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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

3SHAPE A/S and 3SHAPE INC.
Petitioners

v.

MEDIT CORPORATION
Patent Owner

Case No. IPR2024-01265
Patent 9,262,864

**PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 9,262,864
UNDER 35 U.S.C. §§311–19 and 37 C.F.R. §42.100 *et seq.***

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I. INTRODUCTION

3SHAPE A/S and 3SHAPE INC. (“Petitioners”) respectfully request *inter partes* review for Claims 3-7 and 9-13 of U.S. Patent No. 9,262,864 (“the ’864 Patent”) (EX1001) in accordance with 35 U.S.C. §§311–19 and 37 C.F.R. §42.100 *et seq.*

II. MANDATORY NOTICES PURSUANT TO 37 C.F.R. §42.8(a)(1)

A. Real Parties-In-Interest

Pursuant to 37 C.F.R. §42.8(b)(1), Petitioners certify that 3Shape A/S, 3Shape Inc., 3Shape Holding A/S, 3Shape Trios A/S, and 3Shape Poland sp. z.o.o. are real parties-in-interest. Out of an abundance of caution, 3Shape Germany GmbH, 3Shape France SAS, 3Shape Italy SRL, 3SHAPE UK LIMITED, 3SHAPE DOOEL Skopje, 3Shape S.A.S., 3Shape (Shanghai) Co., Ltd., 3Shape Do Brasil Soluções Tecnológicas Para Saude Ltda, 3Shape Australia Pty Ltd., 3Shape Trios Sociedad Limitada, 3Shape Japan GK, 3Shape Ukraine Ltd., SC Investment Company, LLC, SoundBite Technology, LLC, Shenzhen Full Contour Design Company Ltd., 3Shape Design Services Costa Rica, S.R.L., 3Shape Design Services, LLC, 3Shape A/S Medical Device Manufacturing (Shanghai) Co. Ltd., 3Shape Korea Ltd., 3Shape Manufacturing US LLC, 3Shape India Limited, EQT IX JAWS BIDCO S.A.R.L., Clausen Engineering APS, Tais Clausen, DM Family Office ApS, Deichmann Media APS, and Nikolaj Hoffmann Deichmann are also identified as real parties-in-interest, for purposes of compliance with 35 U.S.C. §312(a)(2).

B. Identification of Related Matters Under 37 C.F.R. §42.8(b)(2)

The following is a list of any judicial or administrative matters that would affect, or be affected by, a decision in this proceeding:

Related District Court Proceedings

3Shape A/S v. Medit Corporation, Civ. Action No. 22-cv-00443 (W.D. Tex.) (“the 443 Litigation”); and

Medit Corporation v. 3Shape A/S, Civ. Action No. 23-cv-00658 (W.D. Tex.) (“Related Litigation”).¹

Related PTAB Proceeding

3Shape A/S v. Medit Corporation, Petition for *Inter Partes* Review of U.S. Patent No. 9,262,864, filed on August 14, 2024, Case No. IPR2024-01266.

¹ Medit filed its claim of patent infringement of U.S. Patent Nos. 7,912,257; 9,191,648; 9,245,374; and 9,262,864 as affirmative counterclaims in *3Shape A/S v. Medit Corp.*, Case No. :22-cv-00443 (W.D. Tex.) (the “443 Litigation”) on August 18, 2023. On September 8, 2023, the Court ordered Medit’s four affirmative counterclaims for patent infringement to be severed from the ’443 Litigation and be placed in a separate action. EX1016. Medit’s Answer to 3Shape’s Complaint and Affirmative Counterclaims then became the operative complaint in the Related Litigation. EX1015.

Related Applications

The '864 Patent issued from U.S. Patent Application No. 14/487,371, which is a continuation of U.S. Patent Application No. 12/666,464, filed on November 15, 2010 (U.S. Patent 8,866,883), which is a National Stage of PCT International Application No. PCT/US08/68522 (EX1003), which claims priority to U.S. Provisional Application No. 60/947,009, filed on June 29, 2007 (EX1004).

C. Lead and Backup Counsel

Pursuant to 37 C.F.R. §§42.8(b)(3) and 42.10(a), Petitioners hereby identify its lead and backup counsel as follows:

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Powers of Attorney are being filed concurrently herewith in accordance with 37 C.F.R. §42.10(b).

D. Service Information Under 37 C.F.R. §42.8(b)(4)

Petitioners consent to e-mail service at the addresses listed above.

III. PAYMENT OF FEES

The undersigned authorizes the Office to charge Deposit Account No. 02-4800 for fees required by 37 C.F.R. §42.15(a).

IV. REQUIREMENTS UNDER 37 C.F.R. §42.104

A. Grounds for Standing

Pursuant to 37 C.F.R. §42.104(a), Petitioners hereby certify that the '864 Patent is available for *inter partes* review in accordance with 37 C.F.R. §42.102(a)(2). Petitioners are not barred or estopped from requesting *inter partes* review challenging the claims of the '864 Patent on the grounds identified herein.

This Petition is filed within one year from the date on which Petitioners were served counterclaims by Patent Owner in the 443 Litigation, which asserted infringement of the '864 Patent. EX1015.

Neither Petitioners nor its privies have received a final written decision under 35 U.S.C. §318(a) regarding any claim of the '864 Patent on any ground that was raised or could have been raised by Petitioners or its privies in any *inter partes* review, post grant review, or covered business method patent review.

B. Identification of Challenges and Precise Relief Requested

Pursuant to 37 C.F.R. §42.104(b), Petitioners challenge Claims 3-7 and 9-13 of the '864 Patent, and request that these claims be found unpatentable over the prior art for the reasons given below. Petitioners' Grounds for challenging the validity of Claims 3-7 and 9-13 are as follows:

Ground	References	Basis	Claims Challenged
1	U.S. Patent Pub. No. 2003/0018250 ("Trousset") (EX1008) in view U.S. Patent Pub. No. 2002/0055082 ("Durbin") (EX1012)	103	3-7 and 9-13
2	U.S. Patent Pub. No. 2006/0119622 ("Kariathungal") (EX1009) in view of Durbin	103	3-5, 7, and 9-11, 13
3	Kariathungal in view Durbin, and in further view of Trousset	103	6 and 12

In addition to the above prior art, Petitioners rely upon evidence listed in the Exhibit List, including the Declaration and *Curriculum Vitae* of Eli Saber, Ph.D. (EXs1005, 1007). EX1005, ¶¶1-211 supports this Petition, and citations are provided below.

C. Prior Art Qualification of Asserted References

The '864 Patent was filed on September 16, 2014 as U.S. Patent Application No. 14/487,371 ("the '371 Application"). EX1001. The '371 Application is a continuation of U.S. Patent Application No. 12/666,464, filed on November 15,

2010 (U.S. Patent 8,866,883), which is a National Stage of PCT International Application No. PCT/US08/68522, which claims priority to U.S. Provisional Application No. 60/947,009, filed on June 29, 2007.

Even if the '864 Patent is deemed entitled to its earliest priority date, all of the applied references in this Petition are prior art.

Trousset (EX1008), published no later than Jan. 23, 2003, constitutes prior art at least under 35 U.S.C. §102(b).

Kariathungal (EX1009), published no later than June 8, 2006, constitutes prior art at least under 35 U.S.C. §102(b).

Durbin (EX1012), published no later than May 9, 2002, constitutes prior art at least under 35 U.S.C. §102(b).

V. BACKGROUND

A. The '864 Patent

The '864 Patent is generally directed to display of three-dimensional dental data acquired intraorally from a dental patient. EX1001, Abstract. More particularly, the claims challenged in this proceeding concern display of a three-dimensional dental model alongside still images that were acquired during a three-dimensional scan of the dentition, such that “the two views (model and still image) may be synchronized to provide a common perspective of the model's subject matter.” *Id.* According to the '864 Patent, that synchronized display “provides useful visual

information for disambiguating surface features of the model during interactive model processing steps such as marking a margin of a prepared tooth surface for a restoration.” *Id.*

B. The ’864 Patent Examination History

A single office action issued rejecting all claims over U.S. Pat. Pub. No. 2005/0089822 (“Geng”) (EX1013) as anticipated and claim 1 as anticipated by U.S. Pat. Pub. No. 2006/0020363 (“Orth”) (EX1014).² Germane to the challenged claims of this petition, Applicant amended independent Claim 3 to recite “synchronizing the first window and the second window with the processor to provide a common perspective on the subject for both the three-dimensional model and the one of the plurality of images.” EX1002, at 48. Applicant amended independent Claim 9 to recite “synchronize the first window and the second window to provide a common perspective on the subject in both the three-dimensional model and the one of the plurality of images.” EX1002, at 49.

In connection with these amendments, Applicant explained that “a system can store a three-dimensional model that was derived from a sequence of still frames of video data,” and that “the source data – the sequence of still frames from the video feed – can be retained to provide visually clear two-dimensional data of dental

² The issued and pending claims share the same numbering.

content from a variety of poses that were used to generate the three-dimensional model.” EX1002, pp. 52-53. Regarding the amendments, Applicant noted that “these two data sources can usefully be presented into a single workspace to concurrently provide the two different and useful sources of visual information as visual context for accurately determining a margin. The claims have been amended to clarify this inventive concept.” *Id.* at 53. Applicant successfully achieved allowance by arguing Geng (EX1013) and Orth (EX1014) both failed to disclose the claimed feature of “synchronizing the first window and the second window with the processor to provide a common perspective on the subject *for both the three-dimensional model and the one of the plurality of images.*” EX1002, at 13 (emphasis added). Instead, both of the applied references are directed solely to rendering and manipulation of three-dimensional models alone.

As demonstrated below, the prior art relied upon in this Petition explicitly discloses the synchronized three-dimensional model and two-dimensional image display that was absent from the prior art applied by the Examiner.

C. Summary of the Applied Prior Art

1. Troussel (EX1008)

Troussel discloses a system for medical image display that allows a three-dimensional representation to be displayed from a viewpoint corresponding to the viewpoint from which an underlying two-dimensional image was acquired,

simultaneously with the two-dimensional image itself. EX1008, Abstract. And the two-dimensional image is used to construct the three-dimensional representation. *Id.*, Abstract. Troussel includes a single FIGURE with displays 3a, 3b, and 3c – along with storage 5 and 3D representation management subsystem 7. ¶[0019]. Storage 5 stores two-dimensional images acquired by various technologies including X-ray imaging, CT tomography, or magnetic resonance. *Id.* Storage 5 also stores additional imaging parameters “such as the angular orientation of the imaging direction and possibly other parameters: field of view, distance between the source and the detectors, sensor resolution, position of the table on which the patient lies, rotation of the sensors in their plane, rotation of the image acquired, geometric operations on the image, etc.” *Id.* at ¶[0020]. 3D representation management subsystem 7 is configured to reconstruct three-dimensional models from the two-dimensional images stored in storage 5. *Id.* at ¶[0024].

Troussel’s displays 3a, 3b, and 3c allow simultaneous display of various image types, including a three-dimensional representation and a previously acquired two-dimensional image that was used to construct the three-dimensional representation. ¶¶[0022]-[0023]. Such display is from the same viewpoint (i.e. the same imaging orientation), to assist in a surgical procedural theater, as summarized by Troussel:

“[I]n order to display **3D images** corresponding to the models thus reconstructed, the subsystem 7 comprises means for computing which automatically orient **the 3D representation** so that it corresponds *substantially to the same viewpoint* as **a 2D image** with which it must be **displayed on the means 3**, and particularly to the *same imaging orientation as the latter.*” ¶[0027] (emphasis added).

2. Kariathungal (EX1009)

Kariathungal also discloses a system for medical image display that allows a three-dimensional representation to be displayed from a viewpoint corresponding to the viewpoint from which an underlying two-dimensional image was acquired, simultaneously with the two-dimensional image itself. EX1009, Abstract. And the two-dimensional image is used to construct the three-dimensional representation. *Id.*, Abstract.

Kariathungal’s system comprises a computer unit 180 that includes a picture archival communication system (PACS) configured to create a three-dimensional model with a processor from a sequence of images sets stored in a memory. ¶[0024]; ¶[0009]. Kariathungal explains that a variety of different imaging technologies may be used to capture its two-dimensional images stored and managed by its Picture Archival Communication Systems (PACS), including x-ray, ultrasound, CT, MRI, EBT, MR, or nuclear medicine. ¶[0007].

As one example embodiment, Kariathungal's Figure 6 embodiment includes windows/regions 622, 624, 626, or 628 within the same display unit 620 in which one previously acquired two-dimensional image (used to create a three-dimensional model) may be displayed according to its disclosed display protocol. ¶[0042]. Continuing with the Figure 6 embodiment, Kariathungal also discloses rendering a three-dimensional model within one of windows/regions 622, 624, 626, or 628 within the same display unit 620 as a corresponding two-dimensional image in its own "window," as summarized by Kariathungal:

“[A] display protocol for medical imaging equipment may allow at least one three-dimensional medical image to be concurrently displayed with at least one two-dimensional medical image. The three-dimensional medical image may be linked with the two-dimensional medical image so a user can manipulate the viewing angle and pointer in the linked images.” Abstract (emphasis added).

3. Durbin (EX1012)

Durbin “relates to intra-oral methods and apparatus for optically imaging a structure and creating representative 3D models from the images.” Durbin, Abstract. Significant to this Petition, Durbin evidences the understanding of a POSITA concerning multi-aperture scanning systems and the capture of image sets with each image in the set captured from a different optical axis:

“FIG. 3 shows another embodiment with multiple image apertures that require only lateral motion. In this embodiment a plurality of image apertures 132A and the illuminator(s) 134A are mounted in a known orientation to one another on a laterally moveable apparatus. The number of image apertures and their orientation is selected to provide sufficient coverage and overlap of the dental structure to be modeled at the desired resolution. At each lateral position, an image from each of the apertures 132A is recorded for later processing.” Durbin, ¶[0047].

D. Person of Ordinary Skill in the Art (“POSITA”)

A POSITA is presumed to be aware of all pertinent art, thinks along conventional wisdom in the art, and is a person of ordinary creativity. Regarding the ’864 Patent, a POSITA would have at least (1) a bachelor’s degree in electrical engineering, computer engineering, computer science, or an equivalent field, as well as at least two to three years of industry or research experience with computer vision/graphics making use of three-dimensional virtual models; or (2) a master’s degree in electrical engineering, computer engineering, computer science, or an equivalent field with a focus in making use of three-dimensional virtual models in the area of computer vision/graphics. EX1005, ¶¶35-36.

VI. CLAIM CONSTRUCTION

The Board only construes the claims when necessary to resolve the underlying controversy. *Toyota Motor Corp. v. Cellport Systems, Inc.*, IPR2015-00633, Paper 11 at 16 (PTAB Aug. 14, 2015) (citing *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)). Given the Markman Order (EX1017) in the Related Litigation indicating that certain disputed terms are to take on their plain and ordinary meaning under the *Phillips* standard, Petitioner believes that no express constructions of the claims are necessary for this proceeding. Petitioners apply the plain and ordinary *Phillips* meaning in the Grounds below.

While the proper metes and bounds of these terms are disputed, the cited prior art falls within these bounds whatever they may be. The prior art meets the language of the claims regardless of whether a plain and ordinary meaning is applied or if Petitioner's non-adopted litigation construction is adopted. The Challenged Claims are unpatentable under all the potential constructions. Petitioners are not waiving their right to contest indefiniteness in the Related Litigation by virtue of this Petition.

VII. PETITIONERS HAVE A REASONABLE LIKELIHOOD OF PREVAILING

Obviousness under 35 U.S.C. §103 is determined by evaluating several factual inquiries, namely the scope and content of the prior art, ascertaining the differences between the claimed invention and the prior art, and resolving the level of ordinary skill in the relevant art, as well as considering any objective evidence of “secondary

considerations” relevant to obviousness. *Graham v. John Deere Co.*, 383 U.S. 1 (1966). Further, the purported invention of the ‘864 Patent is nothing more than the combination of well-known technologies and techniques yielding a predictable outcome. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007).

The following explains why Claims 3-7 and 9-13 of the ‘864 Patent are unpatentable over the prior art asserted in Grounds 1-3.

A. Claims 3-7 and 9-13 Would Have Been Obvious Over Troussel in View of Durbin (Ground 1).

The following sections explain where each element of Claims 3-7 and 9-13 is found in the prior art of Troussel and Durbin.

1. Claim 3 (Preamble): A method comprising:

Troussel discloses a method that includes the steps (among others) of creating a three-dimensional model [3.1], along with displaying one of the plurality of images (used to create that model) in a first window of a display [3.2] and rendering the three-dimensional model with its processor in a second window of the display [3.3]. EX1005, ¶58.

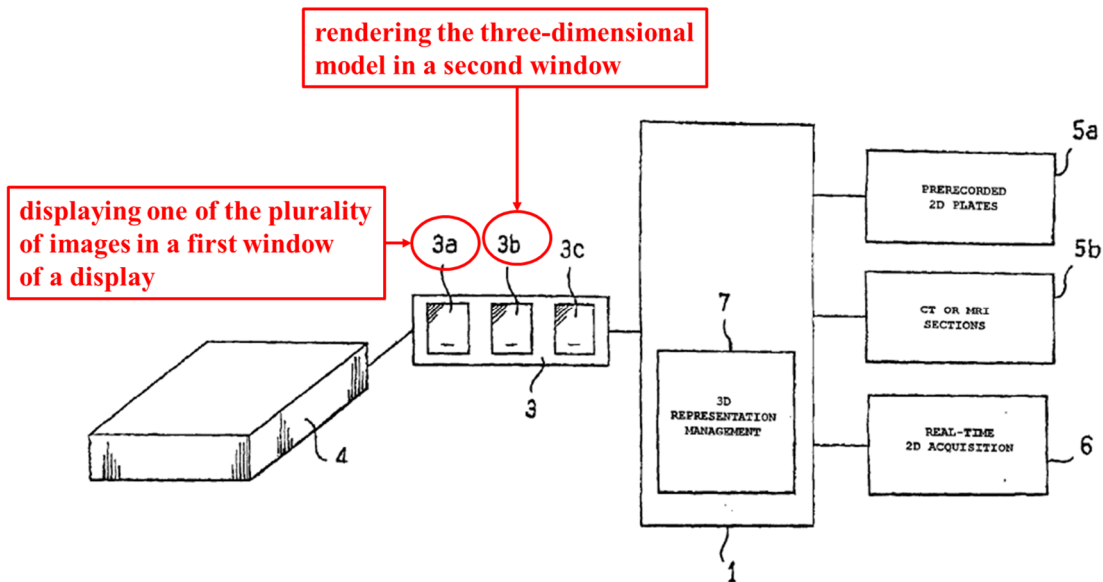
As Troussel succinctly explains:

“In the example illustrated in the drawing FIGURE, provision the means for display 3 may comprise three different screens 3a, 3b, and 3c, allowing the simultaneous display of these various image types.”

¶[0023] (emphasis added)

“[I]n order to display 3D images corresponding to the models thus reconstructed, the subsystem 7 comprises means for computing which automatically orient the 3D representation so that it corresponds *substantially to the same viewpoint* as a 2D image with which it must be displayed on the means 3, and particularly to the *same imaging orientation as the latter*.” ¶[0027] (emphasis added); see also Abstract. EX1005, ¶59.

An example of Troussel’s FIGURE annotated to reflect its disclosure is as follows (annotations in **RED**):



EX1005, ¶60.

- a. **[3.1]: creating a three-dimensional model with a processor from a sequence of image sets stored in a memory, each image set including a plurality of images of a subject, each one of the plurality of images in each image set captured from a different optical axis;**

Trousset discloses “creating a three-dimensional model with a processor from a sequence of image sets stored in a memory.”

Trousset’s system includes a processing unit 1 with a 3D representation management subsystem 7 as the claimed processor. ¶[0019] (“The drawing FIGURE shows schematically an imaging system comprising a means for processing unit 1 and means forming an interface 2 which comprise one or more screens 3 and a control box 4, for example, with buttons and a joystick.”). ¶[0022] (“[The processing unit 1] also manages, via a subsystem 7, the reconstruction of 3D models and the display of corresponding images.”). EX1005, ¶63.

Trousset’s processing unit 1 via 3D representation management subsystem 7 is configured to create a three-dimensional model from a sequence of image sets stored in storage 5 as the claimed memory:

“The three-dimensional models are, in particular, reconstructed by the subsystem 7 from 2D images and particularly from some of the images acquired by X-ray (not fluoroscopy) prior to the operation and stored in the means for storage 5a.” ¶[0024]; *see also* ¶[0016] (3D models from X-ray images); ¶[0017] (3D models from CT

or MRI); ¶[0019] (storage of previously acquired 2D images); ¶[0024], ¶[0026] (3D model reconstruction from previously acquired 2D images); Claim 17 (3D models from X-rays); Claim 18 (3D models from CT or MRI).

“A method and system for medical image display comprising means for acquiring two-dimensional images; means for displaying images; means for managing the display of a three-dimensional representation on the means display and for **automatically orienting the three-dimensional representation** according to at least one operating parameter of the means for acquisition means so that **the three-dimensional representation** is viewed on the means for display **from a viewpoint corresponding to that** from which the means for image acquisition acquire or **have acquired a two-dimensional image.**”

Abstract (emphasis added). EX1005, ¶64.

Concerning “each image set including a plurality of images of a subject, each one of the plurality of images in each image set captured from a different optical axis,” Troussel’s stored two-dimensional images used to create its three-dimensional model are sets of images. And, each one of the plurality of images in each image set was captured from a different optical axis. Troussel uses the information concerning the parameters of the two-dimensional image acquisition to drive its process of orienting its three-dimensional model into the same perspective, including the

angular position of the imaging means that was used during the imaging process as a “different optical axis” as between individual images. EX1005, ¶65.

As explained by Troussel:

“For each image or plate, the means for storage 5 a and 6 store, in addition to the matrices with pixels, **the imaging parameters to which the image corresponds**, such as the **angular orientation of the imaging direction** and possibly other parameters: field of view, distance between the source and the detectors, sensor resolution, position of the table on which the patient lies, **rotation of the sensors in their plane, rotation of the image acquired**, geometric operations on the image, etc.” ¶[0020] (emphasis added)

“The processing implemented by the means for computing of the subsystem 7 for automatically orienting the 3D representation may be particularly simple and, for example, be based on a **simplified geometric description of the parameters involved on image acquisition**. In particular, the path of the X-ray tubes and of the detectors around their pivot shaft may be deduced simply **from information relating to the angular position**.” ¶[0030] (emphasis added); *see also* ¶¶[0027]-[0028], [0033], [0008], [0011]-[0011], (discussing parameters relating to imaging orientation of 2D images). EX1005, ¶66.

While Troussel does not expressly state precisely how its two-dimensional images were obtained from different optical axes and stored in its sets to implement its viewing capabilities discussed above, multi-aperture scanner/camera arrangements were known to obtain a plurality of two-dimensional image sets such that “each one of the plurality of images in each image set [is] captured from a different optical axis.” In such arrangements, images are obtained from different optical axes and stored its sets not by simply moving the imaging apparatus (e.g. an intra-oral scanner) relative to the structure being imaged, but instead multiple images from different optical axes are captured at the same overall position of the imaging apparatus relative to the structure being imaged using the multiple apertures. EX1005, ¶67.

The ’864 Patent acknowledges these multi-aperture scanner/camera arrangements that obtained a plurality of two-dimensional image sets such that “each one of the plurality of images in each image set [is] captured from a different optical axis” were known in the prior art. As stated by the ’864 Patent:

“While Rohály discloses one multi-aperture system, it will be appreciated that any multi-aperture system suitable for reconstructing a three-dimensional point cloud from a number of two-dimensional images may similarly be employed.” EX1001, 9:9-13. EX1005, ¶¶68-69.

Durbin discloses a multi-aperture arrangement that a POSITA would have understood is exemplary of how the two-dimensional images of Troussset's system would have been captured and organized to implement its system with viewing capabilities of two-dimensional images from different optical axes:

“FIG. 3 shows another embodiment with multiple image apertures that require only lateral motion. In this embodiment a plurality of image apertures 132A and the illuminator(s) 134A are mounted in a known orientation to one another on a laterally moveable apparatus. The number of image apertures and their orientation is selected to provide sufficient coverage and overlap of the dental structure to be modeled at the desired resolution. At each lateral position, an image from each of the apertures 132A is recorded for later processing.” Durbin, ¶[0047]. EX1005, ¶70.

b. [3.2]: displaying one of the plurality of images in a first window of a display:

Troussset's system displays one of its plurality of images in a first window of a display. Specifically, Troussset teaches display of one of its two-dimensional previously acquired images on one of screens 3a, 3b, or 3c as the claimed “first window of a display.”:

“In the example illustrated in the drawing FIGURE, provision the means for display 3 may comprise three different screens 3a, 3b, and 3c, allowing the

simultaneous display of these various image types.”

¶[0023] (emphasis added).

“[I]n order to display 3D images corresponding to the models thus reconstructed, the subsystem 7 comprises means for computing which automatically orient the 3D representation so that it corresponds substantially to the same viewpoint as **a 2D image** with which it must be **displayed on the means 3**, and particularly to the same imaging orientation as the latter.” ¶[0027] (emphasis added). EX1005, ¶73.

Trousset’s individual screens 3a, 3b, and 3c are individual windows. In addition, Trousset contemplates images displayed simultaneously within regions of a single one of screens 3a, 3b, or 3c as the claimed “windows”:

“Of course, other types of display are possible; in particular, the various image types can be displayed simultaneously on the same screen, subdivided into several display regions.” ¶[0023]. EX1005, ¶74.

c. [3.3]: rendering the three-dimensional model with the processor in a second window of the display; and

Trousset’s system renders the three-dimensional model with its processor (processing unit 1 via 3D representation management subsystem 7) in a second window of the display. Specifically, Trousset teaches rendering the three-

dimensional model on one of screens 3a, 3b, or 3c, or within the same screen as a corresponding two-dimensional image in its own “window” as the claimed “second window of a display.”

“In the example illustrated in the drawing FIGURE, provision the means for display 3 may comprise three different screens 3a, 3b, and 3c, **allowing the simultaneous display of these various image types**. Of course, other types of display are possible; in particular, the various image types can be displayed simultaneously on the same screen, **subdivided into several display regions**.” ¶[0023] (emphasis added).

“[I]n order to display **3D images** corresponding to the models thus reconstructed, the subsystem 7 comprises means for computing which automatically orient the 3D representation so that it corresponds substantially to the same viewpoint as a 2D image with which it must be **displayed on the means 3**, and particularly to the same imaging orientation as the latter.” ¶[0027] (emphasis added). EX1005, ¶77.

- d. **[3.4]: synchronizing the first window and the second window with the processor to provide a common perspective on the subject for both the three-dimensional model and the one of the plurality of images**

Trousset's display of its two-dimensional image and rendering of its three-dimensional model are synchronized between its first and second windows, as Trousset explains:

“[I]n order to display **3D images** corresponding to the models thus reconstructed, the subsystem 7 comprises means for computing which automatically orient **the 3D representation** so that it corresponds *substantially to the same viewpoint* as **a 2D image** with which it must be **displayed on the means 3**, and particularly to the *same imaging orientation as the latter*.” ¶[0027] (emphasis added); *see also* ¶[0023] (discussing simultaneous display).

“When the radiologist now wishes better understanding of a series of prerecorded 2D images, a second operating mode for the system is selected. In the second mode, the means for storage 5 automatically transmit the parameters relating to the imaging which corresponds to the series of image on which the radiologist wishes to focus, to the subsystem 7 which manages the 3D image. The subsystem 7 **then automatically adjusts the 3D representation so that it corresponds to the same viewpoint and possibly**

to the same scale and to the same centering as the 2D plates which are displayed. ¶[0033] (emphasis added); ¶[0034] (preselected orientations); Claim 1(c); Claim 3; Claim 4; Claim 19(c); Claim 20(d). EX1005, ¶80.

2. **Claim 4: The method of claim 3 further comprising receiving a user selection of a different one of the plurality of images and rotating the three-dimensional model to maintain the common perspective.**

Trousset's system allows a user to select a different one of the plurality of images (used to construct its three-dimensional model) which rotates its three-dimensional model to maintain the common perspective:

“When the radiologist now wishes better understanding of a series of prerecorded 2D images, a second operating mode for the system is selected. In the second mode, the means for storage 5 automatically transmit the parameters relating to the imaging which corresponds to the series of image on which the radiologist wishes to focus, to the subsystem 7 which manages the 3D image. The subsystem 7 **then automatically adjusts the 3D representation so that it corresponds to the same viewpoint and possibly to the same scale and to the same centering as the 2D plates which are displayed.**” ¶[0033] (emphasis added); *see also* ¶[0022] (discussing user selection of 2D images); ¶[0024] (discussing creation of 3D models from 2D images); ¶[0028] (discussing translating 3D model);

¶¶[0029], [0031] (discussing scaling 3D model); Abstract, ¶¶ [0007], [0010], [0011], [0027] (discussing display of 3D model in the same orientation as stored 2D image). EX1005, ¶83.

3. Claim 5: The method of claim 3 further comprising receiving a user selection of a different one of the plurality of images and translating the three-dimensional model to maintain the common perspective.

Trousset's system allows a user to select a different one of the plurality of images (used to construct its three-dimensional model) which *translates* its three-dimensional model to maintain the common perspective:

“Also, the means for management comprises means for automatically translating the three-dimensional representation and in centering it in the same way as a two-dimensional image acquired in real time or previously acquired. It may also comprise means for automatically adjusting the scale of the three-dimensional representation with respect to a two-dimensional image acquired in real time or previously acquired.” ¶[0012] (emphasis added); *see also* ¶[0028], Claims 5-7. EX1005, ¶86.

4. **Claim 6: The method of claim 3 further comprising receiving a user selection of a different one of the plurality of images and scaling the three-dimensional model to maintain the common perspective.**

Trousset's system allows a user to select a different one of the plurality of images (used to construct its three-dimensional model) which *scales* its three-dimensional model to maintain the common perspective:

“Also, the means for management comprises means for automatically translating the three-dimensional representation and in centering it in the same way as a two-dimensional image acquired in real time or previously acquired. It may also comprise means for automatically adjusting the scale of the three-dimensional representation with respect to a two-dimensional image acquired in real time or previously acquired.” ¶[0012] (emphasis added); *see also* ¶[0029], [0031], Claim 8-14, Claim 21-22. EX1005, ¶89.

5. **Claim 7: The method of claim 3 further comprising receiving a user selection of a different perspective of the three-dimensional model and selecting a new one of the plurality of images to maintain the common perspective.**

Trousset's system allows a user to select a different perspective of the three-dimensional model which selects a new one of the plurality of images (used to construct its three-dimensional model) to maintain the common perspective:

“In a third operating mode, the means for management unit is programmed to allow the radiologist to store one or more orientations which correspond to particularly interesting views of the anatomical region that is being studied, when analysis is made of the 3D model. The radiologist may then recall these preselected orientations during the operations.” ¶[0034]. EX1005, ¶92.

6. Claim 9 (Preamble): A system comprising:

Trousset discloses a system with each of the claimed features of claim 9, as detailed below. *See also* Claim 3 (detailing the method of 2D and 3D display of Trousset’s system). EX1005, ¶95.

- a. **[9.1]: a memory storing a three-dimensional model of a subject and a sequence of image sets used to create the three dimensional model, each image set including a plurality of images of a subject, each one of the plurality of images in each image set captured from a different optical axis;**

Trousset’s system includes a memory that can store a previously constructed three-dimensional model of a subject:

“In a third operating mode, the means for management unit is programmed to allow the radiologist to store one or more orientations which correspond to particularly interesting views of the anatomical region that is being studied, when analysis is made of the 3D model. The

radiologist may then recall these preselected orientations during the operations.” ¶[0034]. EX1005, ¶97.

The claim language concerning three-dimensional model creation and image sets is substantially the same as that for Claim 3, element [3.1], which is incorporated here by reference. In addition, a POSITA would have appreciated that any generated three-dimensional model in Troussel will be stored in a memory, whether temporary or persistent. EX1005, ¶98.

b. [9.2]: a display configured to provide a user interface displaying one of the plurality of images in a first window; and

Troussel’s display 3 is connected to control box 4 which may include a keyboard, buttons, and a joystick as a user interface to its system, which allows selections such as a specific two-dimensional image among the stored sets:

“The drawing FIGURE shows schematically an imaging system comprising a means for processing unit 1 and means forming an interface 2 which comprise one or more screens 3 and a control box 4, for example, with buttons and a joystick.” ¶[0019].

“The means for processing unit 1 manages the display of the 2D plates acquired before the operation or of the 2D images acquired in real time, depending on the selections controlled by the user from the interface keyboard 4.” ¶[0022]. EX1005, ¶101.

As explained above with reference to Claim 3, element [3.2], Troussel's display is configured to display one of its plurality of images in a first window. EX1005, ¶102.

- c. **[9.3]: a processor configured to render the three-dimensional model in a second window displayed in the user interface concurrently with the one of the plurality of images in the first window and to synchronize the first window and the second window to provide a common perspective on the subject in both the three-dimensional model and the one of the plurality of images.**

As explained above with reference to Claim 3, element [3.1] Troussel's processing unit 1 via 3D representation management subsystem 7 is configured to create a three-dimensional model from a sequence of image sets stored in a memory as storage 5. EX1005, ¶105.

The claim language concerning rendering the created three-dimensional model in a second window is substantially the same as that for Claim 3, elements [3.3] and [3.4], which is incorporated here by reference. EX1005, ¶106.

- 7. **Claim 10: The system of claim 9 wherein the processor is configured to receive a user selection of a different one of the plurality of images and rotate the three-dimensional model to maintain the common perspective.**

See Claim 4 addressing identical language, but in method form.

8. **Claim 11: The system of claim 9 wherein the processor is configured to receive a user selection of a different one of the plurality of images and translate the three-dimensional model to maintain the common perspective.**

See Claim 5 addressing identical language, but in method form.

9. **Claim 12: The system of claim 9 wherein the processor is configured to receive a user selection of a different one of the plurality of images and scale the three-dimensional model to maintain the common perspective.**

See Claim 6 addressing identical language, but in method form.

10. **Claim 13: The system of claim 9 wherein the processor is configured to receive a user selection of a different perspective of the three-dimensional model and select a new one of the plurality of images to maintain the common perspective.**

See Claim 7 addressing identical language, but in method form.

11. **Explanation of Why Claims 3-7 and 9-13 Would Have Been Obvious over Troussel in View of Durbin**

Claims 3-7 and 9-13 would have been obvious over Troussel in view of Durbin. EX1005, ¶120.

- a. **Difference between the claimed invention and the prior art.**

As discussed above, Troussel discloses details concerning the use of its model and two-dimensional image viewing system, but it does not expressly state precisely how its two-dimensional images are captured from different optical axes and stored to implement its viewing capabilities. Durbin provides that express disclosure in the form of a multi-aperture scanner/camera arrangement that obtains a plurality of two-

dimensional image sets such that “each one of the plurality of images in each image set [is] captured from a different optical axis.” EX1005, ¶121.

b. A POSITA would have had motivation to combine the disclosures of Troussel and Durbin.

A POSITA would have been motivated to apply Durbin’s disclosure concerning multi-aperture scanner/camera arrangements that obtain a plurality of two-dimensional images from different optical axes to confirm how a POSITA would have implemented Troussel’s existing model and two-dimensional imaging viewing system. Given the existing details of Troussel’s system that allows for viewing of two-dimensional images from different optical axes, a POSITA would have already been aware that multi-aperture scanner/camera arrangements, such as the one disclosed in Durbin, provided the ability to capture two-dimensional images in a form that readily met the requirements of Troussel’s system for recall and later viewing. In addition, Durbin itself provides motivation to a POSITA to use its multi-aperture scanner/camera arrangement disclosure because it efficiently facilitates “automated intra-oral scanning of all the dental structures in the jaw through an optical aperture and combines the information available in the entire set of images to create and present an accurate 3D model of the scanned structures. The system allows intra oral images of dental structures *to be taken rapidly and with high resolution such that the acquired images can be processed into accurate 3D models of the imaged dental structures.*” ¶[0024] (emphasis added). Even further,

the understanding that multi-aperture scanner/camera arrangements such as that disclosed in Durbin were known in the prior art is confirmed by the '864 Patent itself. EX1001, 9:9-13. EX1005, ¶122.

c. A POSITA would have had a reasonable expectation of success based on the disclosures of Troussel and Durbin and knowledge generally available in the art.

A POSITA would have had a reasonable expectation of success in making the combination of Troussel's model and two-dimensional imaging viewing system with the multi-aperture scanner/camera disclosure of Durbin relating to capture of two-dimensional images from multiple optical axes. This is so because both references are directed to generation of three-dimensional models from underlying two-dimensional images. *See* Discussion above regarding element [3.1] (concerning Troussel's model generation), and Durbin, ¶[0052]-[0052] (concerning Durbin's model generation). And, Durbin simply provides a POSITA's existing understanding of capture of two-dimensional images using a multi-aperture scanner/camera arrangement which two-dimensional images would have been stored in Troussel's existing storage system to facilitate its viewing capabilities. EX1005, ¶123.

Combining the disclosures of Troussel with Durbin would only require the use of "known methods"—using each in the same way they were used as disclosed. Specifically, Troussel already discloses maintenance of a three-dimensional model

in a common perspective based on selection of a two-dimensional image and all the viewing capabilities of its underlying model and imaging viewing system – And, Durbin provides the POSITA’s existing understanding of capture of two-dimensional images using a multi-aperture scanner/camera technique demonstrating how a POSITA would have understood two-dimensional images would have been captured to support Troussel’s model and two-dimensional imaging viewing and stored in its preexisting storage system. None of the methods would need to be used in an unexpected or unintended way. Each would be fulfilling its original purpose and used in an expected way. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007) (“The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results. . . . [W]hen a patent claims a structure already known in the prior art that is altered by the mere substitution of one element for another known in the field, the combination must do more than yield a predictable result.”). EX1005, ¶124.

The combination of Troussel renders obvious all the recited features of Claims 3-7 and 9-13. EX1005, ¶125.

B. Claims 3-5, 7, 9-11, and 13 Would Have Been Obvious Over U.S. Kariathungal in view of Durbin (Ground 2).

The following sections explain where each element of Claims 3-5, 7, 9-11, and 13 is found in the prior art of Kariathungal and Durbin.

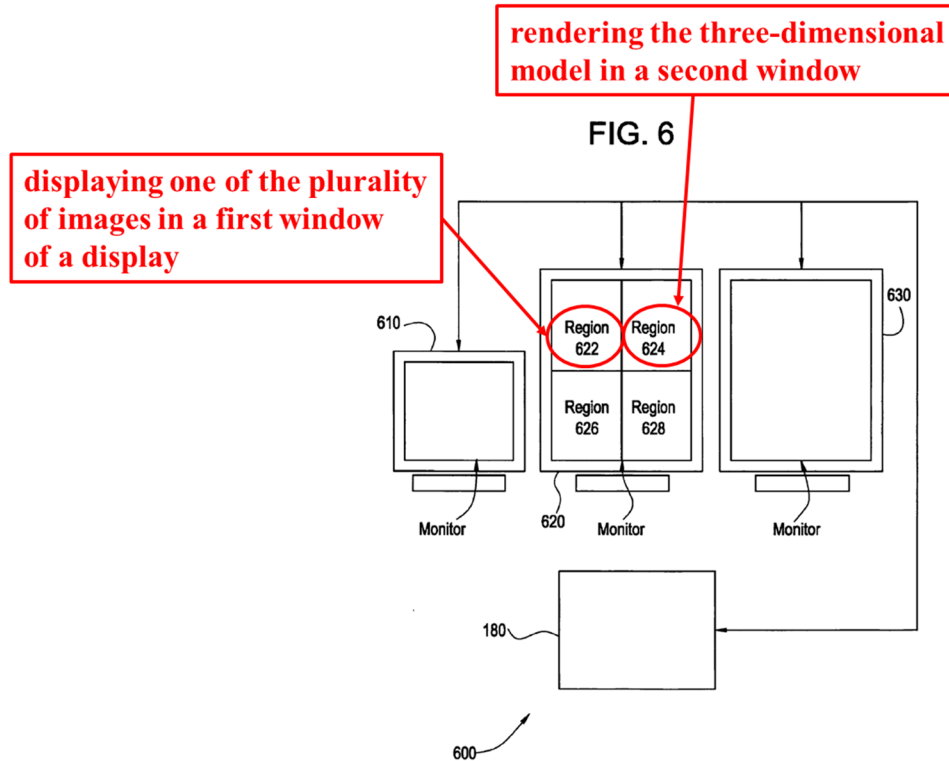
1. Claim 3 (Preamble): A method comprising:

Kariathungal discloses a method that includes the steps (among others) of creating a three-dimensional model [3.1], along with displaying one of the plurality of images (used to create that model) in a first window of a display [3.2] and rendering the three-dimensional model with its processor in a second window of the display [3.3]. EX1005, ¶127.

As Kariathungal succinctly explains:

“[A] display protocol for medical imaging equipment may allow at least one three-dimensional medical image to be concurrently displayed with at least one two-dimensional medical image. The three-dimensional medical image may be linked with the two-dimensional medical image so a user can manipulate the viewing angle and pointer in the linked images.” Abstract. EX1005, ¶128.

An example of Kariathungal’s display protocol is demonstrated below with an annotated version of Figure 6 to reflect its disclosure (annotations in **RED**):



EX1005, ¶129.

- a. **[3.1]: creating a three-dimensional model with a processor from a sequence of image sets stored in a memory, each image set including a plurality of images of a subject, each one of the plurality of images in each image set captured from a different optical axis;**

Kariathungal discloses “creating a three-dimensional model with a processor from a sequence of image sets stored in a memory.”

Kariathungal’s system comprises a computer unit 180 that includes a picture archival communication system (PACS) configured to create a three-dimensional model with a processor from a sequence of images sets stored in a memory. ¶[0024] (“The system 100 also includes a computer unit 180...In an embodiment, the

computer unit 180 may be, or may be part of, a picture archival communication system (PACS).”); ¶[0009] (“As computer and medical imaging technology has become more sophisticated, the PACS diagnostic workstations have become capable of creating a reformatted three-dimensional model from the two-dimensional data sets.”). EX1005, ¶132.

Concerning “each image set including a plurality of images of a subject, each one of the plurality of images in each image set captured from a different optical axis,” Kariathungal’s stored two-dimensional images used to create its three-dimensional model are sets of images. And, each one of the plurality of images in each image set were captured from a different optical axis. Kariathungal uses the information concerning the orientation relative to the subject from which the image was taken to drive its process of orienting its three-dimensional model into the same perspective, including the position of the imaging means that was used during the imaging process as a “different optical axis” as between individual images. EX1005, ¶133.

Kariathungal explains that a variety of different imaging technologies may be used to capture its two-dimensional images stored and managed by its Picture Archival Communication Systems (PACS):

“An example of a medical diagnostic imaging system is Picture Archival Communication Systems (PACS). PACS is a term for equipment and software that permits images,

such as x-rays, ultrasound, CT, MRI, EBT, MR, or nuclear medicine for example, to be electronically acquired, stored and transmitted for viewing. Images from an exam may be viewed immediately or stored, or transmitted.” ¶[0007]; *see also* ¶[0024] (applicable imaging technologies).

“The images acquired on a PACS system are generally two-dimensional datasets from imaging devices.” ¶[0008].

EX1005, ¶134.

These technologies provide images of different orientations relative to the subject, including axial images, sagittal images, coronal images, or oblique images:

“The two-dimensional medical images may comprise an axial image, a sagittal image, a coronal image, or an oblique image.” ¶[0014]; ¶[0006] (discussing imaging relative to subject being imaged).

EX1005, ¶135.

While Kariathungal does not expressly state precisely how its two-dimensional images were obtained from different optical axes and stored in its sets to implement its viewing capabilities discussed above, multi-aperture scanner/camera arrangements were known to obtain a plurality of two-dimensional image sets such that “each one of the plurality of images in each image set [is] captured from a different optical axis.” In such arrangements, images are obtained from different optical axes and stored in its sets not by simply moving the imaging

apparatus (e.g. an intra-oral scanner) relative to the structure being imaged, but instead multiple images from different optical axes are captured at the same overall position of the imaging apparatus relative to the structure being imaged using the multiple apertures. EX1005, ¶136.

The '864 Patent acknowledges these multi-aperture scanner/camera arrangements that obtained a plurality of two-dimensional image sets such that “each one of the plurality of images in each image set [is] captured from a different optical axis” were known in the prior art. As stated by the '864 Patent:

“While Rohály discloses one multi-aperture system, it will be appreciated that any multi-aperture system suitable for reconstructing a three-dimensional point cloud from a number of two-dimensional images may similarly be employed.” EX1001, 9:9-13.

EX1005, ¶137.

Durbin discloses a multi-aperture arrangement that a POSITA would have understood is exemplary of how the two-dimensional images of Kariathungal's system would have been captured and organized to implement its PACS with viewing capabilities of two-dimensional images from different optical axes:

“FIG. 3 shows another embodiment with multiple image apertures that require only lateral motion. In this embodiment a plurality of image apertures 132A and the illuminator(s) 134A are mounted in a known orientation to

one another on a laterally moveable apparatus. The number of image apertures and their orientation is selected to provide sufficient coverage and overlap of the dental structure to be modeled at the desired resolution. At each lateral position, an image from each of the apertures 132A is recorded for later processing.” Durbin, ¶[0047].

EX1005, ¶138.

b. [3.2]: displaying one of the plurality of images in a first window of a display:

Kariathungal’s system displays one of its plurality of images in a first window of a display. Specifically, Kariathungal teaches the concept of a two-dimensional “driver image” which controls the angle of view for volumetric images (i.e. three-dimensional models):

“In the computer system for displaying medial images at least one volumetric medical image is linked to at least one two-dimensional medical image comprising the linked images. If the images are linked at least one of the medical images may be a driver image. The driver image may control the angle of view for other volumetric medical images.” ¶[0014]; *see also* ¶[0029] (driver image controls angle of view).

EX1005, ¶141.

Kariathungal discloses selection of a two-dimensional “driver image” to display a linked volumetric image (i.e. a three-dimensional model):

“The method for displaying medical images also includes selecting an exam or image for display, the selected exam or image being linked and displayed according to the display protocol.” ¶[0015]; ¶[0030] (selection of two-dimensional image).

EX1005, ¶142.

Kariathungal also explains that its images (two-dimensional and three-dimensional) may be displayed within windows (or regions) of a singular display in its embodiments:

“The more display units available, as in the case of FIG. 3, or display windows available, as in the case of FIG. 4, the more combinations of views exist.” ¶[0037].

EX1005, ¶143.

Kariathungal’s Figure 6 embodiment includes windows/regions 622, 624, 626, or 628 within the same display unit 620 in which one of the plurality of two-dimensional images may be displayed according to its disclosed display protocol:

“Unit 620 includes four display regions, 622, 624, 626, and 628, respectively... Moreover, any combination of images may be displayed in accordance with the present invention.” ¶[0042]; *see also* ¶[0025] (discussing multiple images on a single display in windows for Figure 2) ¶[0032] (discussing multiple images on a single display in windows for Figure 4).

EX1005, ¶144.

c. [3.3]: rendering the three-dimensional model with the processor in a second window of the display; and

Kariathungal's system renders its three-dimensional model with the processor of computer unit 180 in a second window of the display. Specifically, Kariathungal teaches rendering the three-dimensional model within one of windows/regions 622, 624, 626, or 628 within the same display unit 620 as a corresponding two-dimensional image in its own "window" as the claimed "second window of a display.":

"Unit 620 includes four display regions, 622, 624, 626, and 628, respectively... Moreover, any combination of images may be displayed in accordance with the present invention." ¶[0042].

"As computer and medical imaging technology has become more sophisticated, the PACS diagnostic workstations have become capable of creating a reformatted three-dimensional model from the two-dimensional data sets." ¶[0009]

"In the computer system for displaying medial images at least one volumetric medical image is linked to at least one two-dimensional medical image comprising the linked images. If the images are linked at least one of the medical images may be a driver image. The driver image may

control the angle of view for other volumetric medical images.” ¶[0014].

EX1005, ¶147.

- d. **[3.4]: synchronizing the first window and the second window with the processor to provide a common perspective on the subject for both the three-dimensional model and the one of the plurality of images**

Kariathungal’s display of its two-dimensional image and rendering of its three-dimensional model are synchronized between its first and second windows, as Kariathungal explains:

“Therefore, a need exists for a system and method that provides a display protocol for controlling the display and **synchronization** of three-dimensional data with other three-dimensional data and **three-dimensional data with two-dimensional data**. Such a system and method may allow a user to be more efficient and effective of diagnosis and treatment of medical conditions.” ¶[0011] (emphasis added).

“In the computer system for displaying medial [sic] images at least one volumetric medical image is linked to at least one two-dimensional medical image comprising the linked images. If the images are linked at least one of the medical images may be a driver image. The driver image may control the angle of view for other volumetric medical images.” ¶[0014]; *see also* ¶[0029] (driver image

controls angle of view); ¶[0034] (simultaneous review of three and two dimensional images).

EX1005, ¶150.

2. **Claim 4: The method of claim 3 further comprising receiving a user selection of a different one of the plurality of images and rotating the three-dimensional model to maintain the common perspective.**

Kariathungal's system allows a user to select a different one of the plurality of images (used to construct its three-dimensional model) which rotates its three-dimensional model to maintain the common perspective:

“The method for displaying medical images also includes selecting an exam or image for display, the selected exam or image being linked and **displayed according to the display protocol.**” ¶[0015] (emphasis added); ¶[0030] (selection of two-dimensional image).

“In the computer system for displaying medial images at least one volumetric medical image is linked to at least one two-dimensional medical image comprising the linked images. If the images are linked at least one of the medical images may be a driver image. **The driver image may control the angle of view for other volumetric medical images.**” ¶[0014] (emphasis added).

EX1005, ¶153.

A POSITA would have appreciated that such rotation of the three-dimensional model occurs in response to selection of a new linked two-dimensional image in

Kariathungal's display protocol. Further, Kariathungal itself acknowledges that customization of its display protocol is possible to present any combination of two-dimensional images and three-dimensional models in various synchronized views and positions, including at the time of selection:

“FIG. 5 illustrates a method 500 in accordance with an embodiment of the present invention. At step 510, a user may **customize the display protocol** or use the factory default display protocol for displaying at least two volumetric medical images concurrently as well as displaying **at least one volumetric medical image concurrent with at least one two-dimensional medical image**. At step 520, a user may select an exam or image for display. The selected exam or image is linked and displayed according to the display protocol. At step 530, a user may navigate the selected exam or images.” ¶[0041] (emphasis added).

EX1005, ¶154.

3. **Claim 5: The method of claim 3 further comprising receiving a user selection of a different one of the plurality of images and translating the three-dimensional model to maintain the common perspective.**

Kariathungal's system allows a user to select a different one of the plurality of images (used to construct its three-dimensional model) which *translates* its three-dimensional model to maintain the common perspective:

“The method for displaying medical images also includes selecting an exam or image for display, the selected exam or image being linked and **displayed according to the display protocol.**” ¶[0015] (emphasis added); ¶[0030] (selection of two-dimensional image).

“In the embodiment of system 100 and 200, a user may select an image with a computer mouse, and use the computer mouse to rotate the image. The selected image may be the driver image. Rotation or **movement** in the driver image may drive rotation in the other images.” ¶[0030] (emphasis added).

EX1005, ¶157.

A POSITA would have appreciated that Kariathungal’s reference to movement is a translation of a linked three-dimensional image/model by changing the relative location of the linked three-dimensional image/model with respect to its original position by changing its coordinates. A POSITA would have appreciated that such translation of the three-dimensional model occurs in response to selection of a new linked two-dimensional image in Kariathungal’s display protocol. EX1005, ¶158.

Further, Kariathungal itself acknowledges that customization of its display protocol is possible to present any combination of two-dimensional images and

three-dimensional models in various synchronized views and positions, including at the time of selection:

“FIG. 5 illustrates a method 500 in accordance with an embodiment of the present invention. At step 510, a user may customize the display protocol or use the factory default display protocol for displaying at least two volumetric medical images concurrently as well as displaying at least one volumetric medical image concurrent with at least one two-dimensional medical image. At step 520, a user may select an exam or image for display. The selected exam or image is linked and displayed according to the display protocol. At step 530, a user may navigate the selected exam or images.” ¶[0041] (emphasis added).

EX1005, ¶159.

4. **Claim 7: The method of claim 3 further comprising receiving a user selection of a different perspective of the three-dimensional model and selecting a new one of the plurality of images to maintain the common perspective.**

Kariathungal’s system allows a user to select a different perspective of the three-dimensional model which selects a new one of the plurality of images (used to construct its three-dimensional model) to maintain the common perspective:

“In the embodiment of system 300 and 400, a user may select a driver image with a computer mouse, and use the computer mouse to move or rotate the image. Rotation or movement in one image may drive movement or rotation

in the other images. For example, the user may select the volume displayed in display unit 310 as the driver image. The user may then move or rotate the angle of view of the volume in display unit 310 using the computer mouse. Because the display protocol has linked the other views displayed on display units 320, 330, and 340 respectively, the two-dimensional views may move or rotate to present an angle of view similar to the angle of view displayed for the volume. In such a manner, the user may view the volumetric view and the two-dimensional views from the same angle.” ¶[0039] (emphasis added).

EX1005, ¶162.

A POSITA would have appreciated that presentation of a common perspective two-dimensional image occurs in response to selection of a different perspective of the three-dimensional model in Kariathungal’s display protocol. As stated by Kariathungal with regard to oblique views:

“Moreover, the display protocol may also display two-dimensional oblique views of objects along with other two-dimensional views and at least one volume view. For example, instead of displaying the axial, sagittal, and coronal views along with the volume view in FIGS. 3 and 4, the display protocol may display the volume view with three oblique views. The display protocol may also display a mix of the axial, sagittal, and coronal views along with the oblique views. For example, the volume view

may be displayed with the axial, sagittal, **and one oblique view**, or any combination thereof.” ¶[0039] (emphasis added).

EX1005, ¶163.

Further, Kariathungal itself acknowledges that customization of its display protocol is contemplated to present any combination of two-dimensional images and three-dimensional models in various synchronized views and positions, including at the time of selection:

“FIG. 5 illustrates a method 500 in accordance with an embodiment of the present invention. At step 510, a user may **customize the display protocol** or use the factory default display protocol for displaying at least two volumetric medical images concurrently as well as displaying **at least one volumetric medical image concurrent with at least one two-dimensional medical image**. At step 520, a user may select an exam or image for display. The selected exam or image is linked and displayed according to the display protocol. At step 530, a user may navigate the selected exam or images.” ¶[0041] (emphasis added).

EX1005, ¶164

5. Claim 9 (Preamble): A system comprising:

Kariathungal discloses a system with each of the claimed features of claim 9, as detailed below. *See also* Claim 3 (detailing the method of 2D and 3D display of Kariathungal's system). EX1005, ¶166.

- a. [9.1]: a memory storing a three-dimensional model of a subject and a sequence of image sets used to create the three dimensional model, each image set including a plurality of images of a subject, each one of the plurality of images in each image set captured from a different optical axis;**

Kariathungal's system includes a memory that can store a previously constructed three-dimensional model of a subject:

“As computer and medical imaging technology has become more sophisticated, the PACS diagnostic workstations have become capable of creating a reformatted three-dimensional model from the two-dimensional data sets.” ¶[0009]

EX1005, ¶168.

The claim language concerning three-dimensional model creation and image sets is substantially the same as that for Claim 3, element [3.1], which is incorporated here by reference. In addition, a POSITA would have appreciated that any generated three-dimensional model in Kariathungal will be stored in a memory, whether temporary or persistent. EX1005, ¶169.

- b. [9.2]: a display configured to provide a user interface displaying one of the plurality of images in a first window; and

Kariathungal's display units of its various embodiments are connected to computer 180 which may include a mouse as a user interface to its system, which allow selections such as a specific two-dimensional image among the stored sets:

“Alternatively, the computer unit 180 and display units 110 and 120 may be separate units. In such a case, the display unit 110 and a display unit 120 may be in electrical communication with the computer unit 180. The components of the system 100 may be single units, separate units, may be integrated in various forms, and may be implemented in hardware and/or in software.” ¶[0041].

“The method for displaying medical images also includes selecting an exam or image for display, the selected exam or image being linked and **displayed according to the display protocol.**” ¶[0015] (emphasis added); ¶[0030] (selection of two-dimensional image).

EX1005, ¶172.

As explained above with reference to Claim 3, element [3.2], Kariathungal's display units are configured to display one of its plurality of images in a first window. EX1005, ¶173.

- c. **[9.3]: a processor configured to render the three-dimensional model in a second window displayed in the user interface concurrently with the one of the plurality of images in the first window and to synchronize the first window and the second window to provide a common perspective on the subject in both the three-dimensional model and the one of the plurality of images.**

As explained above with reference to Claim 3, element [3.2] Kariathungal's computer unit 180 that includes a picture archival communication system (PACS) is configured to create a three-dimensional model with a processor from a sequence of images sets stored in a memory. EX1005, ¶176.

The claim language concerning rendering the created three-dimensional model in a second window is substantially the same as that for Claim 3, elements [3.3] and [3.4], which is incorporated here by reference. EX1005, ¶177.

- 6. **Claim 10: The system of claim 9 wherein the processor is configured to receive a user selection of a different one of the plurality of images and rotate the three-dimensional model to maintain the common perspective.**

See Claim 4 addressing identical language, but in method form.

- 7. **Claim 11: The system of claim 9 wherein the processor is configured to receive a user selection of a different one of the plurality of images and translate the three-dimensional model to maintain the common perspective.**

See Claim 5 addressing identical language, but in method form.

8. **Claim 13: The system of claim 9 wherein the processor is configured to receive a user selection of a different perspective of the three-dimensional model and select a new one of the plurality of images to maintain the common perspective.**

See Claim 7 addressing identical language, but in method form.

9. **Explanation of Why Claims 3-5, 7, 9-11, and 13 Would Have Been Obvious over Kariathungal in View of Durbin**

Claims 3-5, 7, 9-11, and 13 would have been obvious over Kariathungal in view of Durbin. EX1005, ¶188.

- a. **Difference between the claimed invention and the prior art.**

As discussed above, Kariathungal discloses details concerning the use of its Picture Archival Communication System (PACS), but it does not expressly state precisely how its two-dimensional images are captured from different optical axes and stored to implement its viewing capabilities. Durbin provides that express disclosure in the form of a multi-aperture scanner/camera arrangement that obtains a plurality of two-dimensional image sets such that “each one of the plurality of images in each image set [is] captured from a different optical axis.” EX1005, ¶189.

- b. **A POSITA would have had motivation to combine the disclosures of Kariathungal and Durbin.**

A POSITA would have been motivated to apply Durbin’s disclosure concerning multi-aperture scanner/camera arrangements that obtain a plurality of two-dimensional images from different optical axes to confirm how a POSITA

would have implemented Kariathungal's existing Picture Archival Communication System (PACS). Given the existing details of Kariathungal's PACS system that allows for viewing of images from different optical axes, a POSITA would have already been aware that multi-aperture scanner/camera arrangements, such as the one disclosed in Durbin, provided the ability to capture two-dimensional images in a form that readily met the requirements of Kariathungal's PACS system for recall and later viewing. In addition, Durbin itself provides motivation to a POSITA to use its multi-aperture scanner/camera arrangement disclosure because it efficiently facilitates "automated intra-oral scanning of all the dental structures in the jaw through an optical aperture and combines the information available in the entire set of images to create and present an accurate 3D model of the scanned structures. The system allows intra oral images of dental structures *to be taken rapidly and with high resolution such that the acquired images can be processed into accurate 3D models of the imaged dental structures.*" ¶[0024] (emphasis added). Even further, the understanding that multi-aperture scanner/camera arrangements such as that disclosed in Durbin were known in the prior art is confirmed by the '864 Patent itself. EX1001, 9:9-13. EX1005, ¶190.

- c. A POSITA would have had a reasonable expectation of success based on the disclosures of Kariathungal and Durbin and knowledge generally available in the art.**

A POSITA would have had a reasonable expectation of success in making the combination of Kariathungal's Picture Archival Communication System (PACS) with the multi-aperture scanner/camera disclosure of Durbin relating to capture of two-dimensional images from multiple optical axes. This is so because both references are directed to generation of three-dimensional models from underlying two-dimensional images. *See* Discussion above regarding element [3.1] (concerning Kariathungal's model generation), and Durbin, ¶¶[0052]-[0052] (concerning Durbin's model generation). And, Durbin simply provides a POSITA's existing understanding of capture of two-dimensional images using a multi-aperture scanner/camera arrangement which two-dimensional images would have been stored in Kariathungal's existing storage system to facilitate its image viewing capabilities. EX1005, ¶191.

Combining the disclosures of Kariathungal with Durbin would only require the use of "known methods"—using each in the same way they were used as disclosed. Specifically, Kariathungal already discloses maintenance of a three-dimensional model in a common perspective based on selection of a two-dimensional image and all the viewing capabilities of its underlying Picture Archival Communication System (PACS) – And, Durbin provides the POSITA's existing

understanding of capture of two-dimensional images using a multi-aperture scanner/camera technique demonstrating how a POSITA would have understood two-dimensional images would have been captured to support Kariathungal's PACS system and stored in its preexisting storage system. None of the methods would need to be used in an unexpected or unintended way. Each would be fulfilling its original purpose and used in an expected way. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007) ("The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results. . . . [W]hen a patent claims a structure already known in the prior art that is altered by the mere substitution of one element for another known in the field, the combination must do more than yield a predictable result."). EX1005, ¶192.

The combination of Kariathungal and Durbin renders obvious all the recited features of Claims 3-5, 7, 9-11, and 13. EX1005, ¶193.

C. Claims 6 and 12 Would Have Been Obvious Over Kariathungal in View of Durbin, and in further view of Troussel (Ground 3).

The following sections explain where each element of Claims 6 and 12 is found in the prior art of Kariathungal in View of Durbin, and in further view of Troussel. EX1005, ¶¶194-195.

1. **Claim 6: The method of claim 3 further comprising receiving a user selection of a different one of the plurality of images and scaling the three-dimensional model to maintain the common perspective.**

While Kariathungal directly discloses many of the functions of its Picture Archival Communication System (PACS), it does not expressly disclose a commonly understood feature of scaling a three-dimensional model to maintain a common perspective with a selected two-dimensional image. However, Troussel's system allows a user to select a different one of a plurality of images (used to construct a three-dimensional model) which *scales* its three-dimensional model to maintain the common perspective:

“Also, the means for management comprises means for automatically translating the three-dimensional representation and in centering it in the same way as a two-dimensional image acquired in real time or previously acquired. It may also comprise means for automatically adjusting the scale of the three-dimensional representation with respect to a two-dimensional image acquired in real time or previously acquired.” ¶[0012] (emphasis added); *see also* ¶[0029], [0031], Claim 8-14, Claim 21-22.

EX1005, ¶¶196-197.

2. **Claim 12: The system of claim 9 wherein the processor is configured to receive a user selection of a different one of the plurality of images and scale the three-dimensional model to maintain the common perspective.**

See Claim 6, discussions above.

3. **Explanation of Why Claims 6 and 12 Would Have Been Obvious**

Claims 6 and 12 would have been obvious over Kariathungal in view of Durbin, and in further view of Troussel. EX1005, ¶202.

- a. **Difference between the claimed invention and the prior art.**

As discussed directly above, Kariathungal directly discloses many of the functions of its Picture Archival Communication System (PACS), but it does not expressly disclose a commonly understood feature of scaling a three-dimensional model to maintain a common perspective with a selected two-dimensional image. Troussel provides that express disclosure. EX1005, ¶203.

- b. **A POSITA would have had motivation to combine the disclosures of Kariathungal and Troussel.**

A POSITA would have been motivated to use the express disclosure in Troussel concerning scaling a three-dimensional model to maintain a common perspective with a selected two-dimensional image as another navigation feature to supplement the large suite of capabilities of Kariathungal's existing Picture Archival Communication System (PACS). This functional disclosure in Troussel is readily useable into Kariathungal's system as another way to navigate three-dimensional

models through selection of previously captured two-dimensional images. In addition, the ability to scale, much like rotation and translation, is a fundamental feature of three-dimensional model navigation and readily adapts directly to Kariathungal's existing functionality. Kariathungal's PACS already provides rotation (*see* claim 4) and translation (*see* claim 5) functionality, which a POSITA would have appreciated involved the same fundamental three-dimensional model manipulations prior to re-rendering/re-display that would be used to implement scaling of a three-dimensional model in response to selection of a previously captured two-dimensional image. EX1005, ¶204.

c. A POSITA would have had a reasonable expectation of success based on the disclosures of Kariathungal and Troussel and knowledge generally available in the art.

A POSITA would have had a reasonable expectation of success in making the combination of Kariathungal's Picture Archival Communication System (PACS) with the specific functionality of Troussel's system concerning scaling of the three-dimensional model. This is so because both references are directed to a Picture Archival Communication System (PACS), and both references disclose maintenance of a common perspective of a rendered three-dimensional model based upon selection of a previously captured two-dimensional image as detailed more fully above in Grounds 1 and 2. And, as discussed above, Kariathungal's PACS already provides rotation (*see* claim 4) and translation (*see* claim 5) functionality, which a

POSITA would have appreciated involved the same fundamental three-dimensional model manipulations prior to re-rendering/re-display that would be used to implement scaling of a three-dimensional model in response to selection of a previously captured two-dimensional image. EX1005, ¶205.

Combining the disclosures of Kariathungal with Troussel would only require the use of “known methods”—using each in the same way they were used as disclosed. Specifically, Kariathungal already discloses maintenance of a three-dimensional model in a common perspective based on selection of a two-dimensional image, and Troussel provides the specific disclosure concerning scaling when performing that operation. None of the methods would need to be used in an unexpected or unintended way. Each would be fulfilling its original purpose and used in an expected way. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007) (“The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results. . . . [W]hen a patent claims a structure already known in the prior art that is altered by the mere substitution of one element for another known in the field, the combination must do more than yield a predictable result.”). EX1005, ¶206.

The combination of Kariathungal and Troussel renders obvious all the recited features of Claims 6 and 12, and would be in addition to the combination of

Kariathungal with Durbin relating to image capture from different optical axes discussed in Ground 2 above. EX1005, ¶207.

VIII. OTHER CONSIDERATIONS

A. Any Purported Secondary Considerations Evidence Does Not Overcome the Strong Evidence of the Obviousness of the Claims

All elements of Claims 3-7 and 9-13 are known in the art, and any differences between the claims of the '864 Patent and Trouset, Kariathungal, or Durbin would have been obvious to a POSITA based on the disclosures of the applied references and the knowledge in the art. EX1005, ¶209.

Petitioners are not aware of any secondary considerations evidence bearing any nexus to the purported claimed invention. Any purported evidence of secondary considerations that Patent Owner may present in this proceeding would be insufficient to overcome the strong evidence of obviousness of Claims 3-7 and 9-13.

B. The Board Should Not Deny This Petition Under §314(a)

Petitioners hereby stipulate that, should the Petition be granted, Petitioners will not pursue in the Related Litigation the same grounds or any grounds that are raised or could have reasonably been raised in this Petition pursuant to *Sotera Wireless, Inc. v. Masimo Corp.*, IPR2020-01019, Paper 12 (PTAB Dec. 1, 2020). The Director has stated that “the PTAB will not discretionarily deny institution of an IPR” in view of such a stipulation. Katherine K. Vidal, Interim Procedure for

Discretionary Denials in AIA Post-Grant Proceedings with Parallel District Court Litigation (June 21, 2022) at 3 and n.3 (discussing *Sotera*); *see id.* at 7–9.

Accordingly, Petitioners’ stipulation is dispositive in establishing that institution should not be discretionarily denied under 35 U.S.C. §314(a).

C. The Board Should Not Deny This Petition Under §325(d)

There is no reason to deny institution under §325(d). The totality of the *Becton, Dickinson* factors favor institution. Specifically, none of the cited references herein is the same or substantially the same art previously addressed by the examiner during prosecution of the application. Further, the prior art relied upon in this Petition discloses synchronized display of both the three-dimensional model and the one of the plurality of images—a feature absent from the prosecution applied references. *See* Section V.B.

Further, with respect to factor (f), the Petition is supported by an expert declaration by Dr. Eli Saber explaining how a POSITA would have understood the prior art combinations. *See, e.g.*, EX1005, ¶¶1-211. This new evidence also weighs against discretionary denial. *See, e.g., Puma N. Am., Inc. v. Nike, Inc.*, IPR2019-01058, Paper 10, 19 (PTAB Oct. 31, 2019) (instituting where petition presented “new non-cumulative evidence.... probative to issues of patentability and helpful to our consideration of a prior art combination that was not before the Examiner”).

IX. CONCLUSION

For at least the foregoing reasons, Claims 3-7 and 9-13 of the '864 Patent are unpatentable. Since Petitioners have shown the claims to be *prima facie* obvious, Petitioners have also shown a likelihood of success on the merits. Therefore, this Petition should be granted, and the Board should institute trial.

Date: August 14, 2024

Respectfully submitted,

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APPENDIX A—LIST OF EXHIBITS

EXHIBIT	DESCRIPTION
1001	U.S. Patent No. 9,262,864, issued on February 16, 2016 to J. Rohaly <i>et al.</i> (“the ’864 Patent”)
1002	File History of U.S. Patent Application No. 14/487,371, filed on September 16, 2014
1003	PCT Publication No. WO 2009/006273, published on January 8, 2009
1004	U.S. Provisional Application No. 60/947,009, filed on June 29, 2007
1005	Declaration of Eli Saber in Support of Petition for <i>Inter Partes</i> Review of U.S. Patent No. 9,262,864 (Claims 3-7 and 9-13)
1006	<i>Not yet assigned</i>
1007	<i>Curriculum Vitae</i> of Eli Saber
1008	U.S. Patent Publication No. 2003/0018250 (“Trousset”)
1009	U.S. Patent Publication No. 2006/0119622 (“Kariathungal”)
1010-1011	<i>Not yet assigned</i>
1012	U.S. Patent Publication No. 2002/0055082 (“Durbin”)
1013	U.S. Patent Publication No. 2005/0089822 (“Geng”)
1014	U.S. Patent Publication No. 2006/0020363 (“Orth”)
1015	Defendant Medit Corporation’s Answer to Plaintiff’s Complaint and Affirmative Counterclaims filed on August 18, 2023 in <i>3Shape A/S v Medit Corporation</i> , Civ. Action No. 6:22-cv-00443 (WDTX)

Petition for *Inter Partes* Review of U.S. Patent No. 9,262,864

EXHIBIT	DESCRIPTION
1016	Order Severing Claims Related to Counterclaim Patents filed on September 8, 2023 in <i>3Shape A/S v Medit Corporation</i> , Civ. Action No. 6:22-cv-00443 (WDTX)
1017	Claim Construction Order for U.S. Patent Nos. 7,912,257; 9,191,648; 9,245,374; 9,262,864 filed on May 31, 2024 in <i>Medit Corporation v. 3Shape A/S</i> , Civ. Action No. 6:23-cv-00658 (WDTX)
1019	Multiple View Geometry in computer vision, Richard Hartley and Andrew Zisserman, Second Edition (2003), Introduction pp. 1-21.

CERTIFICATE OF COMPLIANCE WITH 37 C.F.R. §42.24

I hereby certify that the word count for the foregoing Petition totals 11,789 words, excluding the parts which are exempted by 37 C.F.R. §42.24(a)(1).

Date: August 14, 2024

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CERTIFICATE OF SERVICE

The undersigned hereby certifies that on this 14th day of August, 2024, a true and correct copy of the foregoing **PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 9,262,864 UNDER 35 U.S.C. §§311–19 and 37 C.F.R. §42.100 *et seq.* and EXHIBITS 1001-1005, 1007-1009, 1012-1017, and 1019** are being served by USPS Priority Mail Express on the correspondence address of record as follows:

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and a courtesy copy is being served to Patent Owner's litigation counsel as follows:

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