

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

PRIME FOCUS CREATIVE SERVICES CANADA INC.,
Petitioner,

v.

LEGEND3D, INC.,
Patent Owner.

Case IPR2016-01243
Patent 7,907,793 B1

Before LYNNE E. PETTIGREW, CARL M. DEFRANCO, and
KAMRAN JIVANI, *Administrative Patent Judges*.

JIVANI, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

I. INTRODUCTION

Prime Focus Creative Services Canada Inc. (“Petitioner”) sought *inter partes* review of claims 1–20 (the “Challenged Claims”) of U.S. Patent No. 7,907,793 B1 (Ex. 1001, “the ’793 patent”), owned by Legend3D, Inc. (“Patent Owner”). Paper 1 (“Petition” or “Pet.”). On September 23, 2016, Patent Owner filed a Preliminary Response. Paper 12 (“Prelim. Resp.”). Upon consideration of the Petition and Preliminary Response, we instituted an *inter partes* review pursuant to 35 U.S.C. § 314 of the Challenged Claims on the grounds specified below. Paper 14 (“Decision on Institution” or “Dec. on Inst.”).

We have jurisdiction under 35 U.S.C. § 6. This Final Written Decision is entered pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. Based on the record before us, we determine that Petitioner has shown, by a preponderance of the evidence, that claims 1, 2, 7–14, 19, and 20 of the ’793 patent are unpatentable. Petitioner has failed to show, however, that claims 3–6 and 15–18 of the ’793 patent are unpatentable. We also deny Patent Owner’s Motion to Amend.

II. BACKGROUND

A. *Procedural History*

After institution, Patent Owner requested rehearing of our Decision on Institution. Paper 17. We considered Patent Owner’s arguments in support of its request and denied Patent Owner’s request pursuant to 37 C.F.R. § 42.71(d) for failure to show that we overlooked or misunderstood any argument made by Patent Owner in the Preliminary Response. Paper 30.

During the trial, Patent Owner filed a Patent Owner Response (Paper 36, “PO Resp.”), and Petitioner filed a Reply thereto (Paper 43, “Reply”). Patent Owner also filed a Contingent Motion to Amend the Claims (Paper 41, “Motion to Amend”). Petitioner filed an Opposition to Patent Owner’s Contingent Motion to Amend the Claims (Paper 44) and Patent Owner filed a Reply in Support of the Motion to Amend (Paper 46).

Both parties requested an oral hearing, and we scheduled the requested hearing for September 14, 2017. Paper 51. On September 11, 2017, Patent Owner notified us that it had “decided to rest on its papers in IPR2016-01243 and save the expense of participating in the oral hearing.” Ex. 3001, 1–2. The next day, Petitioner confirmed that it wished to continue with the oral hearing. *Id.* at 1. The oral hearing was held as scheduled on September 14, 2017, and the record contains a transcript of the hearing (Paper 53, “Tr.”). Petitioner presented arguments in support of its Petition and against Patent Owner’s Motion to Amend. *See generally id.* Patent Owner did not attend the hearing. *Id.* at 3:4–7.

On October 4, 2017, the Court of Appeals for the Federal Circuit issued its decision in *Aqua Products, Inc. v. Matal*, 872 F.3d 1290 (Fed. Cir. 2017) (en banc) addressing the burden of proof that the Board applies when considering the patentability of substitute claims presented in a motion to amend filed under 35 U.S.C. § 316(d). Given Patent Owner’s pending Motion to Amend, we requested that the parties inform us whether they believed a conference was necessary to discuss what impact, if any, *Aqua Products* has on resolution of Patent Owner’s Motion to Amend. Ex. 3002. Neither party responded to our request.

B. Related Proceedings

The '793 patent is the subject of ongoing litigation between the parties: *Prime Focus Creative Services Canada Inc. v. Legend3D, Inc.*, Central District of California, Case No. 2:15-cv-2340-MWF-PLA, filed on April 21, 2016 (C.D. Cal.) (the “District Court litigation”). Pet. 1. The District Court litigation is stayed and administratively closed until resolution of the instant *inter partes* review. Order, Case No. 2:15-cv-02340-MWF-PLA, Dkt. No. 62 (filed 05/02/16).

C. Overview of the '793 patent (Ex. 1001)

The '793 patent relates to an image sequence depth enhancement system and method that allows for the rapid conversion of a sequence of two-dimensional images into three-dimensional images. Ex. 1001, 1:21–25. The '793 patent describes two tasks: colorizing black-and-white feature films (*id.* at 1:27–65) and converting two-dimensional images to three-dimensional images (*id.* at 1:65–2:16). To perform either of these tasks, the '793 patent classifies elements from movie scenes into two separate categories: “either background elements (i.e. sets and foreground elements that are stationary) or motion elements (e.g., actors, automobiles, etc.) that move throughout the scene.” *Id.* at 2:21–25. In one embodiment, the background elements are combined to create a composite background image, and colorization or depth information is applied to the background elements. *Id.* at 15:15–25. In another embodiment, the motion elements are masked throughout a scene, and colorization or depth information is applied to the masked motion elements. *Id.* at 2:29–3:5.

D. Illustrative Claims

Claims 1, 13, and 20 are independent claims. Claims 1 and 13 are reproduced below.

1. A method for modifying a set of time ordered digital images comprising:

associating a plurality of images comprising common background elements;

obtaining a composite background comprising said plurality of images wherein said composite background excludes a set of motion objects moving in relation to said common background elements;

setting at least one depth parameter associated with a region within said composite background;

applying said at least one depth parameter to at least one image selected from said plurality of images using a computer.

13. A method for modifying a set of time ordered digital images comprising:

associating a first mask with a motion object in a first image;

copying said first mask to create a second mask associated so with a second image;

moving said second mask to a location of said motion object in said second image;

reshaping said second mask to fit said motion object in said second image using a computer;

setting at least one depth parameter associated with said first mask;

applying said at least one depth parameter to said second image using said computer.

E. Cited References

Petitioner relies on the following references:

1. Sandrew, U.S. Patent No. 7,181,081 B2 (“the ’081 patent”) (Ex. 1003).
2. Sandrew, U.S. Patent No. 7,333,670 B2 (“the ’670 patent”) (Ex. 1004).
3. Passmore, U.S. Patent App. Pub. No. 2009/0219383 A1, issued Sept. 3, 2009 (Ex. 1005, “Passmore”).
4. Sullivan et al., U.S. Patent No. 7,573,475 B2, issued Aug. 11, 2009 (Ex. 1006, “Sullivan”).

F. Instituted Grounds of Unpatentability

We instituted trial based on the following grounds of unpatentability under 35 U.S.C. § 103(a) (Dec. on Inst. 16):

References	Challenged Claims
’081 patent and Passmore	1, 2, and 7–12
’081 patent and Sullivan	1–12
’670 patent and Passmore	13, 14, and 19
’670 patent and Sullivan	13–19
’081 patent, ’670 patent, and Passmore	20
’081 patent, ’670 patent, and Sullivan	20

G. Testimony

Petitioner supports its challenges with a declaration of Dr. David Forsyth, filed contemporaneously with the Petition. Ex. 1009. Dr. Forsyth testified further by deposition on March 20, 2017, and a transcript of his testimony has been entered into evidence. Ex. 2021.

Patent Owner rebuts Petitioner's challenges with a declaration of Dr. Carlos Vazquez, filed contemporaneously with the Patent Owner Response. Ex. 2027. Dr. Vazquez testified further by deposition on May 22–23, 2017, and a transcript of his testimony has been entered into evidence. Ex. 1040.

III. ANALYSIS OF PETITIONER'S CHALLENGE

A. Principles of Law

Petitioner bears the burden of proving unpatentability of the challenged claims, and the burden of persuasion never shifts to Patent Owner. *Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015). To prevail in its challenges to the Challenged Claims, Petitioner must demonstrate by a preponderance of the evidence that the claims are unpatentable. 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d).

A claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time of the invention to a person having ordinary skill in the art. *KSR Int'l Co. v. Teleflex, Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the

prior art; (3) the level of skill in the art; and (4) objective evidence of non-obviousness, i.e., secondary considerations such as commercial success, long felt but unsolved needs, and failure of others. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). The obviousness inquiry further requires an analysis of “whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.” *KSR*, 550 U.S. at 418 (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006) (requiring “articulated reasoning with some rational underpinning to support the legal conclusion of obviousness”)).

B. The Level of Ordinary Skill in the Art

Based on testimony of its declarant Dr. Forsyth, Petitioner asserts a person of ordinary skill in the art “would have had at least a Bachelor’s degree education or equivalent and seven or more years of relevant work experience in the area of image analysis.” Pet. 18–19 (citing Ex. 1009, ¶¶ 30–32). Alternatively, Petitioner and Dr. Forsyth assert that “if an academic, a person of ordinary skill in the art at the time of the alleged invention would have had a Ph.D. in a field related to computer image analysis or image enhancement and several years of relevant research.” *Id.* Regardless of the precise formulation of the level of ordinary skill in the art, Petitioner argues, the ’793 patent “is so obvious that it does not matter what level of ordinary skill in the art is applicable.” *Id.* at 19.

Patent Owner, relying on the testimony of its declarant Dr. Vazquez, contends that a person of ordinary skill in the art “would have had at least an undergraduate degree in electrical engineering or computer science (or an equivalent subject) and would have been someone with a good working knowledge of computer programming, data structures, and image

processing,” which such a person would have gained through several years of practical working experience. PO Resp. 1 (citing Ex. 2024 ¶¶ 20–24). Patent Owner continues, “a higher level of education or skill might make up for less experience, and vice-versa.” *Id.* (citing Ex. 2024 ¶ 21). Finally, of Petitioner’s statement of a higher level of ordinary skill, Patent Owner states, “nothing in the record suggests alternative skill levels would lead to a different interpretation of the evidence.” *Id.* at 2.

Our decision does not turn on the differences between the definitions, particularly as Petitioner and Patent Owner agree that their respective positions would not change regardless of which formulation is applied. Pet. 19; PO Resp. 2. We see no compelling reason to apply the higher level of skill advocated by Petitioner. Accordingly, we adopt the formulation advocated by Patent Owner as more representative of the level of ordinary skill in the art at the time of the invention of the ’793 patent.

C. *Claim Construction*

We interpret claims of an unexpired patent using the broadest reasonable construction in light of the specification of the patent in which they appear. *See* 37 C.F.R. § 42.100(b); *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2144–46 (2016) (upholding the use of the broadest reasonable interpretation standard). Under the broadest reasonable interpretation standard, and absent any special definitions, claim terms are given their ordinary and customary meaning, as would be understood by one of ordinary skill in the art in the context of the entire disclosure. *In re Translogic Tech. Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). Any special definitions for claim terms or phrases must be set forth with reasonable clarity, deliberateness, and precision. *In re Paulsen*, 30 F.3d 1475, 1480

(Fed. Cir. 1994). In the absence of such a definition, limitations are not to be read from the specification into the claims. *See In re Van Geuns*, 988 F.2d 1181, 1184 (Fed. Cir. 1993).

The parties' sole claim construction dispute focuses on the term "depth parameter," as recited in each of independent claims 1, 13, and 20. We interpret claim terms to the extent necessary to resolve the controversy before us. *See Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) ("only those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy"). Accordingly, we construe below the term "depth parameter." We further determine that construction of additional terms is not necessary for our analysis and, therefore, do not construe any additional terms. *See id.*

Petitioner did not set forth an explicit construction of the term "depth parameter" in its Petition. *See generally* Pet. Instead, in a general overview comparing the '793 patent to the prior art, Petitioner asserted that the term "depth parameter" as used in the Challenged Claims "relates to the perceived distance of an object from the camera." *Id.* at 10. Petitioner's statement mirrored exactly the opinion of Dr. Forsyth, who stated in his declaration that "a 'depth' parameter relates to the perceived distance of an object from the camera." Ex. 1009 ¶ 39. Although we relied on Dr. Forsyth's testimony in assessing written description support with respect to an earlier priority date for the '793 patent, we did not render an express construction of the term "depth parameter." Dec. on Inst. 8–9.

In its Reply, Petitioner states: "in the '793 Patent, **'depth' means the distance of an object**, and a 'depth parameter' is just a parameter that contains distance information for the object." Reply 15 (internal citation

omitted). Petitioner further clarifies that the claimed “depth parameter” cannot be “as broad as anything that merely creates a *perceived* depth.” *Id.* According to Petitioner, a “‘depth parameter’ in the context of the ’793 Patent corresponds to three-dimensional positioning of objects in the scene.” *Id.* at 21.

Relying on its declarant, Dr. Vazquez, Patent Owner contends the term “depth parameter” should be construed as “a parameter that provides a perceived depth of an object or region in an image.” PO Resp. 3 (citing Ex. 2024 ¶ 44). Patent Owner and Dr. Vazquez continue, “[t]he plain and ordinary meaning for the term ‘depth parameter’ includes, for example, the saturation and luminance parameters of color taught by the ’081 Patent.” *Id.* Patent Owner also recognizes in its Response that Petitioner does not advocate for a specific construction of “depth parameter” and that Dr. Forsyth proffered a subsequent construction that was wholly absent from his declaration and the Petition. *Id.* at 2–3. Patent Owner counters Dr. Forsyth’s proposed construction by arguing that the construction is unsupported by record evidence and inadequately explained. *Id.*

To determine the scope of the term “depth parameter,” we must look to the context provided by the claims themselves, as well as to the Specification in whose light they must be considered under the broadest reasonable interpretation standard. *See Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996) (“the context of the surrounding words of the claim also must be considered in determining the ordinary and customary meaning of those terms”). More particularly, because the disputed term arises in the context of the claims of ’793 patent, we focus our

inquiry first on the claims and disclosure of the '793 patent in particular, as opposed to the predecessor '081 and '670 patents.

The '793 patent is a continuation in part of the '081 and '670 patents. Ex. 1001, (60). The Specification of the '793 patent differs from that of the '081 and '670 patents in that the Specification contains a significant amount of new matter. *See generally* Ex. 1014 (comparison of the '081 and '793 written descriptions); Ex. 1015 (comparison of the '670 and '793 written descriptions). Whereas the matter inherited in the Specification from the predecessor patents describes the colorization of black and white images, the new matter includes Figures 42 through 70 of the '793 Patent and describes depth enhancement, including the depth enhancement problem to be solved and the corresponding solution. *See id.*; *see also* Ex. 1001.

With this new matter added, the Specification of the '793 patent is directed to a system and method of depth enhancement for an image sequence. Ex. 1001, 1:21–25. The invention disclosed in the Specification allows for rapid conversion of a sequence of two dimensional images into three dimensional images. *Id.* The invention, according to the Specification, is capable of being used to achieve depth enhancement (e.g., two-dimensional to three-dimensional conversion) and also colorization of black and white images. *See id.* at 2:20–22 (“Embodiments of the invention classify scenes to be colorized and/or converted from two-dimensional to three-dimensional into movies into two separate categories.”).

The dual uses of the invention disclosed in the Specification are further highlighted by the dual problems the '793 patent seeks to solve. First, the Specification describes prior art colorization systems that require the operator to adjust masks frame by frame. *Id.* at 1:27–1:48. Second, the

Specification describes prior art depth enhancement systems that require manual shaping of masks “for applying depth or Z-dimension data to the objects.” *Id.* at 1:66–2:16.

The invention of the ’793 patent categorizes scenes into either background elements or motion elements that move through a scene. *Id.* at 2:22–25. Motion elements are masked in a key frame by the operator using interface tools. *Id.* at 2:31–33. Once the key frame has been fully masked, all mask information is applied to all frames using known mask fitting or reshaping techniques, one of which is based on luminance and pattern matching. *Id.* at 2:36–48. The Specification describes that by using these “mask reshaping techniques described above for colorization, i.e., using the underlying grey-scale for tracking and reshaping masks, much of the labor involved with converting a two-dimensional movie to a three-dimensional movie is eliminated.” *Id.* at 31:58–62. This reduction in labor is achieved because “once key frames have color or depth information applied to them, the mask information can be propagated automatically throughout a sequence of frames which eliminates the need to adjust wire frame models.” *Id.* at 31:62–66. Figure 3 of ’793 patent is reproduced below.

Figure 3

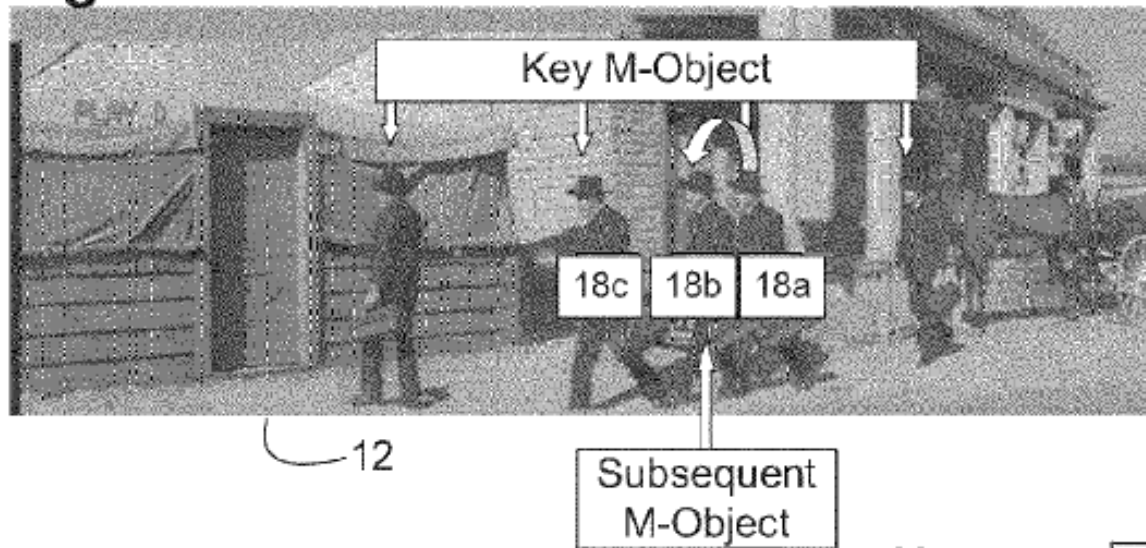
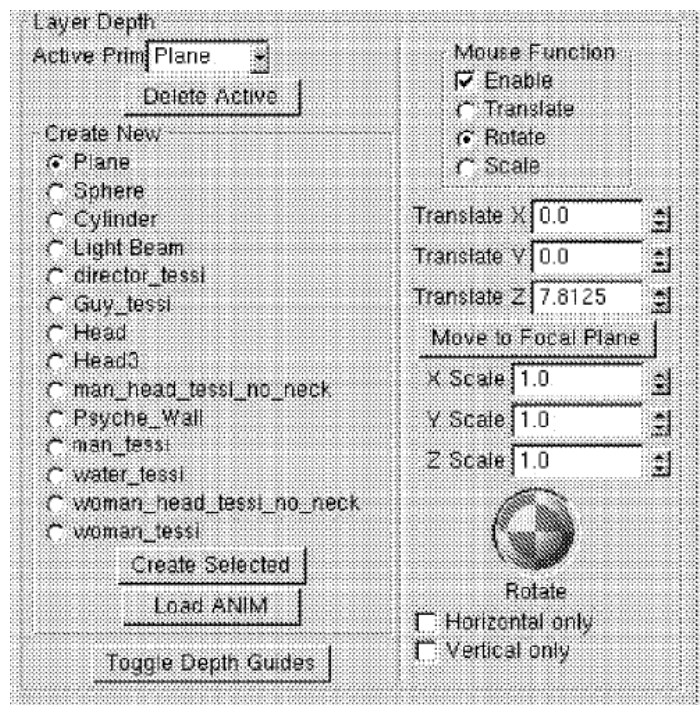


Figure 3 depicts a sample of motion objects (“M-Object”) 18a-c as M-Object 18 moves through a scene. *Id.* at 15:59–64. Key M-Objects 18a and 18c are “assigned a depth” of 32 feet and 28 feet, respectively, “from the camera capture.” *Id.* at 16:5–8. The various depths of M-Object 18 as it moves through the scene, such as for subsequent M-Object 18b, may be “tweened” between these assigned depths in order to allow for realistic three-dimensional motion without the need for wire frame models. *Id.* at 16:9–13.

Alternatively, the Specification describes that background and motion elements can be combined into single frame representations of multiple frames. *Id.* at 2:49–56. These single frame representations then serve as a visual reference database for the computer controlled application of masks within a sequence of multiple frames. *Id.* This alternative includes calculation of the X, Y, and Z coordinates for the frames and use of grayscale to determine the location, shape, color information, and depth information of the masks applied. *Id.* at 2:56–3:5.

The Specification further describes the creation of a single composite background image representing a series of camera pan images. *Id.* at 3:7–12. “For depth conversion projects, (i.e., two-dimensional to three-dimensional movie conversion for example), the single background image representing the series of camera pan images is utilized to set depths of the various items in the background.” *Id.* at 3:21–25. According to the Specification, once depth information is set for the background items, the invention can automatically spread the depth information to individual frames, thus requiring depth to be set only once per scene instead of once per frame. *Id.* at 3:26–32.

Figure 50, cropped and reproduced below, “shows a control panel for the creation of three dimensional images, including the association of layers and three-dimensional objects to masks within an image frame.” *Id.* at 32:44–48.



The reproduced portion of the control panel in Figure 50 depicts an area designated as “Layer Depth,” wherein a user may assign a Z-dimension or depth. *See id.* at 32:48–58. In particular, the “Translate Z” rotation quantity shown in Figure 50 indicates that the object is rotated forward. *Id.*

In scenes where there is minor camera movement, the Specification discloses masking motion objects using the foregoing techniques, and creating a single image for all frames that represents both the static foreground elements and background elements. *Id.* at 3:43–51. The Specification continues:

For depth projects, *the distance from the camera to each item in the composite frame is automatically transferred* to all the frames that were used to create the single composited image. By shifting masked background objects horizontally more or less, there[sic] *precise depth is thus set* in a secondary viewpoint frame that corresponds to each frame in the scene.

Id. at 4:9–14 (emphasis added). After assigning depths to objects in the composite background, a stereoscopic view of the movie is generated by creating a second viewpoint for each image in a scene. *Id.* at 4:23–27. For instance, where original frames were assigned a right eye view point, a left eye viewpoint is created. *Id.*

The Specification uses the term “depth parameter” only once beyond the language of the claims and does so in describing creation of a stereoscopic view. *Id.* at 34:43–48. Figure 69 of the ’793 patent is reproduced below.

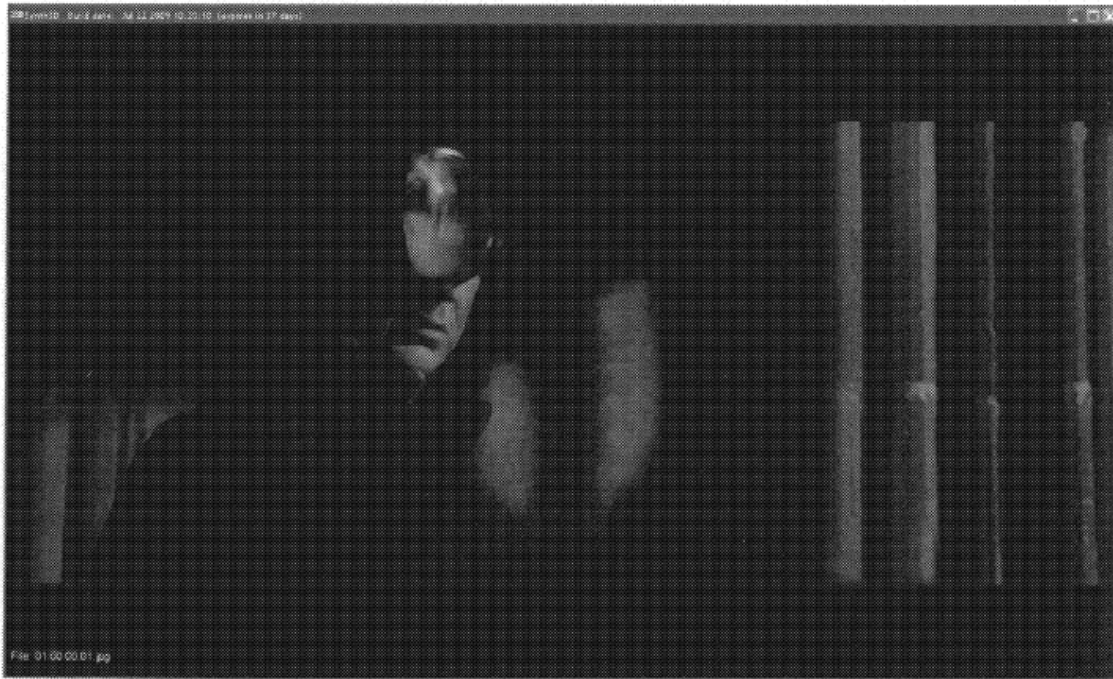


Figure 69 “shows an anaglyph of the final depth enhanced second and last image frame viewable with Red/Blue 3-D glasses, note rotation of person’s head, movement of person’s hand and movement of crystal ball.” *Id.* at 34:36–39. In this figure, the “original two-dimensional image is now shown in three-dimensions” by “applying depth information to the masks in this subsequent frame from an image sequence.” *Id.* at 34:39–43. The Specification refers to this application of depth information as “the operations for applying the depth parameter to a subsequent frame.” *Id.* at 34:43–48.

Against the backdrop of this written description, the independent Challenged Claims recite setting at least one “depth parameter” associated with a region of a composite background, motion object, mask, or non-composited image. *Id.* at 34:66–67, 36:3–4, 36:33–37. Dependent claims 2 and 14 add that setting a depth parameter may include assigning a depth value, which claim 14 further recites as encompassing numeric values. *Id.* at

35:4–6, 36:7–9. Dependent claims 3–6 and 15–18 recite that setting a depth parameter may include selecting, translating, rotating, and changing the size of a “three-dimensional geometric depth shape.” *Id.* at 35:7–23, 36:9–21. Finally, dependent claims 7 and 19 disclose that setting a depth parameter may include associating a transparency mask with a background element and “assigning depth” to the mask. *Id.* at 35:24–27, 36:22–25. Thus, the Challenged Claims describe that depth parameters encompass “depth values,” which include numeric values, and can be set for a background, an image, and a motion object. A depth parameter can be associated with a three-dimensional geometric depth shape.

Having considered the parties’ positions in light of the full trial record, we construe the term “depth parameter” to mean “information that relates to the distance of an object from the camera.” The foregoing intrinsic evidence instructs that “depth parameter” must encompass numeric values for depth and must be capable of being associated with a three-dimensional geometric shape. *Id.* at 35:4–27, 36:7–25. Further, the Specification describes depth and Z dimension data as “depth information.” *See, e.g., id.* at 2:7–15. Depth information, as described in the ’793 patent, includes specific depths assigned to objects (e.g. “a depth of 32 feet”) and “the distance from the camera to each item in the composite frame.” *Id.* at 16:5–8, 4:9–11. The Specification discloses that depth assignment is “accomplished via assigning depths, assigning geometric shapes, entry of numeric values with respect to objects in the single composite frame. In this way creatively selected colors/depths are applied that are appropriate for mapping to the range of gray scale/depth underlying each mask.” *Id.* at

29:50–56. It is this depth information that the ’793 patent refers to as a “depth parameter.” *Id.* at 34:43–48.

In light of the foregoing intrinsic evidence, we do not agree with Patent Owner’s arguments that the plain and ordinary meaning of the term “depth parameter” includes saturation and luminance. PO Resp. 3 (citing Ex. 2024 ¶ 44). Patent Owner and Dr. Vaquez do not offer evidence intrinsic to the ’793 patent in support of their position. *See id.* Nor do Patent Owner and Dr. Vaquez address the intrinsic evidence discussed above. *Id.* Instead, Patent Owner and Dr. Vaquez address only extrinsic evidence, including the ’081 and ’670 patents. *Id.* at 3–15. Our inquiry on claim construction, however, focuses on the specification in which the claims appear. *See Cuozzo Speed Techs.*, 136 S. Ct. at 2144–46; *Vitronics Corp.*, 90 F.3d at 1582.

Further, we find the intrinsic evidence is contrary to Patent Owner’s arguments. The ’793 patent does not describe saturation or luminance as depth information. Rather, the Specification discusses saturation and luminance in the context of color. Ex 1001, 30:27–30 (“The standard color wheel detects the underlying grayscale range and restricts the designer to choose only from those color saturations that will match the grayscale luminance underlying the mask.”); 11:27–32 (“Using an input device such as a mouse, the designer masks features in a selected single frame containing a plurality of pixels and assigns color to them using an HSL color space model based on creative considerations and the grayscale and luminance distribution underlying each mask.”).¹ Significantly, the only mention in the

¹ According to Dr. Vazquez, the acronym HSL stands for Hue, Saturation, and either Luminance or, sometimes, Lightness. Ex. 2024, ¶ 37.

Specification of the HSL model to which Patent Owner cites describes assigning *color* to masks using an HSL color space model, whereas assigning *depth* entails assigning “objects particular depths including contour depths, e.g., geometric shapes such as an ellipsoid to a face.” *Compare id.* at 11:29–30, *with id.* at 11:50–53. The Specification also distinguishes between color and depth information. *See, e.g., id.* at 3:1–3 (“corresponding *color lookup* from frame to frame for colorization projects or *depth information* for two-dimensional to three-dimensional conversion projects”) (emphasis added). Contrary to Patent Owner’s position, the Specification discloses using colorization mask reshaping techniques, such as reliance on underlying greyscale, to propagate depth information once it has been applied, not as depth information itself. *Id.* at 31:58–66.

For the foregoing reasons, we find Patent Owner’s extrinsic evidence, including the testimony of Dr. Vazquez, is insufficient to overcome the intrinsic evidence discussed above in order to establish that the plain and ordinary meaning of “depth parameter,” as used in the ’793 patent, encompasses saturation and luminance.

We similarly disagree with Patent Owner and Dr. Vazquez’s assertion that the claimed “depth parameter” encompasses “a parameter that provides a perceived depth.” PO Resp. 3 (citing Ex. 2024 ¶ 44). Patent Owner offers no evidence from the ’793 patent in support of this assertion. *See id.* Further, Patent Owner’s argument is predicated on the assertion that “the use of saturation and luminance to create perceived depth was well known in the art.” *Id.* As discussed above, we do not find in the Specification support for the notion that saturation and luminance constitute “depth parameters” as that term is used in the ’793 patent, and thus do not agree with Patent

Owner’s proposed construction that the claimed “depth parameter” encompasses “a parameter that provides a perceived depth.”

D. Overview of the ’670 and ’081 Patents

Both Sandrew patents upon which Petitioner relies are parents of the ’793 patent, the instant challenged patent. Specifically, the ’793 patent is a continuation-in-part of U.S. Patent No. 7,577,312, which is a continuation of the ’670 patent, which is a divisional of the ’081 patent. Both the ’081 and ’670 patents provide for colorizing black-and-white feature films by classifying elements from movie scenes into two separate categories: “either background elements (i.e. sets and foreground elements that are stationary) or motion elements (e.g., actors, automobiles, etc.) that move throughout the scene.” Ex. 1003, 1:57–59; Ex. 1004, 1:64–66. In an embodiment of the ’081 patent, the background elements are combined to create a composite background image, and the single background image is colorized. Ex. 1003, 2:16–68. In an embodiment of the ’670 patent, the motion elements are masked throughout a scene, and colorization is applied to the masked motion elements. Ex. 1004, 2:3–45.

E. The ’081 and ’670 Patents as Prior Art to the ’793 Patent

Petitioner’s unpatentability arguments in this case rely heavily on the ’793 patent’s predecessors, the ’081 and ’670 patents. Exs. 1003, 1004. For example, Petitioner relies on the ’081 and ’670 patents as teaching or suggesting every limitation of the challenged independent claims but for the claimed “depth parameter.” Pet. 19–21, 34–36, 39–43, 46–47, 49–52.

A central question in this case is whether the ’081 and ’670 patents can serve as prior art in an obviousness analysis of the Challenged Claims. Patent Owner devotes the majority of its analysis in the Patent Owner

Response to arguing that the '081 and '670 patents are not available as prior art to the '793 patent because the '793 patent is entitled to priority on the basis of the disclosure in the '081 and '670 patents themselves. PO Resp. 18–23.

In our Decision on Institution, we determined, for purposes of that Decision, that the '081 and '670 patents, were available as prior art. Dec. on Inst. 10. We based this determination on our finding that Petitioner had established a reasonable likelihood that it would prevail in showing the Challenged Claims are not entitled to a priority date based on the '081 and '670 patents given the evidence of record at that stage of the proceeding. *Id.*

Under 35 U.S.C. § 120, “a claim in a later application receives the benefit of the filing date of an earlier application so long as the disclosure in the earlier application meets the requirements of 35 U.S.C. § 112, ¶ 1, including the written description requirement, with respect to that claim.” *Tech. Licensing Corp. v. Videotek, Inc.*, 545 F.3d 1316, 1326 (Fed. Cir. 2008). To comply with the written description requirement of 35 U.S.C. § 112 in order to be entitled to an earlier priority date under 35 U.S.C. § 120, each claim limitation must be expressly, implicitly, or inherently supported in the earlier-filed disclosure. *Hyatt v. Boone*, 146 F.3d 1348, 1354 (Fed. Cir. 1998). When an explicit limitation in a claim “is not present in the written description whose benefit is sought it must be shown that a person of ordinary skill would have understood, at the time the patent application was filed, that the description requires that limitation.” *Id.*

The parties’ dispute regarding priority of the '793 patent based on the '081 and '670 patents turns on whether the disclosures of those earlier filed patents adequately describe the Challenged Claims’ term “depth parameter,”

which we construe above in the context of the '793 patent to mean
“information that relates to the distance of an object from the camera.”

The '081 and '670 patents do not recite the term “depth parameter.” Indeed, the only use of the constituent word “depth” in either the '081 patent or '670 patent is in a context unrelated to the “depth parameter” recited in the Challenged Claims. Ex. 1003, 6:54 (only instance of the word “depth” in the context of “bit depth”); Ex. 1004, 3:65 (same). The claims of the '081 and '670 patents, however, recite use of a “color parameter.” *See, e.g.*, Ex. 1003, 29:6–17 (claim 1 of the '081 patent); *see also* Ex. 1004, 26:38–52 (claim 3 of the '670 patent).

Relying on its declarant Dr. Forsyth, Petitioner contends the claimed “depth parameter” is an “entirely distinct, non-overlapping” concept from a “color parameter,” which “relates to the visible hue of an object.” Pet. 10 (citing Ex. 1009 ¶ 39). Again relying on Dr. Forsyth, Petitioner contends:

Given this complete lack of disclosure of depth anywhere in the family history and the material difference between “color” parameters and “depth” parameters, a person of ordinary skill in the art could not possibly have recognized that the inventor of the '081 Patent or '670 Patent had possession of the depth-related invention of the '793 Patent when those earlier patents were filed.

Id. at 10–11 (citing Ex. 1009 ¶¶ 40–41). Petitioner further argues that by filing a non-publication request for the patent application that ultimately issued as the '793 patent, Patent Owner certified that the '793 patent cannot claim priority to the '081 and '670 patents. Reply 5. Specifically, in the non-publication request under 35 U.S.C. § 122(b)(2)(B)(i), Patent Owner certified, as required, that the invention disclosed in the application leading to the '793 patent was not the subject of an application filed in another

country, or under a multilateral international agreement, that requires publication at eighteen months after filing. *Id.* (citing Ex. 1002, 1).

Petitioner elaborates that, because the '081 patent was the subject of a PCT application requiring publication at eighteen months after filing, Patent Owner's non-publication request certified that the '793 patent cannot claim priority to the '081 patent or its divisional, the '670 patent. *Id.*

Conversely, Patent Owner contends one of ordinary skill in art would have understood the disclosure of the '081 and '670 patents as describing sufficiently the claimed "depth parameter" to satisfy the written description requirement of 35 U.S.C. § 112. PO Resp. 16–19. Patent Owner states that the '081 and '670 patents reference the "HSL color space model" and disclose "that a designer can assign color to a plurality of pixels in a frame using an HSL color space model." *Id.* at 16 (citing Ex. 1003, 9:4–6; Ex. 2024 ¶ 46). Relying on its declarant Dr. Vazquez, Patent Owner asserts that one of ordinary skill in the art would have understood that the "Saturation and Luminance aspects of color in the HSL color space are related to shading (luminance), perceived shape, and perceived depth." *Id.* at 13 (citing Ex. 2024 ¶ 39). Patent Owner and Dr. Vazquez continue that it "was also understood at the time of the '081 Patent how the distribution of luminance (e.g., shadows) or saturation was used as a depth cue to create perceived relative depth or depth ordering." *Id.* at 18 (citing Ex. 2024 ¶ 48). Therefore, Patent Owner alleges, one of ordinary skill in the art would have understood the '081 and '670 patents to reasonably convey the claimed "depth parameter," which an ordinarily skilled artisan would have understood as "relat[ing] to the creation of perceived depth, perceived relative depth, and/or perceived depth ordering of objects." *Id.* at 19.

The written description requirement is satisfied by disclosure of “such descriptive means as words, structures, figures, diagrams, formulas, etc., that fully set forth the claimed invention.” *Lockwood v. Am. Airlines, Inc.*, 107 F.3d 1565, 1572 (Fed. Cir. 1997). Here, due to the absence of explicit disclosure of “depth parameter” in the ’081 and ’670 patents, we turn to the understanding of the ’081 and ’670 patents by one of ordinary skill in the art at time. *Hyatt*, 146 F.3d at 1353. Petitioner proffers the testimony of Dr. Forsyth in support of its contention that a person of ordinary skill would not have understood the specifications of the ’081 and ’670 patents to describe use of a “depth parameter.” Pet. 10–11 (citing Ex. 1009 ¶¶ 39–41). As discussed above, Dr. Forsyth attests that “depth parameter” relates to the distance of an object from a camera, a concept that does not appear to have been described in either the ’081 or ’670 patents, but is described in the ’793 patent at issue. *See, e.g.*, Ex. 1015, 4, 13 (indicating new matter added). Dr. Forsyth’s testimony is consistent with our construction of the term “depth parameter” as meaning “information that relates to the distance of an object from the camera.” *See supra* Section III.C.

Patent Owner and Dr. Vazquez adduce substantial evidence in the art of using saturation and luminance to achieve perceived depth, perceived relative depth, and/or perceived depth ordering of objects. PO Resp. 3–14. Patent Owner’s arguments and evidence, however, are predicated upon its construction of the term “depth parameter” as encompassing perceived depth, which we reject above. *See supra* Section III.C. Accordingly, we determine Petitioner has established by a preponderance of the evidence that the Challenged Claims are not entitled to a priority date based on the ’081 and ’670 patents, and thus we determine that the ’081 and ’670 patents are

available as prior art for purposes of Petitioner's challenges to the '793 patent. Because Petitioner and Dr. Forsyth's evidence establishes a preponderance over that of Patent Owner and Dr. Vazquez, we do not reach Petitioner's argument regarding Patent Owner's non-publication request under 35 U.S.C. § 122(b)(2)(B)(i) and find that issue to be moot.

F. Obviousness of claims 1, 2, and 7–12 over the '081 patent and Passmore

1. Overview of Passmore

Passmore discloses an image depth augmentation system and method for providing three-dimensional views from a two-dimensional image. Ex. 1005, Abstract. Figure 3 of Passmore is reproduced below.

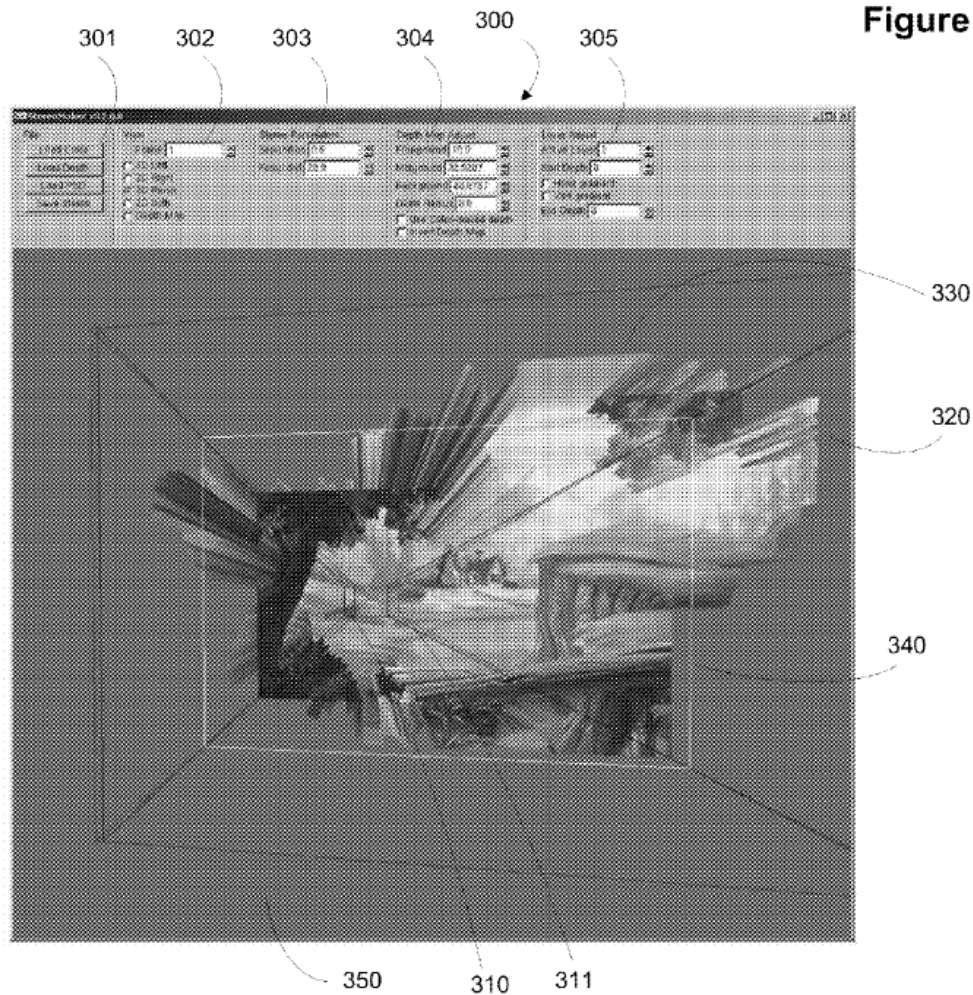


Figure 3 depicts an image “augmented with depth” and shown with left viewpoint 310 and right viewpoint 311. *Id.* ¶ 40. A user may drag areas to and away from the user via mouse to automatically move areas in depth. *Id.* View pane 302 allows for display of a depth map in viewing pane 350. *Id.* ¶ 41. Depth pane 304 allows a user to set distances for the foreground, midground, and background. *Id.*

In one embodiment, Passmore describes using the pre-existing digital masks of colorized movies to augment the depth of an image. *Id.* ¶ 48. Passmore discloses that, by using these preexisting colorization masks to

augment depth, “[t]he enormous effort of generating masks for an entire movie may thus be leveraged.” *Id.*

2. *Combining the ’081 Patent with Passmore*

Petitioner contends the ’081 patent is analogous art to the ’793 patent because they are related to the same field of endeavor, namely “the field of image analysis and image enhancement, (suggested class of 382, subclass 254).” Pet. 15 (citing Ex. 1001, 1:19–21; Ex. 1003, cover page, l. 52). Petitioner, relying on Dr. Forsyth, further contends Passmore is analogous art to the ’793 patent because it is within the same field of endeavor given that Passmore teaches methods of three-dimensional conversion. *Id.* (citing Ex. 1009 ¶ 46).

According to Petitioner, one of ordinary skill in the art would have been motivated to combine the ’081 patent and Passmore because of the specific teachings, suggestions, and motivations of the two references. *Id.* at 16. Specifically, Petitioner points to Passmore’s description of using pre-existing digital masks of colorized movies to augment the depth of an image. *Id.* at 16–17(citing Ex. 1005 ¶ 48). Petitioner contends, “strong market forces would therefore have prompted the variation of the methods of the ’670 and ’081 Patents in view of either Passmore or Sullivan for use in 3D conversion with predictable results.” *Id.* at 17(citing *KSR*, 550 U.S. at 417; Ex. 1009 ¶¶ 48–49). “In essence, all that is required is the simple substitution of one known element from Passmore or Sullivan—depth—for another element from the ’670 or ’081 Patents—color—to obtain predictable results.” *Id.*

Patent Owner does not address Petitioner's arguments or evidence regarding whether the cited references are analogous or Petitioner's proposed rationale for the combination of the '081 patent with Passmore.

Having considered the parties' positions in light of the full trial record, we determine Petitioner has shown by a preponderance of the evidence that the '081 patent and Passmore are analogous art and that one of ordinary skill in the art would have been motivated to combine the teachings of the '081 patent and Passmore, as detailed below. In particular, we agree with Petitioner and Dr. Forsyth that, given the '081 patent's teachings of using masks for colorization, an artisan of ordinary skill would have been motivated to re-use these masks, as Passmore describes, in order to augment depth of an image with predictable results, thereby leveraging "[t]he enormous effort of generating masks for an entire movie." Ex. 1005 ¶ 48.

3. *Claim 1*

Petitioner relies on claim 1 of the '081 patent as teaching or suggesting every limitation of Challenged Claim 1 but for the claimed "depth parameter" and the claimed requirement of "using a computer." Pet. at 19–21. Petitioner further relies on Passmore's "depth pane 304" and "depth map 200 related parameters" as meeting the claimed "depth parameter." *Id.* at 21 (citing Ex. 1005 ¶¶ 41, 48 and Fig. 9).

In response, Patent Owner contends only that claim 1 is entitled to priority based on the '081 patent, thereby rendering the '081 patent ineligible as prior art and predating Passmore. PO Resp. 20.

We agree with Petitioner that claim 1 of the '081 patent discloses verbatim each limitation of Challenged Claim 1, but for the claimed "depth parameter" and the claimed requirement of "using a computer." *Compare*

Ex. 1001, 34:58–35:3, *with* Ex. 1003, 29:6–17. As to the “using a computer” limitation, we agree with Petitioner that the ’081 patent meets this limitation because it uses a computer to generate masks for colorizing images. *See, e.g.*, Ex. 1003, Abst. (“computer controlled application of masks”). With regard to the claimed “depth parameter,” we agree with Petitioner and Dr. Forsyth that this limitation is met by at least Passmore’s “depth map 200 related parameters.” Pet. 21 (citing Ex. 1005 ¶¶ 41, 48 and Fig. 9). In particular, we find Passmore’s numeric distance values for the foreground, midground, and background (Ex. 1005 ¶ 41) each constitute information that relates to the distance of an object from the camera, thereby meeting the term “depth parameter” as we construed it above. *See supra* Section III.C. As to Patent Owner’s assertion of priority based on the ’081 patent, we reject this argument above. *See supra* Section III.E. Having considered the parties’ positions in light of the full trial record, we determine Petitioner has shown by a preponderance of the evidence that claim 1 of the ’793 patent is rendered obvious by the ’081 patent and Passmore.

4. Claim 2

Claim 2 of the ’793 patent recites: “The method of claim 1 wherein said setting said at least one depth parameter comprises assigning a depth value for at least one of said common background elements.” Ex. 1001, 35:4–6. Petitioner and Dr. Forsyth contend, *inter alia*, that Passmore teaches assigning a depth value for at least one of said common background elements. Pet. 21–25 (citing Ex. 1009 ¶¶ 56–58; Ex. 1005 ¶ 48).

In response, Patent Owner contends only that claim 2 is entitled to priority based on the ’081 patent, thereby rendering the ’081 patent ineligible as prior art and predating Passmore. PO Resp. 20.

We agree with Petitioner that Passmore teaches assigning a depth value for at least one common background element. For instance, Passmore describes setting numeric distance values for the background. Ex. 1005 ¶ 41. Passmore further teaches merging and splitting masks to allow for “the combining of masks at similar depth to simplify the tracking of masks through frames.” *Id.* ¶ 48. As to Patent Owner’s assertion of priority based on the ’081 patent, we reject this argument above. *See supra* Section III.E. Having considered the parties’ positions in light of the full trial record, we determine Petitioner has shown by a preponderance of the evidence that claim 2 of the ’793 patent is rendered obvious by the ’081 patent and Passmore.

5. *Claim 7*

Claim 7 of the ’793 patent recites: “The method of claim 1 wherein said setting said at least one depth parameter comprises associating a transparency mask with said at least one common background elements and assigning depth to said transparency mask.” Ex. 1001, 35:24–27. Petitioner contends that the ’081 patent teaches associating transparency masks. Pet. 25 (citing Ex. 1003, 13: 63–64 (“The mask is shown as an opaque or transparent color.”), 10:51–54 (“In cases where cast shadows on a background from a moving object may be confused with the moving object[,] the resulting masks will be assigned to a default alpha layer that renders that part of the moving object mask transparent.”)).

In response, Patent Owner contends only that claim 7 is entitled to priority based on the ’081 patent, thereby rendering the ’081 patent ineligible as prior art and predating Passmore. PO Resp. 20.

We agree with Petitioner that the '081 patent teaches the use of transparent masks. Pet. 25 (citing Ex. 1003, 10:51–54, 13: 63–64). We further determine that Passmore describes assigning depth to masks. For instance, Passmore teaches merging and splitting masks to allow for “the combining of masks at similar depth to simplify the tracking of masks through frames.” Ex. 1005 ¶ 48. As to Patent Owner’s assertion of priority based on the '081 patent, we reject this argument above. *See supra* Section III.E. Having considered the parties’ positions in light of the full trial record, we determine Petitioner has shown by a preponderance of the evidence that claim 7 of the '793 patent is rendered obvious by the '081 patent and Passmore.

6. *Claim 8*

Claim 8 of the '793 patent recites: “The method of claim 1 wherein said obtaining a composite background further comprises: obtaining a camera angle value for said at least one image selected from said plurality of images.” Ex. 1001, 35:28–31. Petitioner contends that claim 13 of the '081 patent recites a “verbatim identical teaching.” Pet. 26–27 (citing Ex. 1003, 29:47–50 (“The method of claim 1 wherein said obtaining a composite background further comprises: obtaining a camera angle value for said at least one image selected from said plurality of images.”))).

In response, Patent Owner contends only that claim 8 is entitled to priority based on the '081 patent, thereby rendering the '081 patent ineligible as prior art and predating Passmore. PO Resp. 20.

We agree with Petitioner that claim 13 of the '081 patent is identical to Challenged Claim 8. *Compare* Ex. 1001, 35:28–31, *with* Ex. 1003, 29:47–50. As to Patent Owner’s assertion of priority based on the '081

patent, we reject this argument above. *See supra* Section III.E. Having considered the parties' positions in light of the full trial record, we determine Petitioner has shown by a preponderance of the evidence that claim 8 of the '793 patent is rendered obvious by the '081 patent and Passmore.

7. *Claim 9*

Claim 9 of the '793 patent recites: "The method of claim 1 wherein said obtaining a composite background further comprises: obtaining a camera location value for said at least one image selected from said plurality of images." Ex. 1001, 35:32–35. Petitioner contends that claim 14 of the '081 patent recites a "verbatim identical teaching." Pet. 27 (citing Ex. 1003, 29:51–54 ("The method of claim 1 wherein said obtaining a composite background further comprises: obtaining a camera location value for said at least one image selected from said plurality of images."))).

In response, Patent Owner contends only that claim 9 is entitled to priority based on the '081 patent, thereby rendering the '081 patent ineligible as prior art and predating Passmore. PO Resp. 20.

We agree with Petitioner that claim 14 of the '081 patent is identical to Challenged Claim 9. *Compare* Ex. 1001, 35:32–35, *with* Ex. 1003, 29:51–54. As to Patent Owner's assertion of priority based on the '081 patent, we reject this argument above. *See supra* Section III.E. Having considered the parties' positions in light of the full trial record, we determine Petitioner has shown by a preponderance of the evidence that claim 9 of the '793 patent is rendered obvious by the '081 patent and Passmore.

8. *Claim 10*

Claim 10 of the '793 patent recites: "The method of claim 1 wherein said obtaining a composite background further comprises: estimating a

camera focal length value for said at least one image.” Ex. 1001, 35:36–39. Petitioner contends that claim 15 of the ’081 patent recites a “verbatim identical teaching.” Pet. 27–28 (citing Ex. 1003, 29:55–58 (“The method of claim 1 wherein said obtaining a composite background further comprises: estimating a camera focal length value for said at least one image.”))).

In response, Patent Owner contends only that claim 10 is entitled to priority based on the ’081 patent, thereby rendering the ’081 patent ineligible as prior art and predating Passmore. PO Resp. 20.

We agree with Petitioner that claim 15 of the ’081 patent is identical to Challenged Claim 10. *Compare* Ex. 1001, 35:36–39, *with* Ex. 1003, 29:55–58. As to Patent Owner’s assertion of priority based on the ’081 patent, we reject this argument above. *See supra* Section III.E. Having considered the parties’ positions in light of the full trial record, we determine Petitioner has shown by a preponderance of the evidence that claim 10 of the ’793 patent is rendered obvious by the ’081 patent and Passmore.

9. *Claim 11*

Claim 11 of the ’793 patent recites: “The method of claim 1 wherein said obtaining a composite background further comprises: estimating a zoom value for said at least one image.” Ex. 1001, 35:40–42. Petitioner contends that claim 16 of the ’081 patent recites a “verbatim identical teaching.” Pet. 28 (citing Ex. 1003, 29:59–61 (“The method of claim 1 wherein said obtaining a composite background further comprises: estimating a zoom value for said at least one image.”))).

In response, Patent Owner contends only that claim 11 is entitled to priority based on the ’081 patent, thereby rendering the ’081 patent ineligible as prior art and predating Passmore. PO Resp. 20.

We agree with Petitioner that claim 16 of the '081 patent is identical to Challenged Claim 11. *Compare* Ex. 1001, 35:40–42, *with* Ex. 1003, 29:59–61. As to Patent Owner's assertion of priority based on the '081 patent, we reject this argument above. *See supra* Section III.E. Having considered the parties' positions in light of the full trial record, we determine Petitioner has shown by a preponderance of the evidence that claim 11 of the '793 patent is rendered obvious by the '081 patent and Passmore.

10. Claim 12

Claim 12 of the '793 patent recites: “The method of claim 1 wherein said obtaining a composite background further comprises: automatically separating said plurality of images at scene changes.” Ex. 1001, 35:43–45. Petitioner contends that claim 20 of the '081 patent recites a “verbatim identical teaching.” Pet. 28–29 (citing Ex. 1003, 30:5–7 (“The method of claim 1 further comprising: automatically separating said plurality of images at scene changes.”)).

In response, Patent Owner contends only that claim 12 is entitled to priority based on the '081 patent, thereby rendering the '081 patent ineligible as prior art and predating Passmore. PO Resp. 20.

We agree with Petitioner that claim 20 of the '081 patent is identical to Challenged Claim 12. *Compare* Ex. 1001, 35:43–45, *with* Ex. 1003, 30:5–7. As to Patent Owner's assertion of priority based on the '081 patent, we reject this argument above. *See supra* Section III.E. Having considered the parties' positions in light of the full trial record, we determine Petitioner has shown by a preponderance of the evidence that claim 12 of the '793 patent is rendered obvious by the '081 patent and Passmore.

G. Obviousness of claims 13, 14, and 19 over '670 patent and Passmore

1. Combining the '670 patent and Passmore

With regard to whether the '670 patent is analogous art to the '793 patent and whether one of ordinary skill in the art would have been motivated to combine the teachings of the '670 patent and Passmore, Petitioner advances the same arguments for the '670 patent as addressed above in the context of the '081 patent. *See supra* Section III.F.2; Pet. 15–16. Similarly, Patent Owner does not address Petitioner's arguments or evidence regarding whether the cited references are analogous or Petitioner's proposed rationale for the combination of the '670 patent with Passmore.

Having considered the parties' positions in light of the full trial record, we determine Petitioner has shown by a preponderance of the evidence that the '670 patent and Passmore are analogous art and that one of ordinary skill in the art would have been motivated to combine the teachings of the '670 patent and Passmore, as detailed below. In particular, we agree with Petitioner and Dr. Forsyth that, given the '670 patent's teachings of using masks for colorization, an artisan of ordinary skill would have been motivated to re-use these masks, as Passmore describes, to augment depth of an image with predictable results, thereby leveraging "[t]he enormous effort of generating masks for an entire movie." Ex. 1005 ¶ 48.

2. Claim 13

Petitioner relies on claim 3 of the '670 patent as teaching or suggesting every limitation of Challenged Claim 13 but for the claimed "depth parameter" and the claimed requirement of "using a computer." *Id.* at 34–36. Petitioner further relies on Passmore's "depth pane 304" and

“depth map 200 related parameters” as meeting the claimed “depth parameter.” *Id.* at 36 (citing Ex. 1005 ¶¶ 41, 48 and Fig. 9).

In response, Patent Owner contends only that claim 13 is entitled to priority based on the ’670 patent’s predecessor, the ’081 patent, thereby rendering the ’670 patent ineligible as prior art and predating Passmore. PO Resp. 20.

We agree with Petitioner that claim 3 of the ’670 patent discloses verbatim each limitation of Challenged Claim 13, but for the claimed “depth parameter” and the claimed requirement of “using a computer.” *Compare* Ex. 1001, 35:46–36:6, with Ex. 1004, 26:38–52. As to the “using a computer” limitation, we agree with Petitioner that the ’670 patent meets this limitation because it uses a computer to generate masks for colorizing images. *See, e.g.,* Ex. 1003, Abst. (“computer controlled application of masks”). With regard to the claimed “depth parameter,” we agree with Petitioner and Dr. Forsyth that this limitation is met by at least Passmore’s “depth map 200 related parameters.” Pet. 36 (citing Ex. 1005 ¶¶ 41, 48 and Fig. 9). In particular, we find Passmore’s numeric distance values for the foreground, midground, and background (Ex. 1005 ¶ 41) each constitute information that relates to the distance of an object from the camera, thereby meeting the term “depth parameter” as we construed it above. *See supra* Section III.C. As to Patent Owner’s assertion of priority based on the ’081 patent, we reject this argument above. *See supra* Section III.E. Having considered the parties’ positions in light of the full trial record, we determine Petitioner has shown by a preponderance of the evidence that claim 13 of the ’793 patent is rendered obvious by the ’670 patent and Passmore.

3. *Claim 14*

Claim 14 of the '793 patent recites: “The method of claim 13 wherein said setting said at least one depth parameter comprises selecting a numeric depth value for said first mask.” Ex. 1001 36:8–10. Referring back to its corresponding analysis of claim 2, Petitioner and Dr. Forsyth contend, *inter alia*, that Passmore teaches selecting a numeric depth value. Pet. 36–37 (citing Ex. 1009 ¶ 73).

In response, Patent Owner contends only that claim 14 is entitled to priority based on the '670 patent's predecessor, the '081 patent, thereby rendering the '670 patent ineligible as prior art and predating Passmore. PO Resp. 20.

We agree with Petitioner that Passmore teaches selecting a numeric depth value for a first mask. For instance, Passmore describes setting numeric depth values for the foreground, midground, and background. Ex. 1005 ¶ 41. Passmore further teaches selecting depths for masks. *Id.* ¶ 48 (describing that the merging and splitting masks allows for “the combining of masks at similar depth to simplify the tracking of masks through frames”). As to Patent Owner's assertion of priority based on the '081 patent, we reject this argument above. *See supra* Section III.E. Having considered the parties' positions in light of the full trial record, we determine Petitioner has shown by a preponderance of the evidence that claim 14 of the '793 patent is rendered obvious by the '670 patent and Passmore.

4. *Claim 19*

Claim 19 of the '793 patent recites: “The method of claim 13 wherein said setting said at least one depth parameter comprises associating a transparency mask with said first mask and assigning depth to said

transparency mask.” Ex. 1001, 36:22–25. Referring back to its corresponding analysis of claim 7, Petitioner and Dr. Forsyth contend, *inter alia*, that Passmore teaches the use of transparency masks. Pet. 37 (citing Ex. 1004, 11: 11–12 (“The mask is shown as an opaque or transparent color.”)); *see also* Ex. 1004, 7:63–66 (“In cases where cast shadows on a background from a moving object may be confused with the moving object[,] the resulting masks will be assigned to a default alpha layer that renders that part of the moving object mask transparent.”).

In response, Patent Owner contends only that claim 19 is entitled to priority based on the ’670 patent’s predecessor, the ’081 patent, thereby rendering the ’670 patent ineligible as prior art and predating Passmore. PO Resp. 20.

We agree with Petitioner that the ’670 patent teaches the use of transparent masks. Pet. 37 (citing Ex. 1004, 11:11–12); *see also* Ex. 1004, 7:63–66. Passmore further teaches selecting depths for masks. *Id.* at ¶ 48 (describing that the merging and splitting masks allows for “the combining of masks at similar depth to simplify the tracking of masks through frames”). As to Patent Owner’s assertion of priority based on the ’081 patent, we reject this argument above. *See supra* Section III.E. Having considered the parties’ positions in light of the full trial record, we determine Petitioner has shown by a preponderance of the evidence that claim 19 of the ’793 patent is rendered obvious by the ’670 patent and Passmore.

H. Obviousness of claim 20 over the ’081 patent, ’670 patent, and Passmore

Petitioner relies on claim 1 of the ’081 patent and claim 3 of the ’670 patent as teaching or suggesting every limitation of Challenged Claim 20 but for the claimed “depth parameter” and the claimed “non-composited image.”

Pet. 39–42. Referring back to its analysis of Challenged Claims 1 and 13, Petitioner contends the '081 and '670 patents teach “using a computer” and Passmore teaches a “depth parameter.” *Id.* at 41. With regard to the claimed “non-composited image,” Petitioner asserts that the images used by the '081 patent to derive the composite background “were always non-composited images since they are taken directly from the original scene, and therefore this limitation is inherently (and expressly) disclosed in the '081 Patent.” *Id.* at 41–42 (citing Ex. 1003, 30:29–47).

In response, Patent Owner contends only that claim 20 is entitled to priority based on the '670 patent's predecessor, the '081 patent, thereby rendering the '670 patent ineligible as prior art and predating Passmore. PO Resp. 20.

We agree with Petitioner that claim 1 of the '081 patent and claim 3 of the '670 patent disclose verbatim each limitation of Challenged Claim 20, but for a “depth parameter,” “using a computer,” and a “non-composited image.” *Compare* Ex. 1001, 36:25–52, *with* Ex. 1003, 29:6–17, *and* Ex. 1004, 26:38–52. As to the “using a computer” limitation, we agree with Petitioner that the '081 and '670 patents meet this limitation because they use a computer to generate masks for colorizing images. *See, e.g.*, Ex. 1003, Abst. (“computer controlled application of masks”); Ex. 1004, Abst. We also agree with Petitioner that the cited portion of the '081 patent expressly teaches applying a parameter to a “non-composited image.” Ex. 1003, 30:32–34 (“applying said at least one color parameter to at least one non-composited image selected from said plurality of images”). With regard to the claimed “depth parameter,” we agree with Petitioner and Dr. Forsyth that this limitation is met by at least Passmore's “depth map 200 related

parameters.” Pet. 36 (citing Ex. 1005 ¶¶ 41, 48 and Fig. 9). In particular, we find Passmore’s numeric distance values for the foreground, midground, and background (Ex. 1005 ¶ 41) each constitute information that relates to the distance of an object from the camera, thereby meeting the term “depth parameter” as we construed it above. *See supra* Section III.C. As to Patent Owner’s assertion of priority based on the ’081 patent, we reject this argument above. *See supra* Section III.E. Having considered the parties’ positions in light of the full trial record, we determine Petitioner has shown by a preponderance of the evidence that claim 20 of the ’793 patent is rendered obvious by the ’081 and ’670 patents with Passmore.

I. Obviousness over Sullivan with the ’081 and ’670 patents

1. Overview of Sullivan

Sullivan discloses systems for two dimension to three dimension image conversion, and creating a complementary stereoscopic image pair. Ex. 1006, Abst. Sullivan describes “receiving a first 2D image comprising image data,” wherein “[t]he image data has depth values associated with the computer-generated geometry.” *Id.* Figure 2 of Sullivan is reproduced below.

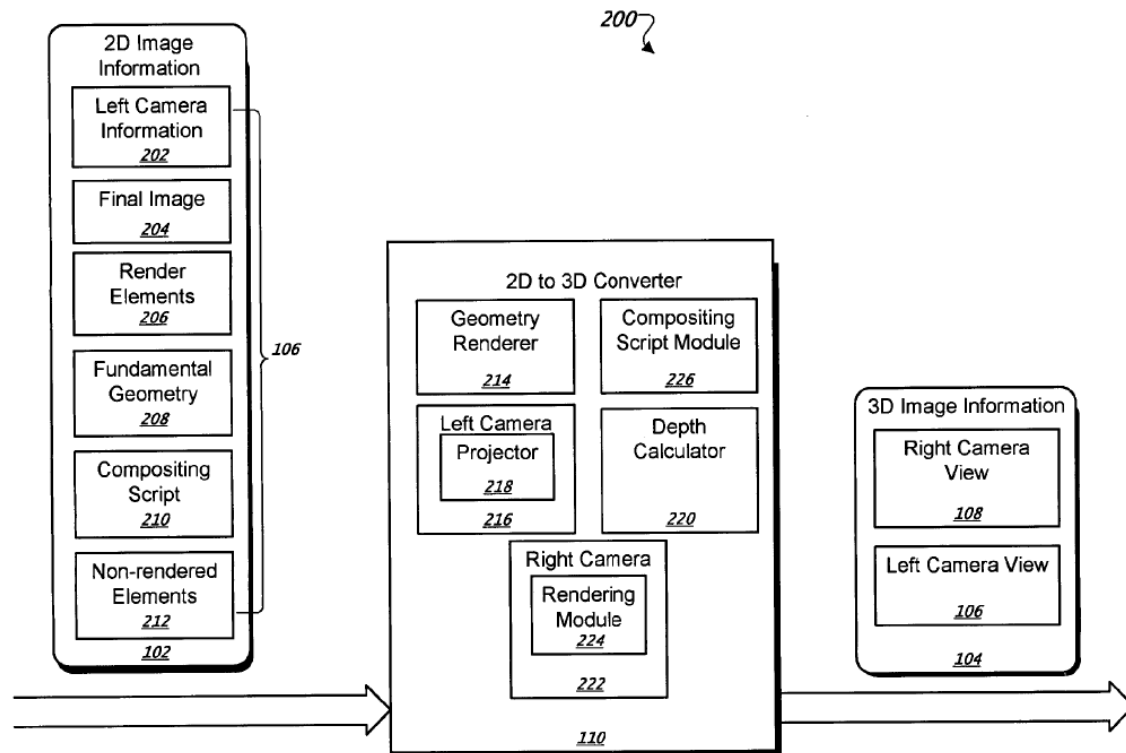


FIG. 2

Figure 2 of Sullivan depicts a 2D-to-3D converter 110 that receives two dimensional image information 102 and generates three dimensional image information 104. *Id.* at 3:60–62. Subsystems 214–226, including depth calculator 220, can be used to generate a scene that includes three dimensional information 104. *Id.* at 4:7–9. Sullivan describes associating fundamental geometry 208 defining objects in three dimensional space with final images 204 from a two dimensional scene. *Id.* at 4:10–17. Image operations can include image rotation, image scaling, and image repositioning. *Id.* at 4:66–67.

2. Combining the '081 and '670 patents with Sullivan

Petitioner conflates its rationale for combining the '081 and '670 patents with Sullivan together with its rationale for combining the '081 and

'670 patents with Passmore. Pet. 15–16. According to Petitioner, one of ordinary skill in the art would have been motivated to combine the '081 and '670 patents with Sullivan because of the specific teachings, suggestions, and motivations of the two references. *Id.* at 16. Petitioner contends, “strong market forces would therefore have prompted the variation of the methods of the '670 and '081 Patents in view of either Passmore or Sullivan for use in 3D conversion with predictable results.” *Id.* (citing *KSR*, 550 U.S. at 417; Ex. 1009 ¶¶ 48–49). Petitioner further contends that, “[i]n essence, all that is required is the simple substitution of one known element from Passmore or Sullivan—depth—for another element from the '670 or '081 Patents—color—to obtain predictable results.” *Id.* at 17. Finally, Petitioner cites the following statement of the '793 patent’s inventor, Mr. Barry Sandrew, made in a press release: “The process of converting existing 2D feature films and television episodes into 3D content is a logical extension of Legend[3D]’s ground-breaking digital colorization process.” *Id.* at 17–18 (citing Ex. 1007, 3).

Petitioner’s proffered rationale fails to address sufficiently the combination of Sullivan with the '081 and '670 patents. “[O]bviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” *KSR*, 550 U.S. 398 at 418 (quoting *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)). Here Petitioner offers only a conclusory statement that “teachings, suggestions, and motivations” of Sullivan support the cited combination. *Id.* at 16–17. Petitioner never identifies any such teachings, suggestions, or motivations in Sullivan. *Id.* Instead, Petitioner cites only to support in Passmore for the

asserted combination of Passmore—not Sullivan—with the '081 and '670 patents. *Id.*

Petitioner's assertion that "strong market forces" would have prompted the cited combination is similarly conclusory and untethered from Sullivan. Petitioner's only cited support for this statement is Passmore's recognition of the benefit of reusing colorization masks for depth augmentation. *Id.* at 16–17 (citing Ex. 1005 ¶ 48). Dr. Forsyth, citing only to Passmore in his declaration, explains that the "strong market forces" he describes are "the benefit in leveraging substantial amounts of previous manual labor." Ex. 1009 ¶ 48. And when questioned at deposition regarding these market forces, Dr. Forsyth again referred only to Passmore's "suggesting you can benefit from [the] work" of "making masks for movies that have been colorized." Ex. 2021, 31:12–15. Neither Petitioner nor Dr. Forsyth explains how or why one of ordinary skill in the art would recognize in Sullivan this "benefit of leveraging substantial amounts of previous manual labor," given that Sullivan does not describe masks, reuse of masks, colorization of black and white images, or manual labor related thereto.

Petitioner's invocation of a "simple substitution" also is insufficiently explained in the context of Sullivan. Petitioner identified in Passmore an explicit teaching of the substitution required, namely depth for color in a system of using masks for colorization of movies. Pet. 16–17. In the context of Sullivan, however, Petitioner makes no attempt to show that Sullivan relates to masks or colorization such that an ordinarily skilled artisan would be motivated to combine the teachings of Sullivan's 2D to 3D conversion system with the '081 and '670 patents' colorization system.

Finally, the single sentence from Mr. Sandrew's press release cited by Petitioner is of little import because it does not address why one would take the specific teachings of Sullivan describing a system that is unrelated to colorization and masking and apply them to the mask-based colorization process of the '081 and '670 patents. *See* Ex. 1007, 3.

In light of the foregoing, we find Petitioner has not set forth a sufficient rationale for combining the cited teachings of the '081 and '670 patents with those of Sullivan. Accordingly, we determine Petitioner has not shown by a preponderance of the evidence in the full trial record that any of the Challenged Claims are unpatentable over Sullivan in combination with the '081 and/or '670 patents.

IV. ANALYSIS OF PATENT OWNER'S MOTION TO AMEND

We determine above that Petitioner has shown by a preponderance of the evidence that claims 1, 2, 7–14, 19, and 20 are unpatentable. Accordingly, we consider Patent Owner's contingent Motion to Amend.

Through its Motion to Amend, Patent Owner seeks to amend original claims 1, 8–13, and 20 “to ensure the claims find clear support in the '081 Patent and the '670 Patent (thereby making it improper to use either as prior art to the '793 Patent)” and to cancel claims 2–7 and 14–19. Motion to Amend 1. More specifically, Patent Owner proposes, *inter alia*, modifying each independent Challenged Claim to include the following limitation: “wherein said at least one depth parameter consists of at least one of luminance and saturation.” *Id.* at 2–3.

As a threshold matter, we observe Patent Owner's Motion is contingent upon a finding of unpatentability. *Id.* We determine above that Petitioner establishes the unpatentability of claims 1, 2, 7–14, 19, and 20. *See supra* Section III.F–H. Of these claims, Patent Owner seeks contingent cancellation of claims 2, 7, 14, 19. Motion to Amend 1. Because the condition precedent of Patent Owner's Motion (i.e., a determination of unpatentability) has been met as to claims 2, 7, 14, 19, we grant Patent Owner's Motion to Amend with respect to these claims. Accordingly, claims 2, 7, 14, 19 are cancelled. Conversely, we determine above that Petitioner fails to establish the unpatentability of claims 3–6 and 15–18. *See supra* Section III.I.2. Because the condition precedent of Patent Owner's Motion to Amend has not been met as to claims 3–6 and 15–18, we deny as moot Patent Owner's Motion with respect to claims 3–6 and 15–18.

We turn next to Patent Owner's proposed modifications to claims 1, 8–13, and 20. Pursuant to 35 U.S.C. § 316(d)(3) and 37 C.F.R. § 42.121(a)(2), an amendment made via a motion to amend during an *inter partes* review “may not enlarge the scope of the claims of the patent or introduce new matter.” *See also Aqua Products, Inc. v. Matal*, 872 F.3d 1290, 1306 (Fed. Cir. 2017) (en banc) (plurality opinion) (“[P]atent owner must satisfy the Board that the statutory criteria in § 316(d)(1)(a)–(b) and § 316(d)(3) are met and that any reasonable procedural obligations imposed by the Director are satisfied”). In light of this tenet, we consider whether Patent Owner's proposed amendments to claims 1, 8–13, and 20 would enlarge the scope of these claims or introduce new matter. *See*

“Guidance on Motions to Amend in view of *Aqua Products*,” dated Nov. 21, 2017 (discussing *Aqua Products, Inc. v. Matal*, 872 F.3d 1290 (Fed. Cir. 2017)) (affirming that claim modifications must meet the requirements of 35 U.S.C. § 316(d)).²

Patent Owner’s proposed modifications to claims 1, 8–13, and 20 explicitly require the claimed “depth parameter” to include “at least one of luminance and saturation.” Motion to Amend 3. Modifying the claimed “depth parameter” to encompass luminance and saturation would enlarge the scope of these claims and introduce new matter because the ’793 patent does not describe saturation or luminance as depth information. *See supra* Section III.C. Rather, the Specification discusses saturation and luminance in the context of color. Ex 1001, 11:27–32, 30:27–30. Significantly, the only mention in the Specification of the HSL model (i.e., Hue, Saturation, and Luminance) describes assigning *color* to masks using an HSL color space model, whereas assigning *depth* entails assigning “objects particular depths including contour depths, e.g., geometric shapes such as an ellipsoid to a face.” *Compare id.* at 11:29–30, *with id.* at 11:50–53. The Specification also distinguishes between color and depth information. *See, e.g., id.* at 3:1–3 (“corresponding *color lookup* from frame to frame for colorization projects or *depth information* for two-dimensional to three-dimensional conversion projects”) (emphasis added). Contrary to Patent Owner’s proposed

² Posted on PTAB public website on Nov. 22, 2017 (https://www.uspto.gov/sites/default/files/documents/guidance_on_motions_to_amend_11_2017.pdf).

amendments, the Specification discloses using colorization mask reshaping techniques, such as reliance on underlying greyscale, to propagate depth information once it has been applied, not as depth information itself. *Id.* at 31:58–66.

In light of the foregoing, we determine that the Specification of the '793 patent does not support interpreting the claimed depth parameter to encompass luminance and saturation. Patent Owner's proposed amendments, therefore, would impermissibly introduce new matter and enlarge the scope of claims 1, 8–13, and 20 to encompass luminance and saturation as "depth parameters." Accordingly, we deny Patent Owner's Motion to Amend as to claims 1, 8–13, and 20.

V. SUMMARY

Petitioner has shown by a preponderance of the evidence that:

Claims 1, 2, and 7–12 are unpatentable under 35 U.S.C. § 103(a) over the '081 patent and Passmore;

Claims 13, 14, and 19 are unpatentable under 35 U.S.C. § 103(a) over the '670 patent and Passmore; and

Claim 20 is unpatentable for under 35 U.S.C. § 103(a) over the '081 patent, '670 patent, and Passmore.

Petitioner has not shown by a preponderance of the evidence that any of the Challenged Claims are unpatentable over Sullivan in combination with the '081 and '670 patents.

Patent Owner's proposed amendments do not satisfy the requirement of 35 U.S.C. § 316(d)(3) and 37 C.F.R. § 42.121(a)(2) that an amendment may not enlarge the scope of the claims or introduce new matter.

VI. ORDER

It is, therefore,

ORDERED that claims 1, 2, 7–14, 19, and 20 of the '793 patent are unpatentable;

FURTHER ORDERED that claims 3–6 and 15–18 of the '793 patent are not held unpatentable;

FURTHER ORDERED that Patent Owner's Motion to Amend is *granted-in-part* and claims 2, 7, 14, and 19 are cancelled;

FURTHER ORDERED that Patent Owner's Motion to Amend is *denied-in-part* as to claims 1, 8–13, and 20; and

FURTHER ORDERED that Patent Owner's Motion to Amend is *denied-in-part as moot* as to claims 3–6 and 15–18; and

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

IPR2016-01243
Patent 7,907,793 B1

FOR PETITIONER:

Joshua Glucoft
Michael Fleming
Jonathan Kagan
IRELL & MANELLA LLP
JGlucoft@Irell.com
MFleming@Irell.com
JKagen@Irell.com
PrimeFocusIPR@irell.com

PATENT OWNER:

Daniel N. Yannuzzi
Trevor J. Quist
SHEPPARD MULLIN RICHTER & HAMPTON LLP
dyannuzzi@sheppardmullin.com
tquist@sheppardmullin.com
Sheppard-Legend3DIPR@sheppardmullin.com