipation analysis, Petitioner does not rely on any inference that the ordinarily skilled person would have drawn from Doo. *See Eli Lilly and Co. v. Los Angeles Biomedical Res. Inst. at Harbor-UCLA Med. Ctr.*, 849 F.3d 1073, 1074–75 (Fed. Cir. 2017) ("[T]he dispositive question regarding anticipation is whether one skilled in the art would reasonably understand or infer from a prior art reference that every claim element is disclosed in that reference.").

goggles" in Doo Figure 6, nor does Doo appear to discuss them. *See* Ex. 1008 ¶ 74. Thus, there is no persuasive argument of record that these lines constitute a virtual 3D shape. And Petitioner does not explain how Figure 6's virtual heart can be both the virtual 3D shape and the projected inner layer at the same time. Moreover, Petitioner admitted, and we agree, that no volume is "clearly displayed in Figure 6" of Doo. *Id.* at 43:21–22. Not only is no volume "clearly displayed," but no volume is displayed at all. Thus, even if Doo's heart in Figure 6 disclosed both the projected inner layer and the virtual 3D shape, there is no evidence that the heart is "confined within a *volume* of a virtual 3D shape," as claim 1 requires.

Third, as for Doo's Figure 11, Patent Owner responds that this figure shows "a graphical representation of a series of three tomographic slices." PO Resp. 31 (citing Ex. 2002 ¶ 110). The rectangles and dashed lines shown "are only meant to illustrate an alignment of the representative slices," Patent Owner argues. *Id.* (citing Ex. 2002 ¶ 110); Sur-reply 18. Thus, Patent Owner concludes, they are not representative of any virtual 3D shape. PO Resp. 31. We agree.[12]

Our Institution Decision preliminarily agreed with Petitioner's assertion that "[t]he virtual 3D shape illustrated in Doo's Figure 11 is a virtual box including a top side, a bottom side, a left side, a right side, a front side, and a back side." Dec. 11 (citing Pet. 38). Upon review of the full record, we now agree with Patent Owner that the rectangles and dashed lines shown in Figure 11 are not representative of any virtual 3D shape. That is

[12] Patent Owner also raises additional arguments based on its proffered claim constructions. PO Resp. 31. We need not address Patent Owner's constructions because we agree that Doo does not teach this limitation, regardless of Patent Owner's proposed constructions.

because Doo describes Figure 11 not as depicting a virtual box, but as sequentially exhibiting images:

> Figure 11 illustrates the application of a fifth three-dimensional modality, "fly through 3D" in which a series of three-dimensional tomographic slices can be *sequentially exhibited*. Each tomographic slice can be a distinct image. The images allow a surgeon to gain an understanding of the patient's internal anatomy. As referred to previously, a fusion of several tomographic slices can be stitched together to create a 3D image.

Ex. 1008 ¶ 78 (emphasis added). In other words, the "sequentially exhibited" images are represented in Figure 11 by solid and dashed lines, so these lines do not depict a virtual box as Petitioner asserts. *See* Pet. 38. As Figure 11 does not depict a virtual box, but instead a series of sequentially-presented images, Figure 11 does not teach the "virtual 3D shape" of claim 1, let alone disclose a "volume of a virtual 3D shape."

In the Reply, Petitioner argues that "Doo's 'fusion [of 3D slices] create[s] a 3D image' within a bounding box." Reply 18 (quoting Ex. 1008 ¶ 78). This argument is untethered from Doo's disclosure. Although Doo discloses that "a fusion of several tomographic slices can be stitched together to create a 3D image," Doo nowhere mentions a "bounding box." *See* Ex. 1008 ¶ 78. This is gloss added by Petitioner's characterization of Figure 11 as showing a virtual box, when it instead depicts sequential exhibition of images. *See id.* At the hearing, when pressed for an explanation of what constitutes a volume in Figure 11 of Doo, Petitioner could not point to any volume in Figure 11, choosing to address Figure 6 instead. Tr. 43:18–44:4. But as we establish above, Figure 6 does not disclose a volume either.

Lastly, we briefly address Dr. Kazanzides's testimony that a "person of ordinary skill in the art at the relevant time would [have understood] that any projected inner layer of a patient would be confined within a volume of a virtual 3D shape, whether the virtual 3D shape were displayed or not." Pet. 38 (citing Ex. 1012 ¶¶ 76–77). Dr. Kazanzides's testimony that the virtual 3D shape need not be displayed is beside the point because Petitioner relies heavily on Doo's figures for allegedly displaying the claimed "virtual 3D shape." Pet. 36–38. Regardless, we need not decide whether the virtual 3D shape must be displayed or not to meet the claim because, for reasons we explain above, Doo does not disclose "a volume of a virtual 3D shape" in which the projected inner layer is confined.

Thus, neither Figure 11 alone nor together with Figure 6 discloses a projected inner layer being confined within a volume of any virtual 3D shape. Accordingly, Petitioner has not met its burden to show that Doo's Figures 6 and 11 disclose the claimed "projected inner layer of the patient from the 3D data being confined within the volume of a virtual 3D shape."

b. Summary as to Claim 1

Based on the foregoing, Petitioner has not proven by a preponderance of the evidence that Doo anticipates claim 1.

3. Dependent Claims 5 and 6

Petitioner contends that Doo discloses all of the limitations of claims 5 and 6, which depend from claim 1. Pet. 39–40. Because Petitioner fails to establish that Doo anticipates claim 1, Petitioner also fails to establish that Doo anticipates claims that depend therefrom, including claims 5 and 6. We therefore need not reach Patent Owner's specific arguments for claim 5. *See* PO Resp. 32–35; Sur-reply 19.

D. Asserted Obviousness over Doo and Amira

Petitioner contends that claims 1–6 and 11–20 would have been obvious over the combined teachings of Doo and Amira. Pet. 41–54.

1. Overview of Amira

Amira describes a 3D data visualization, analysis and modelling system. Ex. 1005, 15[13]. The system allows a user to visualize scientific data sets from various application areas such as medicine, biology, bio-chemistry, microscopy, biomed, and bioengineering. *Id.* 3D data can be quickly explored, analyzed, compared, and quantified. *Id.* 3D objects can be represented as image volumes or geometrical surfaces and grids suitable for numerical simulations, such as triangular surface and volumetric tetrahedral grids. *Id.* The system provides methods to generate such grids from voxel data representing an image volume, and it includes a general-purpose interactive 3D viewer. *Id.*

2. Rationale to Combine

We solely address Petitioner's rationale to combine because it is dispositive of this ground. Petitioner's entire reason to combine is that "a person of ordinary skill in the art at the relevant time would have been motivated to combine Amira with Doo to enable the intra-operative medical image viewing system and method disclosed in Doo to take advantage of the visualization technology disclosed in Amira (or any similar visualization software)." Pet. 41. Petitioner adds that a POSITA "would have had a reasonable expectation of success in combining the intra-operative medical

[13] All references to the page number in Amira refer to the page numbers inserted by Petitioner in the bottom, right-hand corner of each page in Exhibit 1005.

image viewing system and method disclosed in Doo with the visualization technology disclosed in Amira." *Id.* at 41–42 (citing Ex. 1012 ¶ 103).

The Reply adds that Doo highlights how operating rooms with many display screens cause several problems, including "distraction and cognitive load," and that Doo discloses "'a need for an improved system in which the customary . . . medical images . . . are better managed so that a surgeon [need not] look away from the patient' and has a lower cognitive load." Reply 20 (quoting Ex. 1008 ¶ 10) (citing Ex. 1008 ¶¶ 3, 4–7). Petitioner concludes that, "similar to the '271 Patent, . . . Doo suggests an improvement on conventional medical imaging displays, such as disclosed in Amira." *Id.*

Patent Owner contends, and we agree, that Petitioner has failed to "include articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." PO Resp. 49 (citing, e.g., *KSR Int'l Co. v. Teleflex, Inc.*, 550 U.S. 398, 418 (2007)). Patent Owner further argues, "Petitioner has not provided any meaningful analysis of the art nor provided evidence as to why a POSITA would have been motivated or had success combining the medical image viewing system of Doo with the Amira computer software to arrive at the claims of the '271 Patent." *Id.* at 50. This is true.

The U.S. Supreme Court has emphasized that "rejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *KSR*, 550 U.S. at 418 (quoting *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)). Petitioner's argument fails this standard. Petitioner asserts a generic rationale that one of ordinary skill in the art would have applied Amira to

Doo "to take advantage of the visualization technology disclosed in Amira (or any similar visualization software)." Pet. 41. But Petitioner's assertion contains no explanation *why* one of ordinary skill would have taken advantage of Amira's technology in the context of Doo. Petitioner's rationale is so vague and broad that it could be applied to combine any two references because it merely asserts that one reference would "take advantage of the . . . technology disclosed in" another. *See, e.g., In re Van Os*, 844 F.3d 1359, 1361 (Fed. Cir. 2017) (explaining that "a finding that a combination of prior art would have been . . . 'intuitive' is no different than merely stating the combination 'would have been obvious'"). This approach wholly misses *KSR*'s "articulated reasoning" standard. *See KSR*, 550 U.S. at 418.

The Reply's assertion that reducing a surgeon's cognitive load in Doo "suggests an improvement on conventional medical imaging displays, such as disclosed in Amira," fares no better. Reply 20. This assertion again fails to explain *why* one of ordinary skill in the art would have combined Amira with Doo. For instance, Petitioner provides no explanation as to how Amira's display would further reduce cognitive load. *See* Reply 19–20 (only vaguely referring to Amira's "[t]racking capabilities [that] allow for . . . interaction with the visualization" (Ex. 1005, 14, 26)). Not only that, but Doo itself presents a solution for the cognitive load problem. *See* Ex. 1008 ¶ 14 ("The present invention is particularly adapted to manage the multitude of medical images needed to be viewed by a surgeon during an operation so that a surgeon is not required to look away from the patient, so that the surgeon does not have to sustain heavy cognitive loading."). Petitioner does not persuasively explain why one of ordinary skill in the art would turn to

yet another reference (like Amira) for an additional solution, or even what that solution would be.

Petitioner therefore fails to articulate a persuasive rationale to combine Amira with Doo. Thus, Petitioner has not proven by a preponderance of the evidence that claims 1–6 and 11–20 would have been obvious over the combination of Doo and Amira.

E. Asserted Obviousness over Chen, 3D Visualization, and 3D Slicer

Petitioner further contends that claims 1–6 and 11–20 would have been obvious over the combined teachings of Chen, 3D Visualization, and 3D Slicer. Pet. 54–69.

1. Overview of Chen

Chen is a study that describes an AR-based surgical navigation system using an optical see-through HMD (head-mounted display) aimed at improving the safety and reliability of surgery. Ex. 1009, Abstr. Chen's system, including the calibration of instruments, registration, and the calibration of HMD, causes 3D virtual critical anatomical structures in the HMD to be aligned with the actual structures of a patient during an intra-operative motion tracking process.

2. Overview of 3D Visualization

3D Visualization describes a tutorial for loading and visualizing volumes with 3D Slicer and for interacting in 3D with structural images and models of the anatomy. Ex. 1007, 2. The tutorial provides an introduction to the 3D Slicer software, describes 3D data loading and visualization of images, and describes 3D interactive exploration of the anatomy. *Id.* at 3.

3. Overview of 3D Slicer

3D Slicer includes documentation for Slicer software. Ex. 1010, 1–2. 3D Slicer describes an application menu, toolbar, data probe, 3D viewer, slice viewers, and chart viewers. *Id.* at 1–6.

4. Public Accessibility of Chen, 3D Visualization, and 3D Slicer

We start and end our analysis with public accessibility because this issue is dispositive of this ground. Patent Owner argues that the Petition offers no proof that any of these references were publicly accessible. PO Resp. 19. This is true. *See* Pet. 29–30. The Reply submits some argument for public accessibility, but it is conclusory and unpersuasive. Reply 27–28.

a. Legal Standards for Public Accessibility

Petitioner bears the burden of persuasion in demonstrating unpatentability, and "that burden never shifts to the patentee." *See Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015). One aspect of demonstrating by a preponderance of the evidence that the challenged claims are obvious is demonstrating that the references relied upon are patents or printed publications. *Hulu, LLC v. Sound View Innovations, LLC*, IPR2018-01039, Paper 29 at 11 (PTAB Dec. 20, 2019) (precedential) (citing *Nobel Biocare Servs. AG v. Instradent USA, Inc.*, 903 F.3d 1365, 1375 (Fed. Cir. 2018)). The determination of whether a document was publicly accessible "involves a case-by-case inquiry into the facts and circumstances surrounding the reference's disclosure to members of the public." *Medtronic, Inc. v. Barry*, 891 F.3d 1368, 1380 (Fed. Cir. 2018). In short, "[a] given reference is 'publicly accessible' upon a satisfactory showing that such document has been disseminated or otherwise made available to the extent that persons interested and ordinarily skilled in

the subject matter or art[,] exercising reasonable diligence, can locate it." *SRI Int'l, Inc. v. Internet Sec. Sys., Inc*., 511 F.3d 1186, 1194 (Fed. Cir. 2008).

b. Chen

Petitioner first argues that Chen was copyrighted in 2015 and that this copyright notice "prima facie establishes a prior art date." Reply 27 (citing *FLIR Systems, Inc. v. Leak Surveys, Inc.*, IPR2014-00411, Paper 9 at 18 (PTAB Sept. 5, 2014)). The nonprecedential *FLIR Systems* decision Petitioner cites merely notes that a particular reference's copyright notice "prima facie establishes a prior art date" at institution, not in a final decision. IPR2014-00411, Paper 9 at 18–19. But later Board decisions have rejected the prima facie approach of *FLIR Systems* even at institution: "Numerous Board decisions have held that simply pointing to a date, even a copyright date, is not sufficient at the institution stage to demonstrate public accessibility." *Content Square SAS v. Medallia Inc.*, IPR2022-00316, Paper 13 at 26–27 (citing, e.g., *Microsoft Corp. v. Corel Software, LLC*, IPR2016-01083, Paper 14 at 13–14, 15 (PTAB Dec. 1, 2016) ("The copyright notice, alone, however, sheds virtually no light on whether the document was publicly accessible as of that date, therefore additional evidence is typically necessary to support a showing of public accessibility.")). At this final decision stage, "prima facie" evidence such as a copyright date is even more inadequate, as Petitioner must demonstrate unpatentability by a preponderance of the evidence. *See* 35 U.S.C. § 316(e); *Hulu*, IPR2018-01039, Paper 29 at 11 ("To prevail in a final written decision in an *inter partes* review, the petitioner bears the burden of establishing by a preponderance of the evidence that a particular document is a printed publication.").

The remainder of Petitioner's argument in support of public accessibility is terse. Petitioner states, "Chen . . . appeared online on April 13, 2015, and in print in June 2015. . . . Chen was cited by seven publications by January 2017." Reply 27 (citing Exs. 1009, 1028). In support, Petitioner relies in part on the face of Chen, which states that it was "[a]vailable online 13 April 2015." *Id.*; Ex. 1009, 1. This statement does not prove public accessibility because any reference can state it was published without actually being published. Not only that, but there is no indication in this statement whether Chen was "made available to the extent that persons interested and ordinarily skilled in the subject matter or art[,] exercising reasonable diligence, can locate it." *SRI*, 511 F.3d at 1194. Moreover, Petitioner's assertion that Chen was cited by seven publications does not establish public accessibility. Petitioner does not even supply these publications as exhibits for our inspection to verify these citations. *See* Ex. 1028 ¶ 15 (listing seven alleged publications but not including them as exhibits).

Petitioner also relies on a declaration (Ex. 1028) submitted by Pamela Keyl, a Knowledge Management Research Systems Analyst at Petitioner's law firm. *Id.* ¶ 1 ("Keyl Declaration"). However, the Reply merely cites this declaration without discussion. Reply 27 (citing Ex. 1028 ¶¶ 6–14, 16). This terse citation improperly attempts to incorporate by reference the content of the declaration. But arguments and information not presented and developed in a brief, which are instead incorporated by reference, are not entitled to consideration. 37 C.F.R. § 42.6(a)(3) ("Arguments must not be incorporated by reference from one document into another document."); *see also DeSilva v. DiLeonardi*, 181 F.3d 865, 866–67 (7th Cir. 1999) (Incorporation "by reference amounts to a self-help increase in the length of

the . . . brief[.]"). Accordingly, we do not consider the Keyl Declaration. For this reason alone, Petitioner has made no persuasive argument that Chen was publicly accessible in the relevant timeframe, prior to the earliest priority date of the '271 patent.

Even if we consider the Keyl Declaration, we do not find her supporting testimony credible. Ms. Keyl also appears to be an employee of Petitioner's law firm, McCarter & English, LLP. Ex. 1028 ¶¶ 1–2; Pet. 3; Paper 1, 2 (Power of Attorney). Accordingly, even if we were to review the substance of Ms. Keyl's testimony, we would ascribe it lower weight because of the risk of implicit bias caused by Ms. Keyl's apparent employee relationship with Petitioner's counsel. *See Samsung Elecs. Co., Ltd. v. MemoryWeb, LLC*, PGR2022-00034, Paper 39 at 35 (PTAB Nov. 16, 2023).

Accordingly, Petitioner has failed to establish that Chen was publicly accessible in the relevant timeframe.

c. 3D Visualization

Petitioner's argument for the public accessibility of 3D Visualization is similarly terse and unpersuasive. Reply 27–28. Petitioner asserts that 3D Visualization is "a tutorial by 3D Slicer's Director of Training, like previous trainings given at 22 conferences to more than 2700 people." *Id.* (citing Ex 1007, *passim*; Ex. 1021 ¶¶ 11–23). Petitioner's assertion that 3D Visualization is "*like* previous trainings" given at conferences does not assert that 3D Visualization *itself* was presented at any conferences before any skilled artisans. *See id.* (emphasis added). Thus, this bare assertion does not support public accessibility.

Next, stating that 3D Visualization was "[c]opyrighted '©2012–2014,'" Petitioner asserts that "it was available on the internet on September 30, 2014." *Id.* at 28 (citing Ex. 1007; Ex. 1019; Ex. 1021 ¶¶ 25–29). For

similar reasons as with Chen, Petitioner's copyright assertion does not prove public accessibility of 3D Visualization. Further, Petitioner's bare assertion that 3D Visualization was available on the internet on September 30, 2014 is also entirely unexplained. In support, Petitioner cites, but does not discuss, a Reply declaration by Dr. Kazanzides. *Id.* (citing Ex. 1021 ¶¶ 11–23, 25–29). The Reply's mere citation to this declaration is another impermissible incorporation by reference.

Thus, Petitioner fails to establish that 3D Visualization was publicly accessible in the relevant timeframe.

d. 3D Slicer

As with the previous two references, Petitioner supplies a conclusory argument for the public accessibility of 3D Slicer. Reply 28. Petitioner's entire argument is as follows:

> 3D-Slicer-GUI (Exhibit 1010) was "last edited on 7 November 2016, at 08:06." Ex. 1010, 7. Kazanzides therefore opined that it is documentation that became available on November 8, 2016. Ex. 1021, ¶¶ 34-40.

Id. Again, this mere citation without discussion of Dr. Kazanzides's declaration is an impermissible incorporation by reference. Further, a "last edited" date does not prove that 3D Slicer was publicly accessible as of that date because a document may be edited without being published. For these reasons alone, Petitioner has not shown the public accessibility of 3D Slicer.

Not only is the Reply conclusory, but Dr. Kazanzides's testimony is particularly deficient for this reference. He testifies that the "Release Details disclose that 3D Slicer version 4.6 was last released on November 8, 2016. . . . It makes sense that documentation of 3D Slicer version 4.6 was last edited before that version was released." Ex. 1021 ¶ 38. Not only is this mere speculation, but also, editing is not publishing. Dr. Kazanzides also

compares 3D Slicer with a Page Vault capture in Exhibit 1016. *Id.* ¶ 39. But Exhibit 1016 does not include any date in the relevant timeframe. Apart from a May 15, 2023 timestamp, there is no other date shown, let alone a date shown prior to the earliest priority date of the '271 patent. *See* Ex. 1016, 1–2.

Accordingly, Petitioner has failed to establish that 3D Slicer was publicly accessible in the relevant timeframe.

e. Public Accessibility Conclusion

Because Petitioner has not shown any of the references of this ground to be publicly accessible prior art, Petitioner has not proven by a preponderance of the evidence that claims 1–6 and 11–20 would have been obvious over the combination of Chen, 3D Visualization, and 3D Slicer.

IV. MOTION TO EXCLUDE

Petitioner filed a Motion to Exclude, arguing that both of Patent Owner's declarations, from Drs. Mulumudi and Rosenberg, "should be excluded because they lack the relevance and reliability required for admission." Mot. 1. For example, Petitioner contends that neither declarant qualifies as a POSITA under Petitioner's definition of a POSITA "because neither declarant has the required technical degree, the required experience with augmented reality (AR) devices, and the required understanding of conventional medical imaging data and its visualization." *Id.* Petitioner also points, for example, to each declarant's assertion that they are only "qualified to provide expert opinions on **some aspects** of the technology described in the '271 patent." *Id.* at 3–5 (citing Ex. 2002 ¶ 29; Ex. 2004 ¶ 38).

Patent Owner opposes, arguing that Dr. Rosenberg is "an augmented reality engineer with over 30 years of experience," and that Dr. Mulumudi is "an actual medical doctor with over two decades of 'experience in imaging, virtual reality, augmented reality with biofeedback, and treating peripheral vascular and coronary artery diseases from 2000 through today.'" Opp. 2 (citing Ex. 2004 ¶¶ 13, 16; Ex. 2002 ¶ 13). Patent Owner also asserts that Petitioner improperly reargues the merits in its Motion to Exclude. *Id.*

We need not decide Petitioner's Motion to Exclude because in each instance where we find for Patent Owner above, this finding is due to Petitioner's failure to carry its burden of proof. For instance, as we explain above, Petitioner's anticipation ground based on Doo simply misinterprets several of Doo's figures as showing a projected inner layer of a patient "being confined within a volume within a virtual 3D shape," independent of Patent Owner's claim construction arguments and regardless of Patent Owner's declarant testimony. Further, as we also explain above, Petitioner's obviousness ground based on the combined teachings of Doo and Amira fail due to not articulating a sufficient rationale to combine Doo and Amira, and therefore we also need not rely on Patent Owner's declarants for this ground. And finally, as detailed above, Petitioner fails to show public accessibility for any of the references that make up the obviousness ground based on the combined teachings of Chen, 3D Visualization, and 3D Slicer, so we need not rely on Patent Owner's declarants for this ground either.

Thus, we do not rely on Patent Owner's declarants to support a finding that Petitioner did not meet its burden on any ground. Accordingly, we dismiss Petitioner's Motion to Exclude as moot.[14]

Regardless, Petitioner's objections go more to the weight and sufficiency of the declarants' testimony, rather than their admissibility. *See Liquid Dynamics Corp. v. Vaughan Co.*, 449 F.3d 1209, 1221 (Fed. Cir. 2006). We have broad discretion to assign the proper weight to declarations. *See Velander v. Garner*, 348 F.3d 1359, 1371 (Fed. Cir. 2003). There is also no requirement of a perfect match between the expert's experience and the field of the patent. *See SEB S.A. v. Montgomery Ward & Co.*, 594 F.3d 1360, 1373 (Fed. Cir. 2010). We therefore find in the alternative that the declarants' alleged lack of expertise in some aspects of the technology of the '271 patent is an insufficient reason to exclude their testimony. To the extent portions of our decision may be read to rely on either of Patent Owner's declarants' testimony, we assign sufficient weight to that testimony because that testimony is supported by the teachings of the asserted reference, and Petitioner's countervailing declarant testimony is correspondingly unsupported by the teachings of the asserted reference.

V. CONCLUSION

In summary:

Claim(s)	35 U.S.C. §	Reference(s)/Basis	Claim(s) Shown Unpatentable	Claim(s) Not Shown Unpatentable
1, 5, 6	102	Doo		1, 5, 6

[14] For similar reasons, we do not reach Petitioner's Reply argument that Patent Owner's declarants are not qualified. Reply 1–2.

Claim(s)	35 U.S.C. §	Reference(s)/Basis	Claim(s) Shown Unpatentable	Claim(s) Not Shown Unpatentable
1–6, 11–20	103	Doo, Amira		1–6, 11–20
1–6, 11–20	103	Chen, 3D Visualization, 3D Slicer		1–6, 11–20
Overall Outcome				1–6, 11–20

VI. ORDER

It is, therefore:

ORDERED that Petitioner has not shown by a preponderance of the evidence that claims 1–6 and 11–20 of the '271 patent are unpatentable;

ORDERED that Petitioner's Motion to Exclude is *dismissed* as moot; and

FURTHER ORDERED that, because this is a Final Written Decision, parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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