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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. IPR2024-01276
Patent 9,245,374

**PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 9,245,374
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 1, 3, 5, 7-12, 14, 16, and 18-23 of U.S. Patent No. 9,245,374 (“the ’374 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 Applications

The ’374 Patent issued from U.S. Patent Application No. 14/000,446, which is a National Stage of PCT International Application No. PCT/US12/025548, filed

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. 6:22-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. EX1010. Medit’s Answer to 3Shape’s Complaint and Affirmative Counterclaims then became the operative complaint in the Related Litigation. EX1011.

on February 17, 2012, which claims priority to U.S. Provisional Application No. 61/445,499, filed on February 22, 2011.

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 '374 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 '374 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 '374 Patent. EX1011.

Neither Petitioners nor its privies have received a final written decision under 35 U.S.C. §318(a) regarding any claim of the '374 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 1, 3, 5, 7-12, 14, 16, and 18-23 ("the Challenged Claims") of the '374 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 the Challenged Claims are as follows:

Ground	References	Basis	Claims Challenged
1	U.S. Patent No. 5,553,207 (“Sekiguchi”, EX1005)	§102	1, 3, 5, 7, 8, 10-12, 14, 16, 18, 19, and 21-23
2	Sekiguchi	§103	1, 3, 5, 7-12, 14, 16, and 18-23
3	Sekiguchi in view of U.S. Patent No. 7,394,889 (“Partain”, EX1006)	§103	8, 9, and 20

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. (EXs1014-1015). EX1014, ¶¶1-209 support this Petition, and citations are provided below.

C. Prior Art Qualification of Asserted References

The ’374 Patent (EX1001) was filed on August 20, 2013 as U.S. Patent Application No. 14/000,446 (“the ’446 Application”). The ’446 Application is a National Stage of PCT International Application No. PCT/US2012/025548 (EX1003), filed on February 17, 2012, which claims priority to U.S. Provisional Application No. 61/445,499 (EX1004), filed on February 22, 2011.

Even if the ’374 Patent is deemed entitled to its earliest priority date, all of the cited references in this Petition are prior art.

U.S. Patent No. 5,553,207 (“Sekiguchi”) (EX1005), issued on September 3, 1996 and filed on May 24, 1994, constitutes prior art at least under 35 U.S.C. §§ 102(a), 102(b), and 102(e).

U.S. Patent No. 7,394,889 (“Partain”) (EX1006), issued on July 1, 2008 and filed on May 18, 2006, constitutes prior art at least under 35 U.S.C. §§ 102(a), 102(b), and 102(e).

U.S. Patent No. 6,999,073 (“Zwern”) (EX1007), issued on February 14, 2006 and filed on July 19, 1999, constitutes prior art at least under 35 U.S.C. §§ 102(a), 102(b), and 102(e).

U.S. Patent Application Publication No. 2007/0172112 (“Paley”) (EX1008), published on July 26, 2007 and filed on September 3, 2006, constitutes prior art at least under 35 U.S.C. §§ 102(a), 102(b), and 102(e).

U.S. Patent Application Publication No. 2006/0202989 (“Yinghui”) (EX1009), published on September 14, 2006 and filed on March 10, 2006, constitutes prior art at least under 35 U.S.C. §§ 102(a), 102(b), and 102(e).

V. BACKGROUND

A. The ’374 Patent

The ’374 Patent relates to a three-dimensional scanning technique for “exclud[ing] certain scan results from processing and display.” EX1001, 1:27-29. The ’374 Patent discloses, for example, that “[b]y excluding or modifying

processing of subsequent outlier data from within these unoccupied voxels, a three-dimensional reconstruction process can achieve concurrent improvements in accuracy and speed.” *Id.*, 1:31-34. The ’374 Patent explains that “[t]here remains a need for techniques to exclude such outliers from a three-dimensional scanning process.” *Id.*, 1:21-23. EX1014, ¶¶37-40.

The independent claims of the ’374 Patent call for processing a portion of the three-dimensional data that is in a prohibited volume according to a “modified processing”. This modified processing includes detecting a point in the prohibited volume and “displaying the point for a decay time” with the portion of the three-dimensional data. The ’374 Patent discloses that the decay time relates to the time the data in the prohibited volume is displayed:

In another aspect, modified processing may include controlling how data in the prohibited volume is displayed. For example, data within the prohibited volume may be excluded from display, or may be displayed temporarily using a brief decay time such as 0.5 seconds or any other short interval.

EX1001, 17:40-44. EX1014, ¶¶41-42.

Displaying data for a decay time is nothing new. Sekiguchi discloses temporarily displaying data that is present in an overflow/deletion region to allow a user to visually confirm that such data does not correspond to the organ of interest,

and either deleting the data or rendering the data invisible. EX1005, 5:7-26, 6:57-65, 9:4-24. EX1014, ¶42.

B. The '374 Patent Examination History

In the first and only Office Action on the merits, the Examiner indicated that claims 5 and 17 (which recited the “decay time” feature) contain allowable subject matter. EX1002, pp.30-58. The Examiner determined that the prior art considered by the Examiner and cited in the Office Action “is silent to wherein the modified processing includes detecting a point in the prohibited volume and displaying the point for a decay time.” EX1002, p.56. In response, Applicant amended independent claims 1, 13, and 25 to incorporate the allowable “decay time” feature.² EX1002, pp.18-26. However, as demonstrated below, the prior art references relied upon in the Grounds set forth in this Petition—which were not considered by the Examiner during prosecution—explicitly discloses the decay time feature that was absent from the prior art applied by the Examiner.

² Independent claims 1, 13, and 25 of the '446 Application correspond to independent claims 1, 12, and 23 of the '374 Patent challenged in this Petition.

C. Summary of the Applied Prior Art

1. Sekiguchi (EX1005)

Sekiguchi relates to techniques for “individual internal organ extraction” and “presenting a three-dimensional display of individual internal organs by use of three-dimensional digital data attained through a shooting operation by an MRI, an X-ray CT, and the like.” EX1005, 1:22-29. Sekiguchi discloses techniques for mitigating or preventing the problem of extracting image data that does not belong to the region intended to be extracted, *e.g.*, the individual internal organ. *Id.*, 4:40-43 (addressing situation where “a completely wrong extraction result is obtained”). EX1014, ¶¶43-44.

Sekiguchi discloses temporarily displaying voxel data in an “overflow region” to allow the operator to confirm that the data is not associated with the individual internal organ to be extracted. EX1005, 5:9-11 (“operator visually checks the three-dimensional display image to delete the region if the extracted region is actually the overflow region”), abstract. The data in question is then deleted or rendered invisible and the data associated with the individual internal organ is displayed during this process. *Id.*, 9:4-24 (“[a]fter the result is confirmed as described in operation (9), the overflow region is deleted” or the data is rendered invisible). *See also id.*, 5:7-64, 6:26-65, 10:49-65. EX1014, ¶¶45-46.

Like the '374 Patent, Sekiguchi discloses subjecting three-dimensional voxel data to different types of processing depending on the region in which the voxel data is located. For voxel data that is present in Sekiguchi's overflow/deletion region, Sekiguchi discloses visually confirming that the voxel data does not correspond to the organ to be extracted, and processing such voxel data by either deleting the data or rendered the data invisible. *See, e.g.*, EX1005, 5:7-26, 6:57-65. For voxel data that is present in Sekiguchi's objective region, Sekiguchi discloses extracting and visually displaying this data, *i.e.*, such data is not deleted or rendered invisible. *See, e.g., id.*, 5:62-64, 6:26-27, 10:49-55, 12:64-65. Figure 14 of Sekiguchi depicts a flowchart showing the operation of a first embodiment:

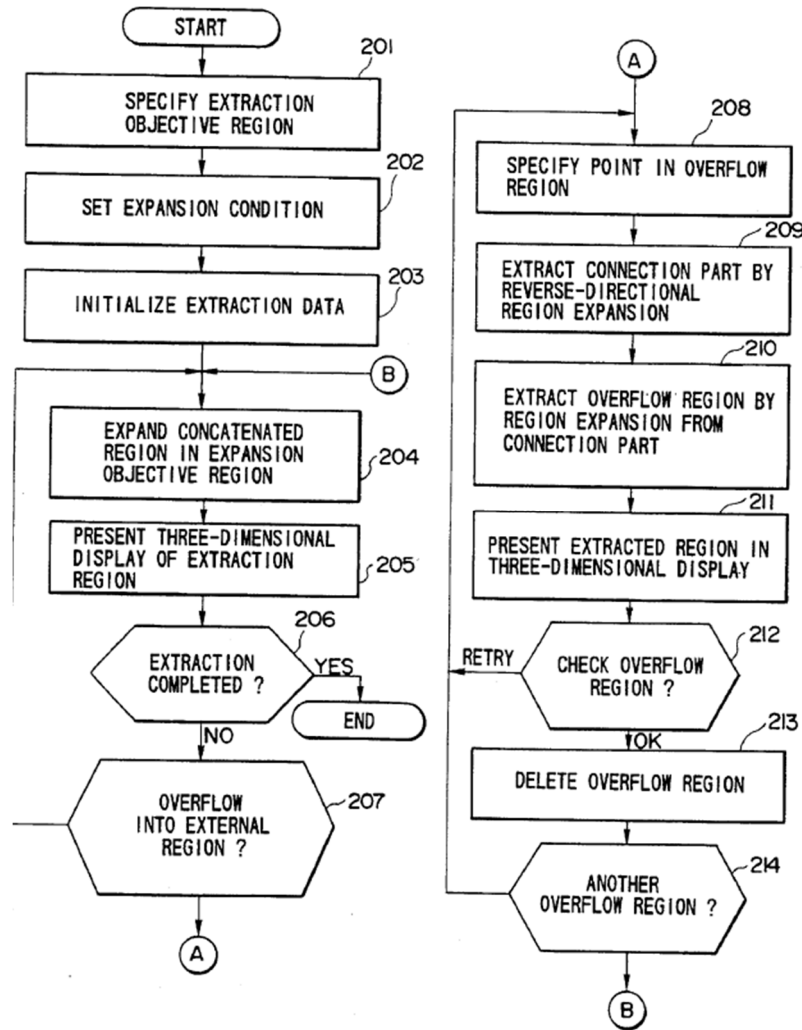


Figure 14 of Sekiguchi

EX1014, ¶¶47.

2. Partain (EX1006)

Partain relates to X-ray and CT imaging techniques and discloses that “[i]n imaging three dimensional volumes, the smallest volume (often a cube) that can be resolved is referred to as a voxel.” EX1006, 8:58-60. Partain discloses employing “voxels with dimensions of 0.4 mm or less in at least two orthogonal directions”.

Id., abstract. EX1014, ¶¶48-50.

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 ’374 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. EX1014, ¶¶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)). The District Court determined that the term “displaying the point for a decay time” (which was the only disputed term in the Related Litigation) is to take on its plain and ordinary meaning. EX1012, pp. 3-4. Thus, Petitioners believe that no express constructions of the claims are necessary in this Proceeding. Petitioners apply the plain and ordinary *Phillips* meaning in the Grounds below.

While the proper metes and bounds of the claims 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 Petitioners' non-adopted litigation construction is adopted (*see* EX1012, pp. 3-4). The Challenged Claims are unpatentable under all the potential constructions.

VII. PETITIONERS HAVE A REASONABLE LIKELIHOOD OF PREVAILING

The following explains why Claims 1, 3, 5, 7-12, 14, 16, and 18-23 of the '374 Patent are unpatentable over the prior art asserted in Grounds 1-3. EX1014, ¶¶33, ¶¶54-207.

A. Claims 1, 3, 5, 7, 8, 10-12, 14, 16, 18, 19, and 21-23 Are Anticipated by Sekiguchi (Ground 1).

Claims 1, 3, 5, 7, 8, 10-12, 14, 16, 18, 19, and 21-23 are anticipated by Sekiguchi. EX1014, ¶54.

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

Sekiguchi discloses the Preamble of Claim 1. Sekiguchi is entitled "method of and apparatus for region extraction in three-dimensional voxel data". EX1005, p. 1. Sekiguchi discloses "a multi-dimensional data processing method" for processing three-dimensional voxel data. *Id.*, 3:20-27. Sekiguchi discloses that "region extraction is conducted on three-dimensional voxel data ... to present a three-dimensional display of the extraction objective region". *Id.*, 3:27-31. EX1014, ¶¶56-59.

Sekiguchi discloses techniques for “conducting an individual internal organ extraction ... by use of three-dimensional digital data attained through a shooting operation by an MRI, an X-ray CT, and the like.” EX1005, 1:22-29. *See also id.*, 10:30-32 (“three-dimensional voxel data attained by the MRI system”). Similarly, the ’374 Patent discloses that its technique “may be used to improve *any* three-dimensional acquisition” such as “x-ray computed tomography” and the like. EX1001, 3:18-19 (emphasis added). Sekiguchi discloses “present[ing] a three-dimensional display of individual internal organs”. EX1005, 1:22-29. Similarly, the ’374 Patent relates to “medical imaging or other sensitive applications”. EX1001, 7:17-18. EX1014, ¶60.

Sekiguchi discloses temporarily displaying voxel data in an overflow region to allow the operator to visually confirm that the data is not associated with the individual internal organ to be extracted. EX1005, 5:9-11, 9:4-24, abstract. *See also id.*, 5:7-26, 6:57-65, 12:57-60, 4:66-67. The data in question is then deleted or rendered invisible while the data associated with the individual internal organ is displayed. *Id.* Similarly, the ’374 Patent discloses that its technique may be employed to “exclude certain scan results from processing and display” such as “outlier data”. EX1001, 1:27-29, 3:19-23. EX1014, ¶61.

- a. **[1.1]: storing a spatial matrix in a memory, the spatial matrix including information for a plurality of voxels in a mesh of a scan space;**

Sekiguchi discloses Element [1.1]. Sekiguchi is entitled “method of and apparatus for region extraction in three-dimensional *voxel data*”. EX1005, p. 1 (emphasis added). Sekiguchi discloses that three-dimensional voxel data is “*stored* in a three-dimensional image *memory* 102.” EX1005, 10:30-32 (emphasis added). Sekiguchi discloses storing “three-dimensional voxel data” associated with a “three-dimensional display image data space” and “three-dimensional space” which constitutes a spatial matrix. *Id.*, 7:24-30. Sekiguchi discloses storing information associated with its techniques in “three-dimensional image memory 102” and “extraction history data memory 104”. *Id.*, 10:30-55. Figure 13 of Sekiguchi discloses a configuration of the apparatus depicting three-dimensional image memory 102 and extraction history data memory 104:

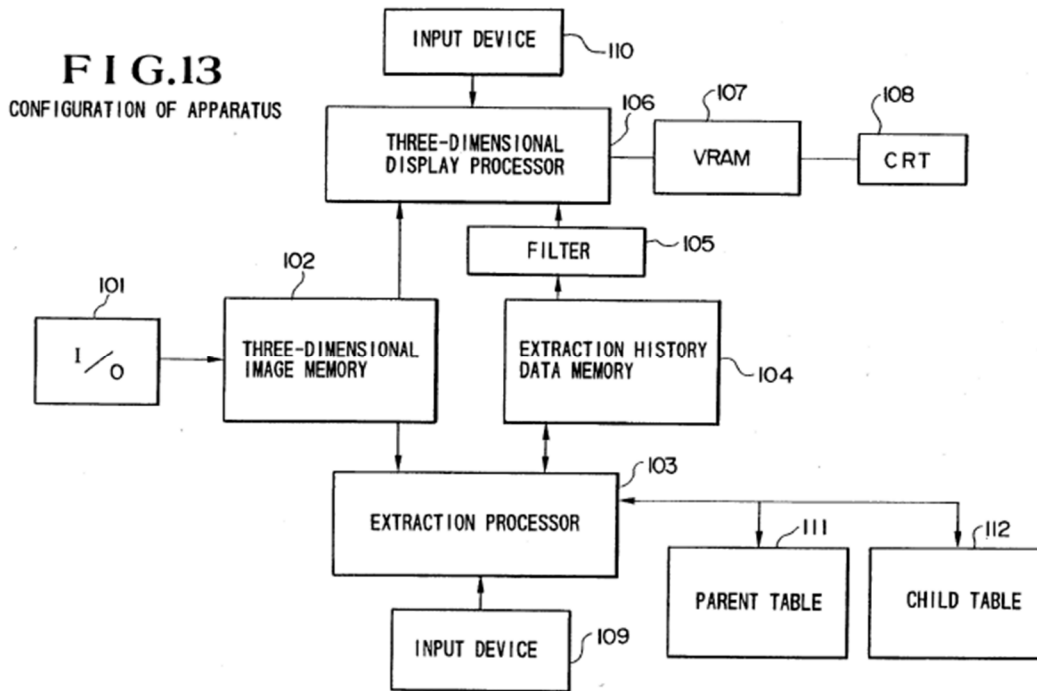


Figure 13 of Sekiguchi

The stored voxel data (“information”) is for a plurality of voxels given that the data is associated with various regions, *e.g.*, an objective region and an overflow region, which are not limited to a single voxel. *See, e.g.*, EX1005, 4:56-6:15. *See also* EX1005, Figs. 1-4 and 6-12 (depicting data for a plurality of voxels), 6:19-24. EX1014, ¶¶62-65.

In addition, Sekiguchi discloses a spatial matrix in Figures 1-4 and 6-12. Figures 1 and 8 of Sekiguchi are reproduced below:

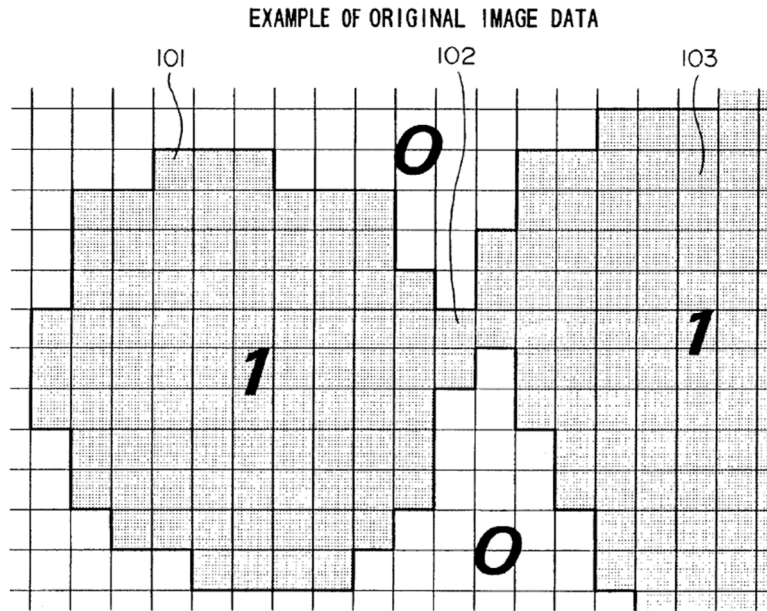


Figure 1 of Sekiguchi

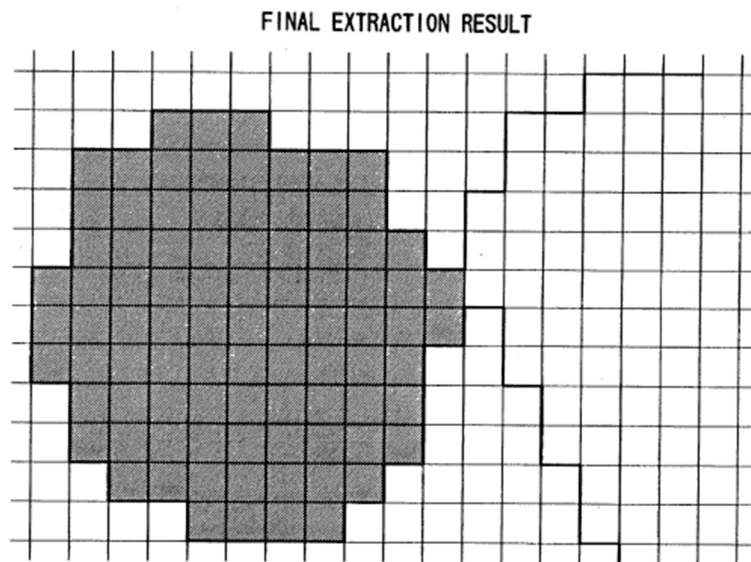


Figure 8 of Sekiguchi

Sekiguchi discloses that depiction of figures in two dimensions is “for simplification of explanation”, and the depicted matrices in fact pertain to “three-dimensional voxel data”. EX1005, 6:19-24 (“The actual object of the present invention is multi-value

three-dimensional voxel data; however, for simplification of explanation, description will now be given of the operations accomplished for two-dimensional binary data.”). Indeed, given that Sekiguchi is entitled “method of and apparatus for region extraction in *three-dimensional voxel* data”, the techniques disclosed in Sekiguchi involve processing and displaying three-dimensional voxel data. EX1014, ¶¶66-68.

The ’374 Patent discloses that the spatial matrix does not require any physical structure. EX1001, 14:17-20 (“[i]t will also be appreciated that, while the spatial matrix 500 is depicted as a three-dimensional structure that maps to the volume of a scan space, no such physical structure is required.”), Figure 7. The ’374 Patent discloses that “[t]he spatial matrix 500 may include *any* memory or combination of memories capable of storing and retrieving information according to voxels within the scan space, and *all* such variations that would be apparent to one of ordinary skill in the art are intended to fall within the scope of this invention”. EX1001, 14:21-26 (emphasis added). For the reasons discussed, Sekiguchi discloses memory capable of storing and retrieving information according to voxels within the scan space, and thus discloses a spatial matrix. EX1014, ¶¶69-70.

Further, an exemplary spatial matrix 500 is depicted in Figure 5 of the ’374 Patent:

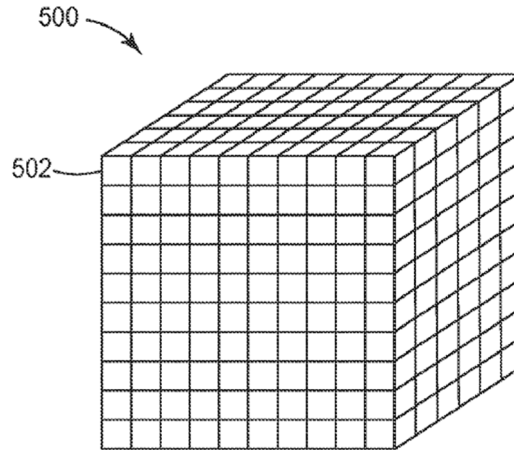


Figure 5 of the '374 Patent

The memory, voxel data space, and matrices of Figures 1-2, 4, and 6-12 disclosed by Sekiguchi (again, which pertain to three-dimensional voxel data, *see* EX1005, 6:19-24) are encompassed by the claimed “spatial matrix”. For example, while the depictions in Figures 1-2, 4, and 6-12 of Sekiguchi are in two dimensions, the matrices are in fact three-dimensional matrices resembling the matrix shown in Figure 5 of the '374 Patent, given the above disclosures of Sekiguchi (*see, e.g.,* EX1005, 6:19-24). EX1014, ¶¶71-72.

The '374 Patent discloses that the voxels are not limited to a cubic shape and “any shape or size of volume may be suitably employed” and that “in one aspect, the mesh of the scan space is subdivided into voxels having a substantially cubic shape”. EX1001, 14:24-39. The '374 Patent also discloses that a scan space relates to the space in which a scan is conducted (*see, e.g.,* EX1001, the “scan space” is element 606 in Figure 6). Sekiguchi discloses such a scan space given that Sekiguchi

discloses that the three-dimensional digital data is “attained through a shooting operation by an MRI, an X-ray CT, and the like”. EX1005, 1:26-29. The ’374 Patent discloses that the “spatial matrix 500 may define a mesh of voxels” (EX1001, 14:26). Sekiguchi’s spatial matrix (*e.g.*, depicted in Figs. 1-2, 4, and 6-12) similarly defines a mesh of voxels of a scan space. Further, Sekiguchi discloses that a rendering processor “continuously references data of the extraction history data 104 updated in the step 204 to generate a three-dimensional display image of the extraction region at the current extraction stage in the VRAM 107, thereby displaying the image on the CRT 108”, and the rendering of the 3D data also results in generating a mesh of scan space. EX1005, 11:45-53. EX1014, ¶¶73-75.

b. [1.2]: obtaining three-dimensional data from an object within the scan space using a scanner;

Sekiguchi discloses Element [1.2]. Sekiguchi discloses “use of three-dimensional digital data attained through a shooting operation by an MRI, an X-ray CT, and the like.” EX1005, 1:22-29. Similarly, the ’374 Patent discloses that its technique “may be used to improve any three-dimensional acquisition” such as “x-ray computed tomography”. EX1001, 3:18-19. Sekiguchi discloses obtaining the three-dimensional data “from an object within the scan space” as claimed, *e.g.*, data associated with an object such as an “individual internal organ”. EX1005, 1:25-26, 10:22-27. Sekiguchi’s processes relate to an “objective region” associated with the scanned object. EX1005, 4:56-6:15. EX1014, ¶¶76-77.

Sekiguchi discloses techniques for “conducting an individual internal organ extraction”. EX1005, 1:22-26. The three-dimensional data is obtained from scanning internal organs. *Id.*, 1:26-29 (“three-dimensional display of individual internal organs by use of three-dimensional digital data attained through a shooting operation by an MRI, an X-ray CT, and the like.”). *See also id.*, 10:22-27 (“three-dimensional voxel data attained through a three-dimensional image shooting operation of an MRI apparatus to extract an image of a particular internal organ therefrom”). The object is within the scan space given that Sekiguchi discloses scanning the object and obtaining voxel data associated with the object, as explained above. Sekiguchi discloses that “FIG. 1 shows an example of original image data on which the extraction processing is to be conducted” and “[t]he actual object of the present invention is multi-value three-dimensional voxel data”. *Id.*, 6:19-22. EX1014, ¶¶78-80.

Sekiguchi discloses “using a scanner” as claimed. Sekiguchi discloses “**scanning** the three-dimensional voxel data”. EX1005, 16:10-13 (emphasis added). Sekiguchi discloses that the three-dimensional data is “attained through a shooting operation by an MRI, an X-ray CT, and the like”. *Id.*, 1:22-29. *See also id.*, 10:23-27 (“This apparatus processes three-dimensional voxel data attained through a three-dimensional image shooting operation...”). The ’374 Patent discloses that the scanner “may include **any** camera or camera system suitable for capturing images

from which a three-dimensional point cloud may be recovered” such as “x-ray computed tomography”. EX1001, 4:65-67 (emphasis added), 3:18-19. *See also* EX1008, [0005], [0028] (X-ray and MRI systems are “scanners”); EX1009, [0026]-[0027] (MRI and CT systems provide “scan” data). Thus, the scanner of the ’374 Patent encompasses camera systems such as x-ray computed tomography and MRI systems like that disclosed by Sekiguchi. EX1005, 1:22-29, 6:19-22. The “scanner” of the ’374 Patent is nothing new as further evidenced by EX1008 which discloses a “scanner” (*see* [0028]-[0029], Fig. 1) used in “any imaging technology” including X-ray and MRI (*see* [0005], [0021]) like Sekiguchi. EX1014, ¶¶81-82.

c. [1.3]: identifying a one of the plurality of voxels in the mesh that is unoccupied;

Sekiguchi discloses Element [1.3]. Sekiguchi discloses that an “***overflow region is indicated*** in the three-dimensional display image”. EX1005, 5:7-8 (emphasis added). Sekiguchi discloses “***specifying an overflow region*** in a three-dimensional display image”. *Id.*, 3:61-63 (emphasis added). *See also id.*, Fig. 3. In Sekiguchi, the overflow region corresponds to voxels that are “unoccupied” by the object of interest (*e.g.*, the internal organ to be extracted). *Id.*, 1:22-29 (“conducting an individual internal organ extraction”), 10:22-27 (“to extract an image of a particular internal organ therefrom”). Indeed, as explained above, the purpose of temporarily displaying the data in the overflow region as taught by Sekiguchi is to

confirm that such data is not of the internal organ to be extracted. *Id.*, 5:7-26, 6:57-65, 9:4-24, 12:57-60. EX1014, ¶¶83-85.

The '374 Patent discloses that an “unoccupied” voxel may contain data points:

Thus while terms such as occupied or unoccupied are used in this description, these terms should not be understood as a direct proxy for whether data points are or can be obtained from a voxel, or whether a voxel is permitted (that is, receiving unmodified processing) or forbidden (that is, receiving modified processing).

EX1001, 15:31-36. According to the '374 Patent, “unoccupied” voxels encompass voxels that are unoccupied by the “surface of interest”. *Id.*, 15:67-16:3 (“any suitable techniques for characterizing a voxel as containing or not containing the surface of interest may be suitably employed to identify prohibited space as contemplated herein.”). Sekiguchi similarly discloses identifying “unoccupied” voxels given that Sekiguchi identifies an overflow region that is unoccupied by the organ that is intended to be extracted (*e.g.*, “the surface of interest”), as explained above. EX1005, 5:7-8, 3:61-63. EX1014, ¶¶86-87.

Sekiguchi discloses that “[t]he operator visually checks the three-dimensional display image to delete the region if the extracted region is actually the overflow region”. EX1005, 5:9-11. Sekiguchi further discloses that “a point belonging to the region other than the objective region *is specified* in a three-dimensional display image to execute deletion of the overflow region”. *Id.*, abstract (emphasis added).

Sekiguchi discloses that “the region extracted by the function of operation (8) *is clearly indicated* in the three-dimensional display image so that the operator confirms the region thus indicated by observing the displayed region” and “[i]f the overflow region is appropriate, the deletion processing of operation (10) below is carried out”. *Id.*, 9:4-24 (emphasis added). Sekiguchi discloses that “the overflow region is deleted” or “an attribute of an invisibility region is assigned to the pixel without deleting the data. That is, the pixel data is retained, but it is not displayed.” *Id.* For the reasons explained above, the “pixel data” discussed in Sekiguchi pertains to three-dimensional voxel data given that Sekiguchi discloses that “[t]he actual object of the present invention is multi-value three-dimensional voxel data”. EX1005, 6:19-24. EX1014, ¶¶88-90.

In addition, Figure 3 of Sekiguchi “is an explanatory diagram for explaining a method of *specifying an overflow region* in a three-dimensional display image”:

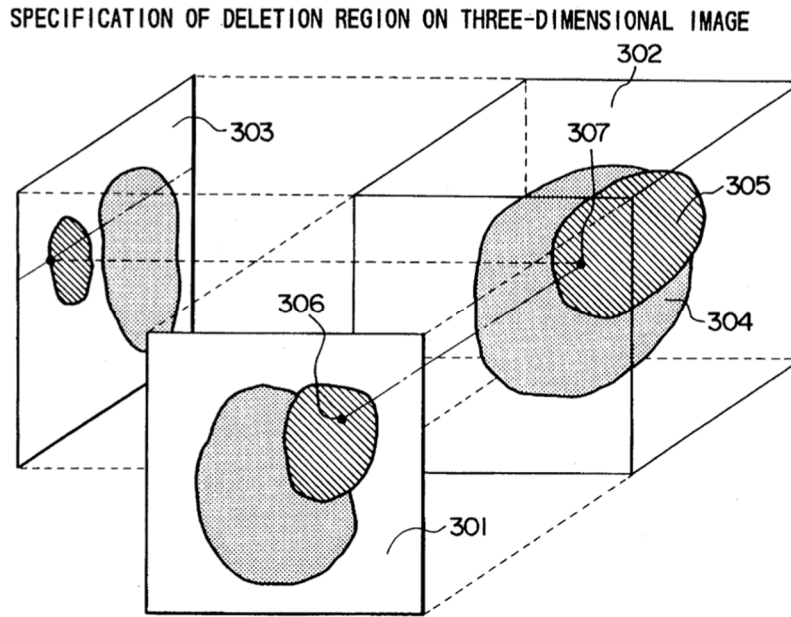


Figure 3 of Sekiguchi

EX1005, 3:61-63 (emphasis added). Sekiguchi also refers to the overflow region as the “deletion region” (see caption in Figure 3). In Figure 3, Element 302 is the 3D display image data space, Element 304 is the objective region, Element 305 is the overflow region (deletion region), and Element 306 is a point within the overflow region. *Id.*, 7:22-30. Sekiguchi discloses that “[i]n the overflow region deletion, there is first required means for indicating a deletion objective region.” *Id.*, 7:12-13. EX1014, ¶¶91-92.

Sekiguchi also identifies multiple points and voxels that are unoccupied by the object of interest given that Sekiguchi discloses identifying an overflow/deletion “region”. *See, e.g.*, EX1005, 5:7-8, 3:61-63, 11:4-6, Fig. 3. Similarly, the ’374 Patent discloses that “identifying the one of the plurality of voxels may include identifying a plurality of points” and “voxels in which points are detected may be forbidden”.

EX1001, 1:50-52, 15:27-29. The '374 Patent discloses that this step “may include identifying at least one of the plurality of voxels in the scan space that is unoccupied.” *Id.*, 15:44-46. *See also id.*, claim 10 (“wherein the prohibited volume includes more than one of the plurality of voxels”). EX1014, ¶93.

- d. [1.4]: storing an indication in the spatial matrix for a modified processing of data from the one of the plurality of voxels, thereby identifying a prohibited volume within the scan space; and**

Sekiguchi discloses Element [1.4].³ Sekiguchi discloses subjecting three-dimensional voxel data to different types of processing depending on the region in which the voxel data is located, like the '374 Patent. EX1005, 5:7-26, 5:62-64, 6:57-65, 6:26-27, 10:49-55, 12:64-65. EX1014, ¶94.

For voxel data that is present in Sekiguchi's overflow/deletion region, Sekiguchi discloses temporarily displaying the voxel data and visually confirming that the voxel data does not correspond to the organ to be extracted, and processing such voxel data by either deleting the data or rendered the data invisible. *See, e.g.*, EX1005, 5:7-26, 6:57-65. *See also id.*, 12:57-60, 4:66-67. This processing disclosed by Sekiguchi corresponds to the claimed “modified processing”, and Sekiguchi's

³ This section addresses both the “modified processing” recited in Elements [1.4] and [1.5] as well as the “unmodified processing” recited in Element [1.5].

overflow/deletion region corresponds to the claimed “prohibited volume”. For voxel data that is present in Sekiguchi’s objective region, Sekiguchi discloses extracting and visually displaying this data, *i.e.*, such data is not deleted or rendered invisible. *See, e.g., id.*, 5:62-64, 6:26-27, 10:49-55, 12:64-65. This processing corresponds to the claimed “unmodified processing”, and the objective region corresponds to a volume that is not in the claimed “prohibited volume”. This is discussed below in greater detail. EX1014, ¶¶95-97.

Sekiguchi discloses the claimed “modified processing”: Sekiguchi discloses temporarily displaying voxel data that is in the overflow/deletion region to allow the operator to visually check that the voxel data is not associated with the object of interest (*e.g.*, the internal organ to be extracted), and subsequently deleting or rendering invisible the voxel data. EX1005, 4:66-67 (“The extraction process is monitored on the three dimensional display image”); 5:7-8 (“The overflow region is indicated in the three-dimensional display image.”); 5:9-11 (“The operator visually checks the three-dimensional display image to delete the region if the extracted region is actually the overflow region”); 5:15-26 (“in a case where the extraction processing is conducted on the three-dimensional voxel data, there is necessitated, as disclosed in reference (3) above, a function for outputting the extraction region as a three-dimensional display image in a real time manner”); 6:57-65 (“In a case where the extraction region overflows into an external region, the extraction is required to

be stopped at an appropriate point in time.... There is provided observation means necessary for the operator to conduct the judgement.”); 9:4-24 (“the region extracted by the function of operation (8) is clearly indicated in the three-dimensional display image so that the operator confirms the region thus indicated by observing the displayed region” and “[i]f the overflow region is appropriate, the deletion processing of operation (10) below is carried out” or “an attribute of an invisibility region is assigned to the pixel without deleting the data. That is, the pixel data is retained, but it is not displayed.”); 12:57-60 (“The operator again evaluates the three-dimensional display image after the deletion processing of the step 213 so as to decide presence or absence of any other overflow region therein.”). This processing disclosed by Sekiguchi, which includes temporarily displaying and deleting/rendering transparent voxel data that is in the overflow/deletion region, corresponds to the claimed “modified processing”; Sekiguchi’s overflow/deletion region corresponds to the claimed “prohibited volume”. *See also* §VII.A.1.f. (Element [1.6]). EX1014, ¶¶98-99.

Sekiguchi discloses the claimed “unmodified processing”: Sekiguchi subjects voxel data that is in the objective region (*i.e.*, not the overflow region) to different (unmodified) processing. For example, Sekiguchi discloses extracting and displaying voxel data that is in the objective region, without subjecting such data to the deletion/rendering invisible processing discussed above. EX1005, 5:62-64

(“displaying ... the three-dimensional image”), 6:26-27 (“region 101 is an objective region to be extracted”), 10:49-55 (“three-dimensional display processor 106 generates ... three-dimensional image data of the extraction region”, “[t]he data is displayed as a three-dimensional display image on a CRT 108”). 12:64-65 (“again start the extraction of the objective region”). EX1014, ¶100.

This extracting and displaying of voxel data present in the objective region (*i.e.*, without the modified processing involving deleting data or rendering the data invisible, discussed above) satisfies the claimed “unmodified processing” recited in Element [1.5]. *See* §VII.A.1.e. In this regard, claim 1 of the ’374 Patent does not explicitly describe what the “unmodified processing” entails. According to the ’374 Patent, the “unmodified processing” encompasses “***any*** processing associated with the acquisition of three-dimensional data” such as “acquisition, display, and refinement”:

[T]he process 700 may include processing a portion of the three-dimensional data that is not in the prohibited volume—or alternatively stated, three-dimensional data that is in the permitted volume of the scan space—according to an unmodified or normal processing. This may include ***any processing associated with the acquisition of three-dimensional data*** such as.... In general, it is contemplated that any three-dimensional process that does not use space carving or the like may be

performed in an ‘unmodified’ processing step as that term is used herein, ***including without limitation acquisition, display, and refinement (for example, optimization, error minimization, etc.) of a three-dimensional surface representation*** based on, for example, a sequence of frames of image data or the like from a three-dimensional scanner. [Emphasis added.]

EX1001, 17:3-20. *See also id.*, 14:41-43. Thus, Sekiguchi’s extracting/displaying of voxel data that is in the objective region, without subjecting such data to the deletion/rendering invisible processing discussed above, satisfies the claimed “unmodified processing”. Further, the acquisition and/or storage of voxel data in the objective region as disclosed by Sekiguchi (EX1005, 1:22-29, 10:30-55, 16:10-13) also satisfies the claimed “unmodified processing”. Sekiguchi discloses processing voxel data that is not in the overflow region (*e.g.*, data that is not in the “prohibited volume”) differently from voxel data that is in the prohibited volume, and this distinct type of processing satisfies the claimed “unmodified processing”. EX1014, ¶¶101-102.

Sekiguchi discloses “storing an indication in the spatial matrix for a modified processing of data from the one of the plurality of voxels” as claimed. Sekiguchi’s system includes elements for storing and processing three-dimensional voxel data and for carrying out the processes described in Sekiguchi, including deleting/rendering invisible the data in the overflow/deletion region (*i.e.*, “modified

processing”), as well as extracting/displaying the data present in the objective region (*i.e.*, “unmodified processing”). For example, Sekiguchi discloses an apparatus (depicted below) including three-dimensional image memory 102, extraction processor 103, extraction history data memory 104, and three-dimensional display processor 106:

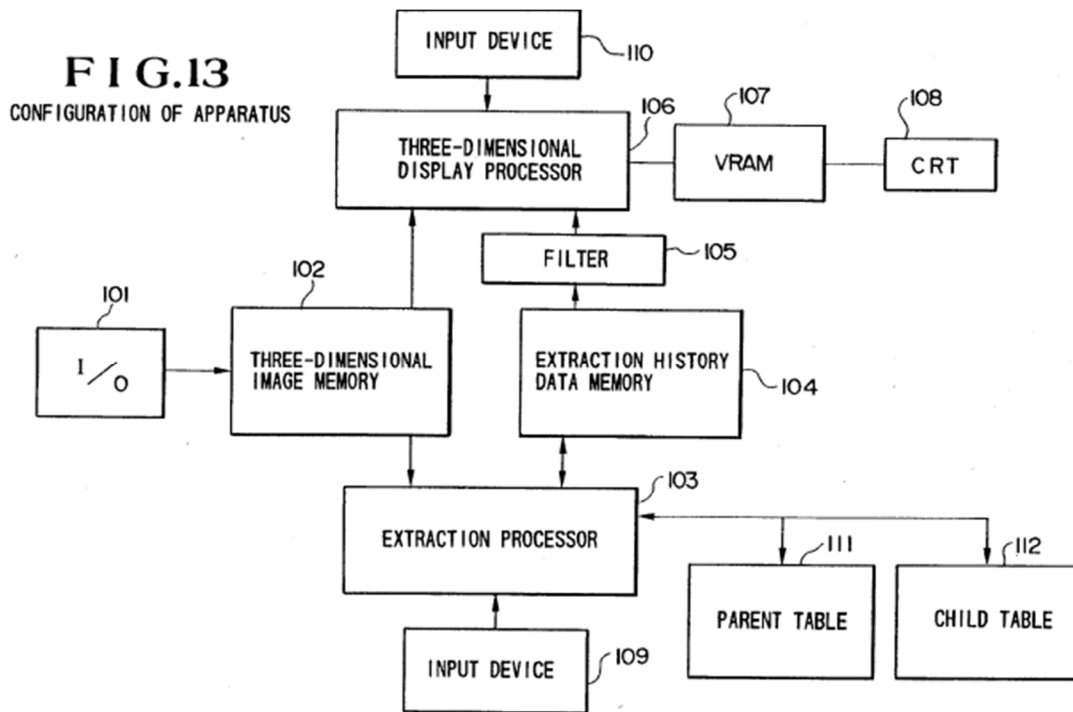


Figure 13 of Sekiguchi

See also §VII.A.1.a. (Element [1.1]). Sekiguchi’s extraction history data memory 104 stores “information denoting a serial extraction number for each voxel of the three-dimensional voxel data” (EX1005, 10:39-41), which includes an indication for modified processing of data from the one of the plurality of voxels. Further, the status of the data being stored by the system but not displayed (“data is retained, but

it is not displayed”, EX1005, 9:20-24) is itself an indication for the modified processing of data from the one of the plurality of voxels. Further, an indication of the overflow region (which, as explained above, is an indication for modified processing) is stored when the overflow region is specified “in the three-dimensional display image”, as disclosed by Sekiguchi. EX1005, 5:7-8, 3:61-63. EX1014, ¶103.

To the extent Patent Owner argues that Element [1.4] requires use of a “processing indicator such as a ‘permitted’ or ‘forbidden’ flag” as disclosed at column 16, lines 64-67 of the ’374 Patent, Sekiguchi discloses this subject matter.⁴ Sekiguchi discloses that “a shaded portion has a value ‘1’ and any other portion has a value ‘0’”. EX1005, 6:25-31. As shown in the spatial matrix of Figure 1, region 101 (shaded region with binary flag “1”) indicates that processing is permitted and unshaded regions (binary flag “0”) indicates that processing is forbidden for a corresponding volume of the scan space. Further, Sekiguchi discloses use of “binary data representing whether or not each pixel belongs inside the extraction region”. *Id.*, 6:32-36. *See also id.*, 6:40-42 (“The number is stored as attribute data for each

⁴ Claim 11, which depends from claim 1, expressly recites a “binary flag for each one of the plurality of voxels that indicates whether processing is permitted or forbidden for a corresponding volume of the scan space” and is also disclosed by Sekiguchi as explained below. §VII.A.7.

pixel. The attribute data will be referred to as ‘extraction history data’ hereinbelow.”). As explained above, references to “pixels” are for “simplification of explanation” and in fact refer to 3D voxels given that the “actual object of the present invention is multi-value three-dimensional voxel data”. *Id.*, 6:19-24. Sekiguchi’s binary data is a processing indicator such as a flag given that it “represent[s] whether or not each pixel belongs inside the extraction region” (EX1005, 6:32-36), and the extraction region of Sekiguchi corresponds to the claimed “prohibited volume”. Sekiguchi’s voxel data described above constitutes an indication of whether the data is subjected to modified or unmodified processing. EX1014, ¶¶104-106.

As explained above, Sekiguchi discloses identifying certain voxels that are unoccupied (*i.e.*, by identifying an overflow region). *See* §VII.A.1.c. Such identification of the overflow region in Sekiguchi (and storing of the associated indication of modified processing as discussed above in §VII.A.1.d.) thereby results in identifying a prohibited volume within the scan space, given that Sekiguchi’s overflow region constitutes the “prohibited volume” which the operator visually inspects for data that does not relate to the object of interest, and which in turn, is deleted or rendered invisible according to Sekiguchi’s technique as explained above. EX1014, ¶107.

- e. **[1.5]: processing a portion of the three-dimensional data that is not in the prohibited volume according to an unmodified processing and processing a second portion of the three-dimensional data that is in the prohibited volume according to the modified processing,**

Sekiguchi discloses Element [1.5] for at least the reasons discussed above concerning Element [1.4]. §VII.A.1.d. As explained above, Sekiguchi discloses subjecting three-dimensional voxel data to different types of processing depending on the region in which the voxel data is located, like the '374 Patent. §VII.A.1.d. For voxel data that is present in Sekiguchi's overflow/deletion region (corresponding to "a second portion of the three-dimensional data that is in the prohibited volume"), Sekiguchi discloses visually confirming that the voxel data does not correspond to the organ to be extracted, and processing such voxel data by either deleting the data or rendered the data invisible. *See, e.g.*, EX1005, 5:7-26, 6:57-65. This processing disclosed by Sekiguchi corresponds to the claimed "modified processing". For voxel data that is present in Sekiguchi's objective region (corresponding to "a portion of the three-dimensional data that is not in the prohibited volume"), Sekiguchi discloses extracting and visually displaying this data, *i.e.*, such data is not deleted or rendered invisible. EX1005, 5:62-64, 6:26-27, 10:49-55, 12:64-65. This processing disclosed by Sekiguchi corresponds to the claimed "unmodified processing". EX1014, ¶¶108-111.

Furthermore, Sekiguchi discloses “a method of and an apparatus for processing multi-dimensional data capable of minimizing human operation”. EX1005, 3:13-16. Sekiguchi seeks to extract and display three-dimensional data associated with an objective region, *e.g.*, three-dimensional data associated with an internal organ. Sekiguchi identifies a certain portion of the three-dimensional data associated with the object to be extracted (“objective region”), and a different portion of the three-dimensional data that does not belong to the object region (“overflow region” or “deletion region”). *Id.*, 6:26-27, Figure 1, 4:56-5:14. This is depicted in Figure 1 of Sekiguchi:

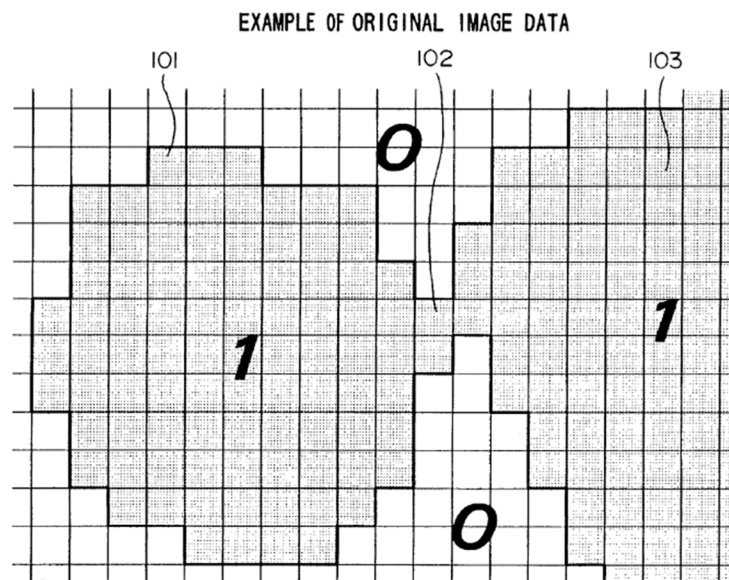


Figure 1 of Sekiguchi

The three-dimensional data that is in the objective region (*i.e.*, data that is not in the prohibited volume) is subjected to processing such as acquisition, extraction, and displaying (each and collectively corresponding to the claimed “unmodified

processing”), as explained above. §VII.A.1.d. The three-dimensional data that is in the overflow/deletion region (*i.e.*, data that is in the prohibited volume) is subject to a different type of processing involving temporarily displaying and deleting/rendering invisible the data (corresponding to the claimed “modified processing”), as explained above. §VII.A.1.d. EX1014, ¶¶112-114.

Element [1.6] of claim 1 further defines the “modified processing”, and Sekiguchi discloses such subject matter of Element [1.6] for the reasons discussed below. EX1014, ¶115.

- f. **[1.6]: wherein the modified processing includes detecting a point in the prohibited volume and displaying the point for a decay time with the second portion of the three-dimensional data.**

Sekiguchi discloses Element [1.6]. Sekiguchi discloses “wherein the modified processing includes detecting a point in the prohibited volume” as claimed. Sekiguchi discloses that “[t]he operator visually checks the three-dimensional display image to delete the region if the extracted region is actually the overflow region”. EX1005, 5:9-11. *See also id.*, 4:66-67, 5:7-8. Sekiguchi discloses that “***a point*** belonging to the region other than the objective region ***is specified*** in a three-dimensional display image to execute deletion of the overflow region”. *Id.*, abstract (emphasis added). Sekiguchi discloses that “the region extracted by the function of operation (8) is clearly indicated in the three-dimensional display image so that the operator confirms the region thus indicated ***by observing the displayed region***” and

“[i]f the overflow region is appropriate, the *deletion processing of operation (10) below is carried out*”, wherein “the overflow region is deleted” or “an attribute of an invisibility region is assigned to the pixel without deleting the data. That is, the pixel data is retained, but it is not displayed.” *Id.*, 9:4-24 (emphasis added). EX1014, ¶¶116-119.

Sekiguchi discloses that the modified processing includes “displaying the point for a decay time with the second portion of the three-dimensional data” as claimed. As explained above, Sekiguchi discloses temporarily displaying three-dimensional data in voxels marked as overflow (or for deletion) to allow the operator to visually check that such data is not associated with the object of interest (*e.g.*, the internal organ to be extracted), and the data is subsequently deleted or rendered invisible. EX1005, 4:66-67 (“The extraction process is monitored on the three dimensional display image”); 5:7-8 (“The overflow region is indicated in the three-dimensional display image.”); 5:9-11 (“The operator visually checks the three-dimensional display image to delete the region if the extracted region is actually the overflow region”); 5:15-26 (“in a case where the extraction processing is conducted on the three-dimensional voxel data, there is necessitated, as disclosed in reference (3) above, a function for outputting the extraction region as a three-dimensional display image in a real time manner”); 6:57-65 (“In a case where the extraction region overflows into an external region, the extraction is required to be stopped at

an appropriate point in time.... There is provided observation means necessary for the operator to conduct the judgement.”); 9:4-24 (“the region extracted by the function of operation (8) is clearly indicated in the three-dimensional display image so that the operator confirms the region thus indicated by observing the displayed region” and “[i]f the overflow region is appropriate, the deletion processing of operation (10) below is carried out” or “an attribute of an invisibility region is assigned to the pixel without deleting the data. That is, the pixel data is retained, but it is not displayed.”); 10:54-55 (“[t]he data is displayed as a three-dimensional display image on a CRT 108.”). EX1014, ¶¶120-121.

Sekiguchi discloses that the three-dimensional data that is in the overflow/deletion region and temporarily displayed (*i.e.*, the data that is in the “prohibited volume” and thus subject to the “modified processing”) includes points. EX1005, abstract (“when a region other than an objective region is extracted as a result of the region extraction, a point belonging to the region other than the objective region is specified in a three-dimensional display image to execute deletion of the overflow region”), 3:20-27, Fig. 14 (“specify point in overflow region”), 11:4-6 (“coordinates of a point or a plurality of points in a region”). Sekiguchi discloses that “[a] point is specified in the overflow region to be deleted”. *Id.*, 12:10. Sekiguchi discloses detecting a point in the prohibited volume in order to temporarily display such point, as well as to visually confirm that the data should be deleted/rendered

invisible, as explained above. Sekiguchi discloses detecting both “a point” (as noted above) as well as multiple points in the overflow region, given that Sekiguchi discloses detecting any data in the overflow region. EX1014, ¶¶122-123.

Sekiguchi discloses “displaying the point for a decay time” as claimed. The ’374 Patent discloses that the “decay time” relates to a temporary period of time during which data within the prohibited volume is displayed:

In another aspect, modified processing may include controlling how data in the prohibited volume is displayed. For example, data within the prohibited volume may be excluded from display, or may be displayed temporarily using a brief decay time such as 0.5 seconds or any other short interval.

EX1001, 17:40-44. Sekiguchi discloses displaying the data to be deleted or rendered invisible “for a decay time” because—as explained above—Sekiguchi discloses temporarily displaying such data in overflow voxels to allow the operator to visually confirm that such data belongs to the overflow region (and is not associated with the internal organ to be extracted), prior to deletion or rendering such data invisible. EX1005, 4:66-67, 5:7-8, 5:9-11, 5:15-26, 6:57-65, 9:4-24. EX1014, ¶124.

Sekiguchi discloses “displaying the point for a decay time” under the District Court’s and Patent Owner’s construction in the Related Litigation. The District Court determined that the term “displaying the point for a decay time” is to take on

its plain and ordinary meaning (EX1012, pp. 3-4), and Sekiguchi discloses the term under the District Court’s construction for the reasons discussed above. Further, Patent Owner asserted that “displaying the point for a decay time” under its plain and ordinary meaning need not be “brief” or “predetermined”:

The plain meaning of this term is consistent with the use of the term in the claims, which recite that a “point in a prohibited volume” is “displayed” for the duration of “a decay time.”... Similarly, here, the specification’s single reference to a “brief decay time” does not mean that every instance of a “decay time” is inherently “brief” (or “short”)... [T]he ’374 patent ... is completely silent as to whether predetermination is or is not associated with displaying data, including when it is displayed for a decay time.

EX1013, pp. 24-26. As discussed above, Sekiguchi discloses temporarily displaying the data for a duration of time (*i.e.*, prior to deletion or being rendered invisible) and thus satisfies the District Court’s (and Patent Owner’s) construction in the Related Litigation. EX1014, ¶125.

Sekiguchi discloses displaying the point for a decay time “with the second portion of the three-dimensional data” as claimed. As explained above, Sekiguchi discloses displaying voxel data in the overflow region with voxel data in the objective region. EX1005, 5:7-26, 5:62-64, 6:26-27, 6:57-65, 10:49-55, 12:64-65. As also explained above, voxel data in Sekiguchi’s overflow region corresponds to

the “second portion of the three-dimensional data that is in the prohibited volume” (which in turn includes the “point in the prohibited volume” recited in Element [1.6]), and voxel data in Sekiguchi’s objective region corresponds to the “portion of the three-dimensional data that is not in the prohibited volume”. *Id.* The purpose of temporarily displaying the “portion” in Sekiguchi is for the purpose of allowing the operator to visually confirm that such “portion” does not correspond to the organ to be extracted and can be deleted or rendered invisible. *Id.* Displaying both portions simultaneously as disclosed by Sekiguchi further advances this purpose. This is also depicted in Figures 1-2, 4, and 6-9 of Sekiguchi. In addition, Sekiguchi expressly discloses “displaying, in a *superimposed* manner, the overflow region onto the three-dimensional image”. EX1005, 5:61-63 (emphasis added). EX1014, ¶126.

2. Claim 3: The method of claim 1 further comprising providing a spatial margin of one or more voxels adjacent to a surface of the object for which processing cannot be prohibited.

Sekiguchi discloses the subject matter of claim 3. *See* Section VII.A.1. (claim 1 from which claim 3 depends). In Sekiguchi, a spatial margin is provided that includes voxels that are adjacent to a surface of the objective region 101 (the outline of the objective region 101), for example, as depicted in Figure 1:

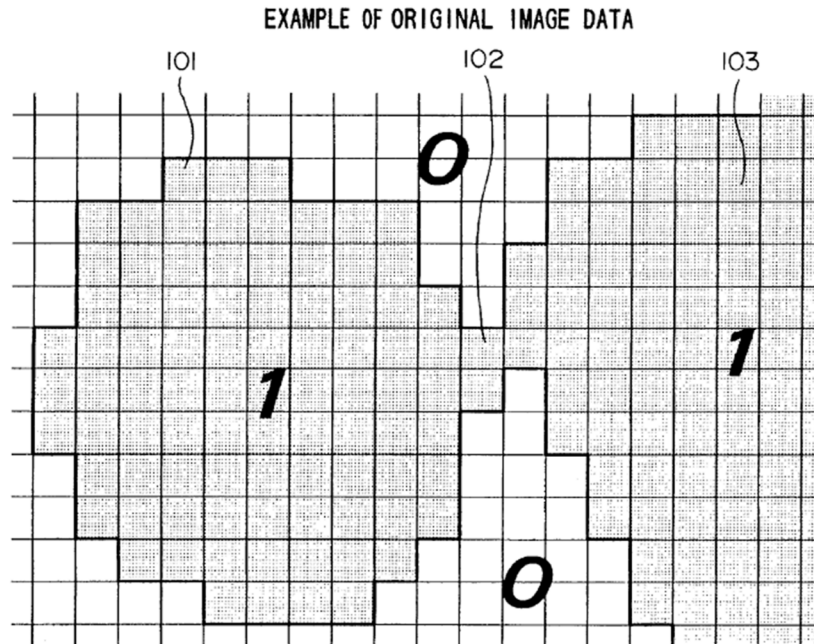


Figure 1 of Sekiguchi

These voxels are voxels for which processing cannot be prohibited because they are included in the extracted and rendered object, as they belong to the objective region 101. Sekiguchi expressly teaches processing (*e.g.*, acquiring, extracting and displaying) such voxels given that they are present in the objective region. EX1014, ¶¶127-129.

In addition, Figure 9 of Sekiguchi depicts a spatial margin of one voxel designated “x” (thus satisfying the claimed “one or more voxels”) that is adjacent to a surface of the object (*e.g.*, the outline of the objective region 101 (shaded portion), which is expressly labeled in Figure 1 above):

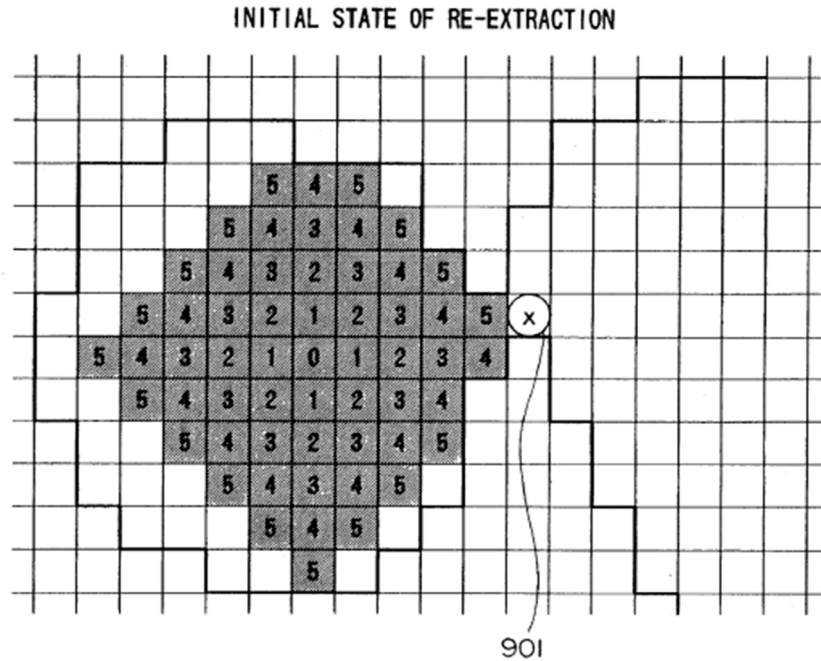


Figure 9 of Sekiguchi

Processing cannot be prohibited for this voxel given that Sekiguchi expressly discloses processing the voxel by, for example, designating it as “x” and assigning such voxel “with the expansion inhibition attribute”. EX1005, 15:21-30. EX1014, ¶130.

3. **Claim 5: The method of claim 1 wherein the modified processing includes omitting any points in the prohibited volume from a surface mesh of the object created with the three-dimensional data.**

Sekiguchi discloses the subject matter of claim 5. *See* Section VII.A.1. (claim 1 from which claim 5 depends). As discussed above in Section VII.A.1.f., Sekiguchi discloses deleting voxel data in the overflow region (corresponding to the “prohibited volume”) or retaining but not displaying the voxel data associated with

the overflow region. Sekiguchi discloses that after confirming the overflow region, “the overflow region is deleted” or “an attribute of an invisibility region is assigned to the pixel without deleting the data” wherein “the pixel data is retained, but it is not displayed”. EX1005, 9:18-25. *See also id.*, abstract (“when a region other than an objective region is extracted as a result of the region extraction, a point belonging to the region other than the objective region is specified in a three-dimensional display image to execute deletion of the overflow region”). Thus, Sekiguchi omits any points associated with the overflow region from further processing including any generation of a surface mesh of the object created with the three-dimensional data, given that such data is deleted or otherwise not displayed. EX1014, ¶¶131-132.

Further, for example, Sekiguchi discloses that “[w]hen there exist a plurality of overflow regions, the extraction processing of the objective region described in operation (1) and the overflow region extraction and deletion of operations (2) to (10) are repeatedly carried out to sequentially delete overflow regions” (EX1005, 9:25-30). The data that was previously deleted or rendered invisible in an earlier iteration is omitted from subsequent iterations of the data refinement process. *Id.* Sekiguchi discloses a rendering processor that “generate[s] a three-dimensional display image of the extraction region at the current extraction stage in the VRAM 107, thereby displaying the image on the CRT 108”. EX1005, 11:45-53. Sekiguchi discloses generating a surface mesh for the reasons discussed above concerning

Element [1.1], and the surface mesh is also created from the three-dimensional data when, for example, the data is rendered onto a display. *Id.* Sekiguchi omits points in the extraction region (corresponding to the “prohibited volume”) from such a surface mesh because such data is deleted or rendered invisible, as explained above. EX1014, ¶¶133-134.

4. Claim 7: The method of claim 1 wherein the modified processing includes omitting any points in the prohibited volume from a high-accuracy refinement of the three-dimensional data.

Sekiguchi discloses the subject matter of claim 7. *See* Section VII.A.1. (claim 1 from which claim 7 depends). For at least the reasons discussed above with respect to claim 5 (Section VII.A.3.), Sekiguchi discloses wherein the modified processing includes omitting any points in the prohibited volume from a high-accuracy refinement of the three-dimensional data. As discussed above in Section VII.A.1.f., Sekiguchi discloses deleting the voxel data in the overflow region or retaining but not displaying the data associated with the overflow region. Sekiguchi discloses that after confirming the overflow region, “the overflow region is deleted” or “an attribute of an invisibility region is assigned to the pixel without deleting the data” wherein “the pixel data is retained, but it is not displayed”. EX1005, 9:18-25. *See also id.*, abstract (“when a region other than an objective region is extracted as a result of the region extraction, a point belonging to the region other than the objective region is specified in a three-dimensional display image to execute deletion of the

overflow region”). Thus, Sekiguchi omits any points associated with the overflow region from further processing including any high-accuracy refinement of the three-dimensional data. For example, Sekiguchi discloses that “[w]hen there exist[s] a plurality of overflow regions, the extraction processing of the objective region described in operation (1) and the overflow region extraction and deletion of operations (2) to (10) are repeatedly carried out to sequentially delete overflow regions” (EX1005, 9:25-30). The data that was previously deleted or rendered invisible in an earlier iteration is omitted from subsequent iterations of Sekiguchi’s data refinement process for increasing accuracy. *Id.* In addition, to the extent Patent Owner (incorrectly) argues that Sekiguchi does not disclose a high-accuracy refinement, the points are omitted from such refinement given that the refinement does not occur. EX1014, ¶¶135-137.

5. Claim 8: The method of claim 1 wherein the mesh of the scan space is subdivided into voxels having a substantially cubic shape.

Sekiguchi discloses the subject matter of claim 8. *See* Section VII.A.1. (claim 1 from which claim 7 depends). Sekiguchi relates to a “method of and apparatus for region extraction in three-dimensional voxel data”. EX1005 (title). Figures 1, 2, 4, and 6-12 of Sekiguchi depict the voxels as square-shaped areas. Figures 1 and 8 of Sekiguchi are reproduced below:

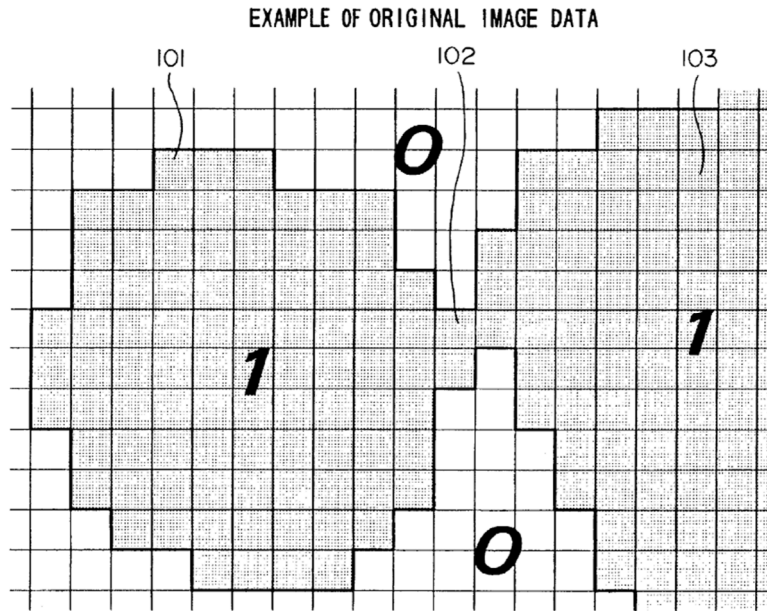


Figure 1 of Sekiguchi

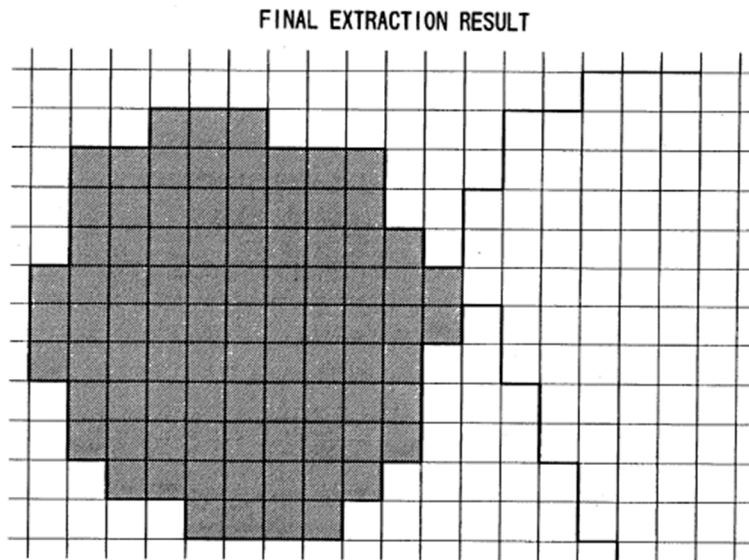


Figure 8 of Sekiguchi

Sekiguchi discloses that embodiments including Figures 1, 2, 4, and 6-12 are depicted in two dimensions (*e.g.*, including the subdivided square-shaped areas) merely “for simplification of explanation”, and that the data described in Sekiguchi

in fact pertains to “three-dimensional voxel data”. EX1005, 6:20-24 (“The actual object of the present invention is multi-value three-dimensional voxel data; however, for simplification of explanation, description will now be given of the operations accomplished for two-dimensional binary data.”). Thus, the subdivided square-shaped areas in Figures 1, 2, 4, and 6-12 are simplified representations of cubic voxels disclosed by Sekiguchi. Sekiguchi’s disclosed use of cubic voxels is consistent with well-known, routine, and conventional practices in the art. *See, e.g.*, EX1006, 8:58-60, abstract; EX1007, 10:23-25 (“the resultant 3D region is expressed in terms of volumetric cells or voxels that are shaped as cubes”). EX1014, ¶¶138-140.

6. Claim 10: The method of claim 1 wherein the prohibited volume includes more than one of the plurality of voxels.

Sekiguchi discloses the subject matter of claim 10. *See* Section VII.A.1. (claim 1 from which claim 10 depends). As explained above in Sections VII.A.1.c. to VII.A.1.f., Sekiguchi discloses that the prohibited volume includes more than one of the plurality of voxels. EX1005, 5:7-8, 3:61-63. The overflow region is a “region” and thus corresponds to a plurality of voxels. Sekiguchi pertains to processing of “three-dimensional voxel data” (title) which encompasses both one and multiple voxels. Further, Figures 1-4 and 6-12 of Sekiguchi depict an overflow region (“prohibited volume”) containing more than one voxel. *See also id.*, Fig. 3 (overflow region 305 contains more than one voxel). EX1014, ¶¶141-142.

7. **Claim 11: The method of claim 1 wherein the spatial matrix includes a binary flag for each one of the plurality of voxels that indicates whether processing is permitted or forbidden for a corresponding volume of the scan space.**

Sekiguchi discloses the subject matter of claim 11. *See* Section VII.A.1. (claim 1 from which claim 11 depends). Sekiguchi discloses that “a shaded portion has a value ‘1’ and any other portion has a value ‘0’”. EX1005, 6:25-31. As shown in the spatial matrix of Figure 1, region 101 (shaded region with binary flag “1”) indicates that processing is permitted and unshaded regions (binary flag “0”) indicates that processing is forbidden for a corresponding volume of the scan space. Sekiguchi further discloses that “[i]n a region extraction by the conventional concatenated region expansion method, a result therefrom is expressed by **binary data** representing whether or not each pixel belongs inside the extraction region or by probability of belonging thereof to the extraction region.” *Id.*, 6:32-36.

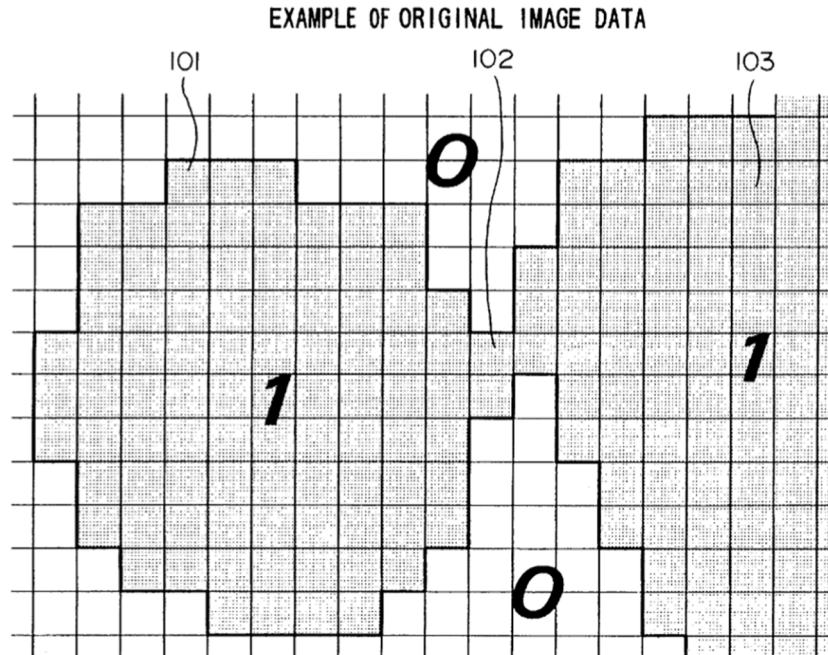


Figure 1 of Sekiguchi

EX1014, ¶¶143-146.

8. **Claim 12 (Preamble): A computer program product comprising computer executable code embodied on a non-transitory computer readable medium that, when executing on one or more computing devices, performs the steps of:**

Sekiguchi discloses the preamble of Claim 12 for at least the reasons discussed above with respect to the preamble of Claim 1. *See* Section VII.A.1. Further, Sekiguchi discloses a computer system including, *inter alia*, three-dimensional image memory 102, extraction processor 103, extraction history data memory 104, three-dimensional processor 106, VRAM 107, CRT 108, and input devices 109 and 110. EX1005, Fig. 13, 10:30-63.

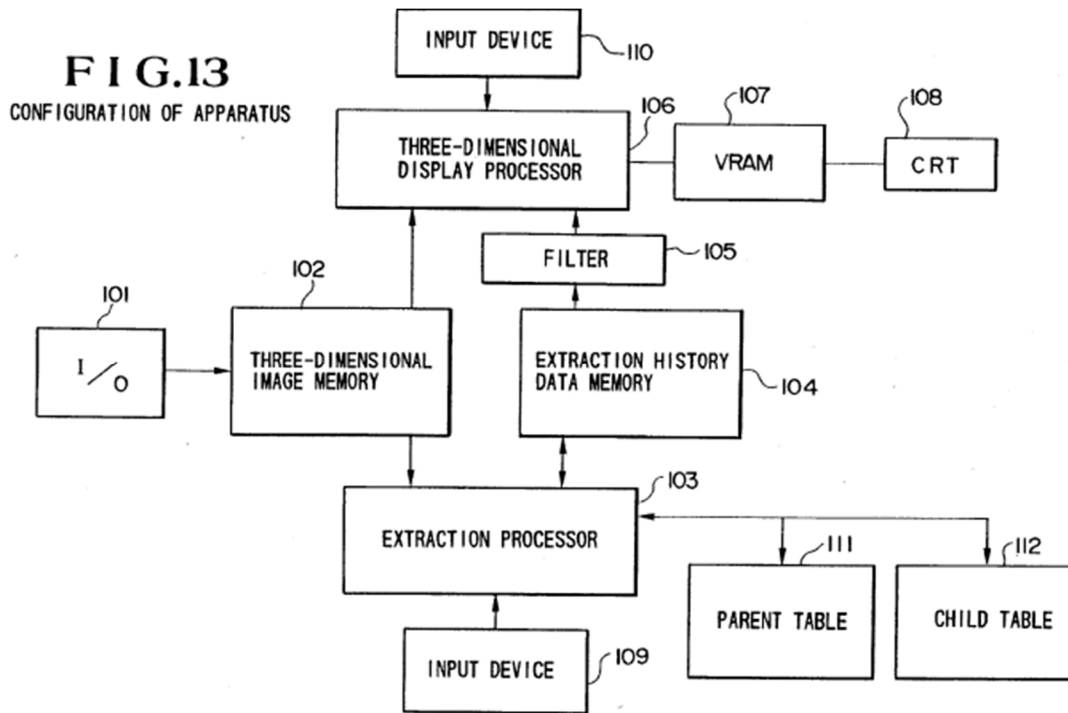


Figure 13 of Sekiguchi

Sekiguchi discloses that its system processes digital three-dimensional voxel data. *Id.*, 1:28 (“three-dimensional digital data”), 3:22 (“multi-dimensional digital data”), 10:23-27 (“three-dimensional voxel data”). The system of Sekiguchi is a computer system utilizing a computer program product in view of the nature of its components and the data that is processed. *Id. See also id.*, 10:27-29 (“data transmission path”, “direction of data flowing between the respective units”). The process steps described in Sekiguchi are performed using such computer system, *e.g.*, depicted in Figure 13. *Id.*, 4:20-21 (“Fig. 13 is a diagram showing an example of the constitution of a system to which the present invention is applied”). Given that Sekiguchi’s system is a computer system and its processes are performed using same, Sekiguchi

discloses use of a computer program product comprising computer executable code embodied on a non-transitory computer readable medium for performing the steps of its techniques, as further evidenced by the fact that software implementation of 3D data processing was well known. *See, e.g.*, EX1007, 2:60-64 (3D data processing performed using “computer readable medium containing program code”), 21:40-60 (“computer readable medium for storing computer program instructions for automatically generating a fully textured 3D model of an object ... comprising ... program code”); EX1008, [0079], (3D data processing techniques “may be realized in hardware, software, or any combination”, “realization in one or more microprocessors, microcontrollers, embedded microcontrollers, programmable digital signal processors or other programmable devices, along with internal and/or external memory”, “computer executable code”), Fig. 1, [0028]; EX1009, claim 17 (3D data processing techniques performed using a “computer program product comprising a computer usable medium having computer readable program”). EX1014, ¶¶147-152.

- a. **[12.1]: storing a spatial matrix in a memory, the spatial matrix storing information for a plurality of voxels in a mesh of a scan space;**

Sekiguchi discloses Element [12.1] for at least the reasons discussed above with respect to Element [1.1]. *See* Section VII.A.1.a. EX1014, ¶153.

- b. [12.2]: obtaining three-dimensional data from an object within the scan space using a scanner;**

Sekiguchi discloses Element [12.2] for at least the reasons discussed above with respect to Element [1.2]. *See* Section VII.A.1.b. EX1014, ¶154.

- c. [12.3]: identifying one of the plurality of voxels in the mesh of the scan space that is unoccupied;**

Sekiguchi discloses Element [12.3] for at least the reasons discussed above with respect to Element [1.3]. *See* Section VII.A.1.c. EX1014, ¶155.

- d. [12.4]: storing an indication in the spatial matrix for a modified processing of data from the one of the plurality of voxels, thereby identifying a prohibited volume within the scan space; and**

Sekiguchi discloses Element [12.4] for at least the reasons discussed above with respect to Element [1.4]. *See* Section VII.A.1.d. EX1014, ¶156.

- e. [12.5]: processing a portion of the three-dimensional data in the prohibited volume according to the modified processing and processing a second portion of the three-dimensional data that is not in the prohibited volume according to an unmodified processing,**

Sekiguchi discloses Element [12.5] for at least the reasons discussed above with respect to Element [1.5]. *See* Section VII.A.1.e. EX1014, ¶157.

Element [12.5] recites a different naming convention of the “portions” of 3D data subjected to “modified” and “unmodified” processing, but Element [12.5] is substantively identical to Element [1.5]. Specifically, Element [12.5] uses the term “a portion” to describe the portion of 3D data that is in the prohibited volume and

that is subjected to the modified processing, whereas Element [1.5] uses the term “a second portion”. Similarly, Element [12.5] uses the term “a second portion” to describe the portion of 3D data that is not in the prohibited volume and that is subjected to the unmodified processing, whereas Element [1.5] uses the term “a portion”. That is, in both Elements [1.5] and [12.5], the portion (whether referred to as “a portion” or “a second portion”) of 3D data that is in the prohibited volume is processed according to the modified processing, and the portion of 3D data (whether referred to as “a portion” or “a second portion”) that is not in the prohibited volume is processed according to the unmodified processing. As such, Sekiguchi discloses Element [12.5] for at least the reasons discussed above with respect to Element [1.5], with the understanding claim 12 reverses the naming convention of the recited “portions” of 3D data. *See* Section VII.A.1.e. EX1014, ¶158-159.

f. [12.6] wherein the modified processing includes detecting a point in the prohibited volume and displaying the point for a decay time with the second portion of the three-dimensional data.

Sekiguchi discloses Element [12.6] for at least the reasons discussed above with respect to Element [1.6]. *See* Section VII.A.1.f. *See also* Section VII.A.8.e. (concerning Element [12.5], explaining that Sekiguchi discloses the recited “portion” and “second portion”). EX1014, ¶160.

- 9. Claim 14: The computer program product of claim 12 further comprising code for providing a spatial margin of one or more voxels adjacent to a surface of the object for which processing cannot be prohibited.**

Sekiguchi discloses the subject matter of claim 14 for at least the reasons discussed above with respect to claim 3. *See* Sections VII.A.2. (claim 3) and VII.A.8. (base claim 12). EX1014, ¶161.

- 10. Claim 16: The computer program product of claim 12 wherein the modified processing includes omitting any points in the prohibited volume from a surface mesh of the object created with the three-dimensional data.**

Sekiguchi discloses the subject matter of claim 16 for at least the reasons discussed above with respect to claim 5. *See* Sections VII.A.3. (claim 5) and VII.A.8. (base claim 12). EX1014, ¶162.

- 11. Claim 18: The computer program product of claim 12 wherein the modified processing includes omitting any points in the prohibited volume from a high-accuracy refinement of the three-dimensional data.**

Sekiguchi discloses the subject matter of claim 18 for at least the reasons discussed above with respect to claim 7. *See* Sections VII.A.4. (claim 7) and VII.A.8. (base claim 12). EX1014, ¶163.

12. Claim 19: The computer program product of claim 12 wherein the mesh of the scan space is subdivided into voxels having a substantially cubic shape.

Sekiguchi discloses the subject matter of claim 19 for at least the reasons discussed above with respect to claim 8. *See* Sections VII.A.5. (claim 8) and VII.A.8. (base claim 12). EX1014, ¶164.

13. Claim 21: The computer program product of claim 12 wherein the prohibited volume includes more than one of the plurality of voxels.

Sekiguchi discloses the subject matter of claim 21 for at least the reasons discussed above with respect to claim 10. *See* Sections VII.A.6. (claim 10) and VII.A.8. (base claim 12). EX1014, ¶165.

14. Claim 22: The computer program product of claim 12 wherein the spatial matrix includes a binary flag for each one of the plurality of voxels that indicates whether processing is permitted or forbidden for a corresponding volume of the scan space.

Sekiguchi discloses the subject matter of claim 22 for at least the reasons discussed above with respect to claim 11. *See* Sections VII.A.7. (claim 11) and VII.A.8. (base claim 12). EX1014, ¶166.

15. Claim 23 (Preamble): A system comprising:

Sekiguchi discloses the preamble of Claim 23 for at least the reasons discussed above with respect to the preamble of Claims 1 and 12. *See* Sections VII.A.1. and VII.A.8. EX1014, ¶167.

- a. **[23.1]: a scanner configured to obtain three-dimensional data from an object within a scan space;**

Sekiguchi discloses Element [23.1] for at least the reasons discussed above with respect to Elements [1.2] and [12.2]. *See* Sections VII.A.1.b. and VII.A.8.b. EX1014, ¶168.

- b. **[23.2]: a memory configured to store a spatial matrix that includes information for a plurality of voxels in a mesh of the scan space; and**

Sekiguchi discloses Element [23.2] for at least the reasons discussed above with respect to Elements [1.1] and [12.1]. *See* Sections VII.A.1.a. and VII.A.8.a. EX1014, ¶169.

- c. **[23.3]: a processor configured to identify a point in the scan space that is unoccupied,**

Sekiguchi discloses Element [23.3] for at least the reasons discussed above with respect to Elements [1.3] and [12.3]. *See* Sections VII.A.1.c. and VII.A.8.c. Sekiguchi discloses identifying at least “a point” that is unoccupied given that Sekiguchi identifies an “overflow region” that is unoccupied, as explained above. EX1005, 5:7-8, 3:61-63, Fig. 3. As also explained above, Sekiguchi further discloses that “a point belonging to the region other than the objective region is specified in a three-dimensional display image to execute deletion of the overflow region”. *Id.*, abstract. EX1014, ¶170.

- d. **[23.4]: to store an indication in the spatial matrix for a modified processing of data from a one of the plurality of voxels that contains the point, thereby identifying a prohibited volume within the scan space,**

Sekiguchi discloses Element [23.4] for at least the reasons discussed above with respect to Elements [1.4] and [12.4]. *See* Sections VII.A.1.d. and VII.A.8.d. EX1014, ¶171.

- e. **[23.5]: to process a portion of the three-dimensional data that is not in the prohibited volume according to an unmodified processing, and to process a second portion of the three-dimensional data that is in the prohibited volume according to the modified processing,**

Sekiguchi discloses Element [23.5] for at least the reasons discussed above with respect to Element [1.5] and [12.5]. *See* Sections VII.A.1.e. and VII.A.8.e. EX1014, ¶172.

- f. **[23.6]: wherein the modified processing includes detecting a point in the prohibited volume and displaying the point for a decay time with the second portion of the three-dimensional data.**

Sekiguchi discloses Element [23.6] for at least the reasons discussed above with respect to Elements [1.6] and [12.6]. *See* Sections VII.A.1.f. and VII.A.8.f. EX1014, ¶173.

B. Claims 1, 3, 5, 7-12, 14, 16, and 18-23 Would Have Been Obvious Over Sekiguchi (Ground 2).

Claims 1, 3, 5, 7-12, 14, 16, and 18-23 would have been obvious over Sekiguchi. Patent Owner may argue that one or more of the claimed features are not

exactly disclosed. Any such argument is untenable but to the extent that there are any minor differences such differences would have been obvious, *e.g.*, as discussed below. EX1014, ¶174.

1. Sekiguchi suggests and teaches applying its techniques to three-dimensional voxel data

Patent Owner may argue that Sekiguchi's disclosures (*e.g.*, Figures 1-4 and 6-12) relate to two-dimensional data and that Sekiguchi's disclosures do not relate to processing steps involving "a plurality of voxels" (*e.g.*, as recited in Element [1.1], [1.3], and [1.4]) or "three-dimensional data" (*e.g.*, as recited in Elements [1.2], [1.5] and [1.6]). Such an argument is untenable. As explained above in Section VII.A.1., Sekiguchi discloses that embodiments (including, for example, Figures 1-4 and 6-12) are described in two dimensions merely "for simplification of explanation", and that Sekiguchi's techniques in fact pertain to "three-dimensional voxel data". EX1005, 6:20-24 ("The actual object of the present invention is multi-value three-dimensional voxel data; however, for simplification of explanation, description will now be given of the operations accomplished for two-dimensional binary data."). EX1014, ¶175.

At a minimum, it would have been obvious to employ three-dimensional voxel data and a three-dimensional spatial matrix in the embodiments of Sekiguchi, given that Sekiguchi expressly teaches that its disclosures in two dimensions are merely "for simplification of explanation" and that "[t]he actual object of the present

invention is multi-value three-dimensional voxel data”. EX1005, 6:20-24. Thus, for example, a POSITA would have readily modified the subject matter depicted in Figures 1-4 and 6-12 of Sekiguchi to be three-dimensional spatial matrices to accommodate the three-dimensional voxel data disclosed by Sekiguchi. To the extent Sekiguchi does not expressly disclose that any of its processing steps involve the use of voxel data, such application to voxel data would have been obvious given that Sekiguchi expressly teaches that “[t]he actual object of the present invention is multi-value three-dimensional voxel data”. *Id.* Such modifications would have been predictable, and a POSITA would have had a reasonable expectation of success given that Sekiguchi expressly teaches such modifications. EX1014, ¶176.

2. Sekiguchi suggests and teaches “displaying the point for a decay time” under Petitioner’s construction

Patent Owner may argue that Sekiguchi does not disclose “displaying the point for a decay time” (claim 1) under Petitioner’s construction.⁵ This argument is untenable. The District Court determined that such term should be given its plain and ordinary meaning and did not adopt Petitioners’ construction. EX1012, pp. 3-4.

⁵ In the Related Litigation, Petitioners construed this term as “temporarily displaying the point for a predetermined, short time interval.” EX1012, pp. 3-4.

Nonetheless, “displaying the point for a decay time”, even under Petitioners’ non-adopted construction, would have been obvious. EX1014, ¶177.

As explained above, Sekiguchi teaches temporarily displaying the data in the overflow region, *e.g.*, the data is displayed for the purpose of allowing the operator to visually confirm that the data is not associated with the object of interest prior to deletion or being rendered invisible. EX1005, 5:7-26, 6:57-65, 9:4-24, 12:57-60, 4:66-67. *See* §VII.A.1.f. It would have been obvious for this temporary display of data to be for a predetermined, short time interval. Sekiguchi seeks to provide an “efficient” process “to reduce loads imposed on the operator” and teaches that “automation” and reducing “human” interaction is “most ideal”. EX1005, abstract, 1:22-26, 2:17-20. Sekiguchi teaches that its techniques are “capable of minimizing the human operation to be achieved for the extraction processing to guarantee reliability of extraction”, and a POSITA would have recognized that limiting the display of the data to a predetermined, short time interval, *e.g.*, by use of automation, would help achieve the goal of “minimizing the human operation”. *Id.*, 3:14-19. *See also id.*, 4:52-55 (“The primary object of the present invention is to attain a high extraction reliability with a minimal amount of support jobs.”). Sekiguchi teaches automating elements of its process to reduce human interaction. *Id.* *See also id.*, 6:52-54 (“an overflow region can be automatically extracted”), 15:53-54 (“thereby automatically achieving the extraction of the objective region”). Indeed, it was well

known to process models “through a combination of user interaction and automated analysis” and utilize “automated analysis during an evaluation of a digital model” (EX1008, [0062], [0066]), and Sekiguchi suggests and teaches doing so. Automating the time period for displaying the data in question for a predetermined, short time interval would have merely involved applying Sekiguchi’s suggestions and teachings to automate steps of its process to the specific step of temporarily displaying voxel data in an overflow region (EX1005, 5:9-11, 9:4-24). Sekiguchi’s disclosure that “it is difficult to automatically decide the interruption time” (EX1005, 6:59-61) specifically relates to automation of interrupting extraction, and does not preclude automation of displaying the overflow region in the process described above. EX1014, ¶¶178-182.

It would have been obvious to modify Sekiguchi to temporarily display the point for a predetermined, short time interval (under Petitioner’s construction from the Related Litigation) for several reasons. One, Sekiguchi provides teaching, suggestion, or motivation that would have led a POSITA to modify Sekiguchi to display the point for a predetermined, short time interval via automation, as discussed above. *See, e.g.*, EX1005, 2:17-20, 3:14-19, 4:52-55, 6:52-54, 15:53-54. Two, such modification would have merely constituted use of a known technique (automation of 3D imaging techniques) to improve similar methods/systems (as disclosed by Sekiguchi) in the same way, *e.g.*, to reduce the burden on the human

operator as taught by Sekiguchi. Three, such a modification would have merely constituted applying a known technique (automation of 3D imaging techniques) to the known method/system of Sekiguchi that is ready for improvement to yield predictable results. Four, such a modification would have merely constituted combining prior art elements (the techniques/systems disclosed by Sekiguchi) according to known methods (automation of 3D imaging techniques) to yield predictable results. Five, such modification would have merely involved selection of a predetermined, short time interval from a finite number of identified, predictable time intervals, to improve the techniques/systems of Sekiguchi with a reasonable expectation of success. Again, a POSITA would have had a reasonable expectation of success given that Sekiguchi expressly teaches and suggests automation of its processing steps. EX1014, ¶¶183-188.

3. Claims 8, 9, and 20 would have been obvious

Claim 9 recites “The method of claim 8 wherein the substantially cubic shape measures about 250 microns on each edge.” Claim 20 recites “The computer program product of claim 19 wherein the substantially cubic shape measures about 250 microns on each edge.” Sekiguchi discloses the subject matter of base claims 8 and 19 for the reasons discussed above. *See* Sections VII.A.5. and VII.A.12. EX1014, ¶189.

Further, concerning claims 8, 9, and 20, it would have been obvious to employ voxels having a substantially cubic shape measuring about 250 microns on each edge in view of Sekiguchi. The '374 Patent discloses that “any other suitable size according to desired resolution, processing capabilities, and so forth” can be used. EX1001, 14:34-39. Thus, the '374 Patent merely exemplifies a “250×250×250 micron cube for each voxel” (EX1001, 14:34-39), and Patent Owner asserts no criticality associated with this particular voxel size. *See also* EX1006, 8:58-60, abstract (disclosing general conditions of “voxels with dimensions of 0.4 mm or less in at least two orthogonal directions”), 9:3-12. *See also* EX1007, 10:23-25 (“the resultant 3D region is expressed in terms of volumetric cells or voxels that are shaped as cubes”). “[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.” *In re Aller*, 220 F.2d 454, 456 (CCPA 1955). EX1014, ¶¶190-191.

C. Claims 8, 9, and 20 Would Have Been Obvious Over Sekiguchi in View of Partain (Ground 3).

Sekiguchi alone discloses and suggests the subject matter of claims 8, 9, and 20 for the reasons discussed above. *See* §§VII.A.-VII.B. In addition, the subject matter of claims 8, 9, and 20 would have been obvious in view of Sekiguchi and Partain for the reasons discussed below. EX1014, ¶¶192-193.

That is, to the extent Patent Owner argues that Sekiguchi does not disclose the additional subject matter recited in claims 8, 9, and 20, such subject matter would have been obvious in view of Partain. Use of cubic voxels was well-known in X-ray and CT imaging. Partain, which relates to X-ray and CT imaging applications, discloses that “[i]n imaging three dimensional volumes, the smallest volume (*often a cube*) that can be resolved is referred to as a voxel.” EX1006, 8:58-60, abstract (emphasis added). *See also id.*, 9:3-12. Indeed, use of cubic voxels was well-known and routine in the art. *See, e.g.*, EX1007, 10:23-25 (“the resultant 3D region is expressed in terms of volumetric cells or *voxels that are shaped as cubes*”) (emphasis added). It would have been obvious to employ voxels having a substantially cubic shape given that such cubic shape is standard practice in X-ray and CT imaging applications as evidenced by Partain, and Sekiguchi relates to the same and similar types of imaging technologies. EX1005, 1:22-29, 10:30-32. In addition, Partain demonstrates that it was well known in X-ray and CT imaging to employ “voxels with dimensions of 0.4 mm or less in at least two orthogonal directions”, which encompasses the “about 250 microns on each edge” recited in claim 9. EX1006, abstract, 9:3-12. Partain discloses voxels that are cubic in shape as noted above, and thus teaches use of cubic voxels having a dimension of each edge of 0.4 mm or less. EX1014, ¶¶194-198.

It would have been obvious to modify Sekiguchi to employ voxels having a substantially cubic shape wherein the substantially cubic shape measures about 250 microns on each edge, in view of Partain. This is true for several reasons. One, “a prima facie case of obviousness exists where the claimed ranges or amounts do not overlap with the prior art but are merely close.” M.P.E.P. § 2144.05I, citing *Titanium Metals Corp. of America v. Banner*, 778 F.2d 775, 783 (Fed. Cir. 1985). Here, the range disclosed by Partain (0.4 mm or less) encompasses the claimed “about 250 microns” and thus renders same obvious. *See also In re Aller*, 220 F.2d 454, 456 (CCPA 1955) (“[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.”). Two, such a modification would have merely constituted applying a known technique (use of cubic voxels having a dimension of each edge of 0.4 mm or less as expressly taught by Partain) to the known method/system of Sekiguchi that is ready for improvement to yield predictable results. Three, such a modification would have merely constituted combining prior art elements (the techniques/systems disclosed by Sekiguchi) according to known methods (use of cubic voxels having a dimension of each edge of 0.4 mm or less as expressly taught by Partain) to yield predictable results. Four, such modification would have merely involved selection of cubic voxel dimensions as claimed from a finite number of identified, predictable solutions, to improve the techniques/systems of Sekiguchi

with a reasonable expectation of success. Such modification would have been predictable—and a POSITA would have had a reasonable expectation of success—at least because both Partain and Sekiguchi relate to three-dimensional imaging for X-ray and CT applications, as discussed above. Partain provides additional details concerning suitable voxel dimensions that can be used in this context. Sekiguchi teaches data processing techniques utilizing three-dimensional voxel data, and Partain demonstrates that in such processing involving voxel data, it was routine and conventional to use cubic voxels having a dimension of each edge of 0.4 mm or less. Partain is in the same field of endeavor as Sekiguchi and the '374 Patent, *e.g.*, data processing relating to medical imaging. Partain is reasonably pertinent to the technical issues and problem addressed in Sekiguchi and the '374 Patent, *e.g.*, processing and display of three-dimensional data such as that obtained from X-ray and CT imaging. EX1014, ¶¶199-205.

VIII. OTHER CONSIDERATIONS

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

All elements of the Challenged Claims are known in the art, and any differences between the Challenged Claims of the '374 Patent and Sekiguchi would have been obvious to a POSITA based on the disclosures of the applied references and the knowledge in the art.

Petitioners are not aware of any secondary considerations evidence bearing any nexus to the purported claimed invention. EX1014, ¶206. 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 the Challenged Claims.

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. Sekiguchi and Partain were not considered during prosecution. Further, the prior art relied upon in this Petition discloses the claimed “decay time” feature—a feature absent from the prior art applied during prosecution. *See* §VII.A.1.f.

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.*, EX1014, ¶¶1-209. 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 1, 3, 5, 7-12, 14, 16, and 18-23 of the '374 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. 9,245,374, issued on January 26, 2016 to J. McQueston and I. Kriveshko (“the ’374 Patent”)
1002	File History of U.S. Patent Application No. 14/000,446, filed on August 20, 2013
1003	International PCT Publication No. WO 2012/115862, published on August 30, 2012 (Int’l Appln. No. PCT/US2012/025548)
1004	U.S. Provisional Application No. 61/445,499, filed on February 22, 2011
1005	U.S. Patent No. 5,553,207 (“Sekiguchi”)
1006	U.S. Patent No. 7,394,889 (“Partain”)
1007	U.S. Patent No. 6,999,073 (“Zwern”)
1008	U.S. Patent Application Publication No. 2007/0172112 (“Paley”)
1009	U.S. Patent Application Publication No. 2006/0202989 (“Yinghui”)
1010	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)
1011	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)
1012	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)

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EXHIBIT	DESCRIPTION
1013	Plaintiff Medit Corporation's Responsive Claim Construction Brief filed on February 26, 2024 in <i>Medit Corporation v. 3Shape A/S</i> , Civ. Action No. 6:23-cv-00658 (WDTX)
1014	Declaration of Eli Saber, Ph.D.
1015	<i>Curriculum Vitae</i> of Eli Saber, Ph.D.

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

I hereby certify that the word count for the foregoing Petition totals 13,214 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. 9,245,374 UNDER 35 U.S.C. §§311–19 and 37 C.F.R. §42.100 *et seq.* and EXHIBITS 1001–1015** are being served by USPS Priority Mail Express on the correspondence address of record as follows:

3M Innovative Properties Company
P.O. Box 33427
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and a courtesy copy is being served to Patent Owner's litigation counsel as follows:

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