

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SHENZHEN JIMUYIDA TECHNOLOGY CO., LTD.,
Petitioner,

v.

ARTEC EUROPE S.A.R.L.,
Patent Owner.

IPR2023-01148
Patent 7,768,656 B2

Before KEVIN C. TROCK, GARTH D. BAER, and AMBER L. HAGY,
Administrative Patent Judges.

HAGY, *Administrative Patent Judge.*

DECISION
Denying Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

A. *Background and Summary*

Shenzhen Jimuyida Technology Co., Ltd. (“Petitioner”) filed a petition requesting *inter partes* review (Paper 1, “Pet.”) of claims 1–4, 6–15, and 17–22 (“the challenged claims”) of U.S. Patent No. 7,768,656 B2 (Ex. 1001, the “‘656 patent”). See 35 U.S.C. § 311. Artec Europe S.A.R.L. (“Patent Owner”) timely filed a Preliminary Response. Paper 5, “Prelim. Resp.”

Under 37 C.F.R. § 42.4(a), we have authority to determine whether to institute review. The standard for instituting an *inter partes* review is set forth in 35 U.S.C. § 314(a), which provides that an *inter partes* review may not be instituted unless the information presented in the Petition and the Preliminary Response shows “there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.”

Having considered the arguments and the associated evidence, we determine that Petitioner has not shown a reasonable likelihood that it will prevail in establishing the unpatentability of any of the challenged claims. Accordingly, we do not institute *inter partes* review.

B. *Real Parties in Interest*

Petitioner identifies Shenzhen Jimuyida Technology Co., Ltd., and Shenzhen Creality 3D Technology Co., Ltd., as the real parties in interest. Pet. 4.

Patent Owner identifies Artec Europe S.A.R.L. as the real party in interest. Paper 3, 1.

C. Related Matters

As required by 37 C.F.R. § 42.8(b)(2), the parties identify the following district court proceeding involving the '656 patent: *Artec Europe S.A.R.L. v. Shenzhen Creality 3D Technology Co., Ltd.*, Case No. 1:22-cv-1676 (E.D.N.Y.). Pet. 4; Paper 3, 1.

D. The '656 Patent (Ex. 1001)

The '656 patent, titled “System and Method for Three-Dimensional Measurement of the Shape of Material Objects,” issued on August 3, 2010, based on an application filed on August 28, 2007. Ex. 1001, codes (22), (45), (54).

The '656 patent is directed to “performing non-contact measurement of a 3D surface shape of a material object . . . through the use of a structured-light triangulation method.” *Id.* at 1:11–14. The disclosed system “includes a light projector for projecting a structured light pattern onto the surface of any object,” “a camera for capturing an image of the structured light pattern acting on the surface of the object,” and a “computing device for determining the 3D measurement of the surface shape of the illuminated object through a triangulation algorithm employed based on a calculated correspondence between the projected structured light and the captured image.” *Id.* at 1:43–51.

Figure 1, reproduced on the next page, is a block diagram representation of the disclosed system. *Id.* at 2:4–7.

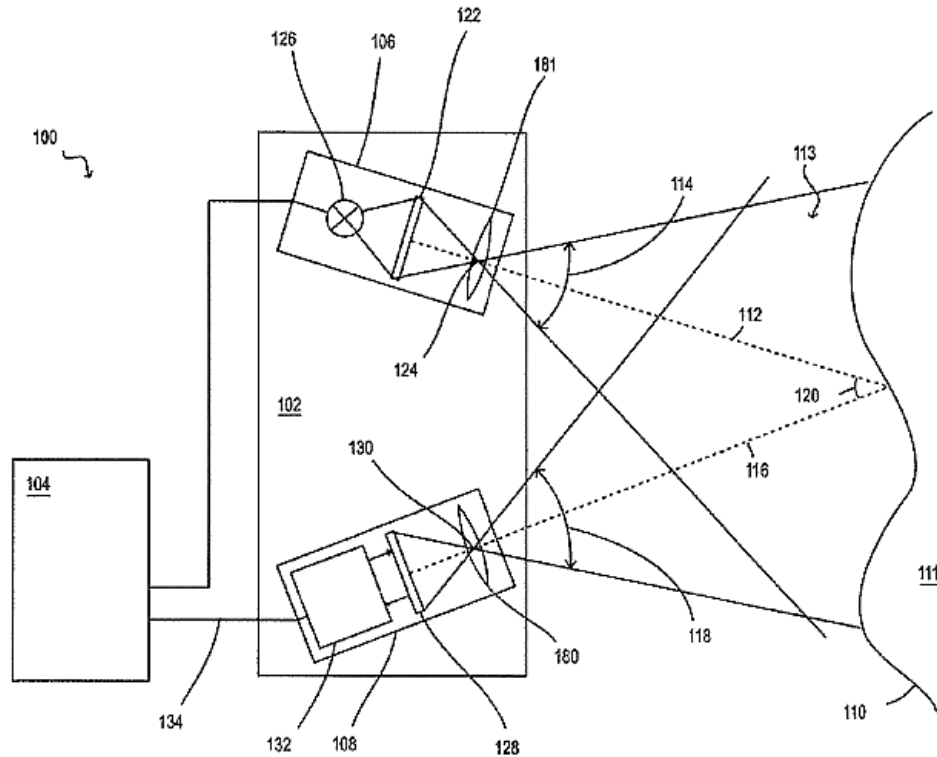


Fig. 1

Figure 1 is a block diagram representation of a system for the 3D measurement of the shape of material objects. Ex. 1001, 2:4–7.

As depicted in Figure 1, system 100 includes optical unit 102, which produces structured light with one or more projectors 106. Ex. 1001, 3:7–9. Projector 106 is a slide projector including light source 126 and slide 122 for modulating the light emitted from light source 126. *Id.* at 3:10–16. Projector 106 further includes lens 181 having vertex 124 for projecting a slide image as structured light 113 onto surface 110 of object 111 being measured. *Id.* at 3:16–20. Optical unit 102 includes camera 108 or other image detecting device for capturing an image of structured light 113 acting on surface 110 of object 111. *Id.* at 3:30–33. Camera 108 includes lens 180 having vertex 130. *Id.* at 3:33–34. Computing device 104 analyzes the

captured image received from camera output 134 to calculate the 3D shape of surface 110 of object 111. *Id.* at 3:49–53.

The '656 patent describes that a plurality of points in slide 122 are projected onto surface 110 of object 111 and then mapped one-to-one to respective points in the captured image that is captured by camera 108. *Id.* at 3:66–4:2. The position of each point in the captured image depends on the distance to surface 110 of object 111 and the shape and orientation of surface 110 in relation to optical unit 102. *Id.* at 4:2–6. To reconstruct the shape and position of surface 110, each point in the captured image is associated with a respective point in slide 122 and then the shape, position, and/or orientation of surface 110 are derived from the coordinates of the points using triangulation techniques that, according to the '656 patent, are known to those skilled in the art. *Id.* at 4:6–12.

To simplify the task of searching for correspondence between points in the captured image and slide 122, projected light 113 can be structured to represent an assemblage of distinct elements that can be identified in the captured image. *Id.* at 4:40–44. The '656 patent describes the introduction of this heterogeneity into the captured image as “coding.” *Id.* at 4:44–45. The system of the '656 patent further simplifies the task of detecting elements of structured light 113 in the image captured by camera 108 by restricting the number of directions in which structured light 113 can be deformed to one known direction, and organizing a code sequence of structured light 113 in that direction. *Id.* at 5:3–10.

E. Illustrative Claims

Of the challenged claims, claims 1 and 12 are independent. Challenged claims 2–4, 6–11, and 22 depend from claim 1, and challenged

claims 13–15 and 17–21 depend from claim 12. Claims 1 and 12, reproduced below, illustrate the claimed subject matter¹:

1. [1.PREAMBLE] A system for the 3D measurement of the shape of a material object, comprising:

- [1.A] a light projector for projecting a structured light pattern onto a surface of said object, wherein said light projector comprises a light source, a slide with a slide pattern located on a slide surface, and a projector lens characterized by a projector lens vertex;
- [1.B] a device for capturing an image of said structured light pattern reflected on said object, wherein said device for capturing an image comprises a device lens characterized by a device lens vertex; and
- [1.C] a computing device for determining a measurement relating to the shape of said object using a triangulation algorithm based on a correspondence between points in said slide pattern and said image, and
- [1.D] wherein said slide pattern comprises a plurality of coded elements, where each of said coded elements is characterized by at least one parameter and, where said at least one parameter defines a spatial or temporal distribution of an amplitude or a wavelength of said structured light, and
- [1.E] wherein said coded elements are assigned to one of at least first group or second group, each of which first group and second group comprising at least two of said coded elements, and
- [1.F] wherein at least a first slide virtual line and a second slide virtual line are defined on said slide surface, where said first slide virtual line is defined by an intersection between said slide surface and a first plane passing through said projector lens vertex and through said device

¹ Bracketed reference numbers and letters have been added to correspond to Petitioner's labeling of claim limitations in Petitioner's claim charts.

lens vertex, and said second slide virtual line is defined by an intersection between said slide surface and a second plane passing through said projector lens vertex and through said device lens vertex, and

[1.G] where said coded elements of said first group are located along said first virtual line and said coded elements of said second group are located along said second virtual line.

Ex. 1001, 8:15–53.

12. [12.PREAMBLE] A method for the 3D measurement of the shape of a material object, comprising:

[12.A] projecting a structured light pattern from a light projector onto a surface of an object, wherein the light projector comprises a light source, a slide with a slide pattern located on a slide surface, and a projector lens characterized by a projector lens vertex;

[12.B] capturing an image of said structured light pattern reflected on the surface of the object with a device for capturing an image, wherein said device for capturing an image comprises a device lens characterized by a device lens vertex;

[12.C] determining a measurement relating to the surface of the object using a triangulation algorithm based on a correspondence between points in said slide pattern and said image, and

[12.D] wherein said slide pattern comprises a plurality of coded elements, where each of said coded elements is characterized by at least one parameter and, where said at least one parameter defines a spatial or temporal distribution of an amplitude or a wavelength of said structured light, and

[12.E] wherein said coded elements are assigned to one of at least first group or second group, each of which first group and second group comprising at least two of said coded elements, and

[12.F] wherein at least a first slide virtual line and a second slide virtual line are defined on said slide surface, where said first slide virtual line is defined by an intersection between said slide surface and a first plane passing through said projector lens vertex and through said device lens vertex, and said second slide virtual line is defined by an intersection between said slide surface and a second plane passing through said projector lens vertex and through said device lens vertex, and

[12.G] where said coded elements of said first group are located along said first virtual line and said coded elements of said second group are located along said second virtual line.

Id. at 9:34–10:11.

F. Prior Art and Asserted Grounds

Petitioner asserts that claims 1–4, 6–15, and 17–22 are unpatentable on the following grounds:

Claims Challenged	35 U.S.C. §	References/Basis
1–4, 6–15, 17–22	103(a)	Tomasi, ² Vinther ³
1–4, 6–15, 17–22	103(a)	Tomasi, Vinther, Vuylsteke ⁴

Petitioner offers the Declaration of Mohit Gupta, Ph.D. Ex. 1003.

Patent Owner offers the Declaration of Dave Aikens. Ex. 2001.

² US Patent Pub. No. 2004/0005092 A1, published Jan. 8, 2004 (Ex. 1004, “Tomasi”).

³ PCT International Pub. No. WO 2007/059780 A1, published May 31, 2007 (Ex. 1005, “Vinther”).

⁴ Vuylsteke and Oosterlinck, “Range Image Acquisition with a Single Binary-Encoded Light Pattern,” *IEEE Transactions on Pattern Analysis and Machine Intelligence*, Vol. 12, No. 2, Feb. 1990 (Ex. 1006, “Vuylsteke”).

II. ANALYSIS

A. *Principles of Law*

A patent 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 the invention was made to a person having ordinary skill in the art to which said subject matter pertains.” *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 ordinary skill in the art; and (4) when in evidence, objective evidence of nonobviousness.⁵ *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). “To satisfy its burden of proving obviousness, a petitioner cannot employ mere conclusory statements. The petitioner must instead articulate specific reasoning, based on evidence of record, to support the legal conclusion of obviousness.” *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016).

“In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring *inter partes* review

⁵ Petitioner argues that “[t]here is no evidence in the ’656’s prosecution history or elsewhere supporting any secondary considerations arguments, or evidence of nexus to any challenged Claim.” Pet. 98; *see also* Ex. 1003 ¶ 66. Patent Owner does not present arguments or evidence of secondary considerations at this stage. Therefore, secondary considerations do not constitute part of our analysis herein.

petitions to identify “with particularity . . . the evidence that supports the grounds for the challenge to each claim”). This burden of persuasion never shifts to Patent Owner. *See Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (discussing the burden of proof in *inter partes* review).

B. Level of Ordinary Skill in the Art

The level of skill in the art is a factual determination that provides a primary guarantee of objectivity in an obviousness analysis. *Al-Site Corp. v. VSI Int’l Inc.*, 174 F.3d 1308, 1324 (Fed. Cir. 1999) (citing *Graham*, 383 U.S. at 17–18; *Ryko Mfg. Co. v. Nu-Star, Inc.*, 950 F.2d 714, 718 (Fed. Cir. 1991)).

Relying on the declaration testimony of Dr. Gupta, Petitioner asserts that a person of ordinary skill in the art “would have had a bachelor’s degree in computer systems, computer science, or the equivalent thereof, and at least two years of experience with 3D scanning or related technology.” Pet. 15; *see also* Ex. 1003 ¶ 42. Petitioner also asserts that “[m]ore education can supplement practical experience, and vice-versa.” Pet. 15.

Relying on the declaration testimony of Mr. Aikens, Patent Owner asserts that “Petitioner’s level of ordinary skill is incomplete” because a person of ordinary skill in the art

could have alternatively held a bachelor’s degree in optics, optical engineering, optical science, electrical engineering, physics, or mathematics and broader experience with optical measurement or scanning systems would similarly suffice because these degrees and experience provide similar training and background that could be utilized and employed by a person in the relevant field.

Prelim. Resp. 7 (citing Ex. 2001 ¶¶ 2–16). According to Patent Owner, a person of ordinary skill in the art “would have had a bachelor’s degree in computer systems, computer science, optics, optical engineering, optical science, electrical engineering, physics, or mathematics or the equivalent thereof, and at least two years of experience with optical measurement or scanning systems, 3D scanning, or related technology.” *Id.* (citing Ex. 2001 ¶¶ 2–16).

Based on the present record, including the disclosure of the ’656 patent, we apply Petitioner’s definition of the level of ordinary skill in the art. *See* Pet. 15. We determine this level of skill comports with the qualifications a person would have needed to understand and implement the teachings of the ’656 patent and the prior art of record. *Cf. Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (noting that the prior art itself may reflect an appropriate level of skill in the art). We also conclude that the differences between the parties’ competing definitions are not material to our decision, and our decision would be same under either definition.

C. Claim Interpretation

We apply the same claim construction standard used in district courts, namely that articulated in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). *See* 37 C.F.R. § 42.100(b) (2023). In applying that standard, claim terms generally are given their ordinary and customary meaning as would have been understood by a person of ordinary skill in the art at the time of the invention and in the context of the entire patent disclosure. *Phillips*, 415 F.3d at 1312–13.

Petitioner contends that “[a]ll claim terms should generally be construed according to their plain and ordinary meaning.” Pet. 16. Petitioner also notes that all of the challenged claims “use the phrase ‘virtual line,’” which Petitioner represents “is used for the first time in the claims and does not appear anywhere else in the specification or file history.” *Id.* Petitioner asserts that “the phrase ‘virtual line’ as properly construed refers to the ‘meridians’ described in the patent specification, which are themselves commonly referred to as the epipolar lines inherent in the geometry of a structured light 3D imaging system including a projector and a camera.” *Id.* (citing Ex. 1003 ¶ 43).⁶

Patent Owner does not expressly address Petitioner’s contentions as to construction of “virtual line,” but argues that Petitioner fails to show that the alleged disclosure of epipolar lines in the prior art (Tomasi) teaches or suggests the claimed “virtual lines.” *See* Prelim. Resp. 36–37. We address this point below in the context of addressing the substance of Petitioner’s showing.

Patent Owner asserts that the term “device for capturing an image” is a “term that plainly invokes 35 U.S.C. § 112 ¶6,” and faults Petitioner for not offering a construction of that term, insisting that institution should be denied for failure to comply with 37 C.F.R. § 42.104(b)(3). Prelim. Resp. 1, 9–17.⁷ Because, as discussed further herein, we deny institution for other reasons, we need not resolve this issue.

⁶ The Petition cites to paragraph 43 of the Gupta Declaration, but the cited subject matter appears in paragraph 44.

⁷ As Patent Owner notes (Prelim. Resp. 16, n.7), the Consolidated Trial Practice Guide (Nov. 2019), available at

Having considered the record, we determine that no explicit claim construction is necessary for this Decision. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (holding that only claim terms in controversy need to be construed, and only to the extent necessary to resolve the controversy (citing *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).

D. Overview of Cited References

1. Tomasi (Ex. 1004)

Tomasi is a U.S. Patent Application titled “Coded-Array Technique for Obtaining Depth and Other Position Information of an Observed Object,” published on January 8, 2004. Ex. 1004, codes (43), (54). Tomasi discloses an image correspondence system used to optically observe an object and determine three dimensional features, characteristics, and other information of the object. *Id.* ¶ 32. Figure 1, reproduced on the next page, is a block diagram of the image correspondence system described in Tomasi. *Id.* ¶ 10.

<https://www.uspto.gov/sites/default/files/documents/tpgnov.pdf> (“CTPG”), provides that “[w]here claim language may be construed according to 35 U.S.C. § 112[¶6], a petitioner must provide a construction that includes both the claimed function and the specific portions of the specification that describe the structure, material, or acts corresponding to each claimed function.” CTPG 45 (citing 37 C.F.R. § 42.104(b)(3)).

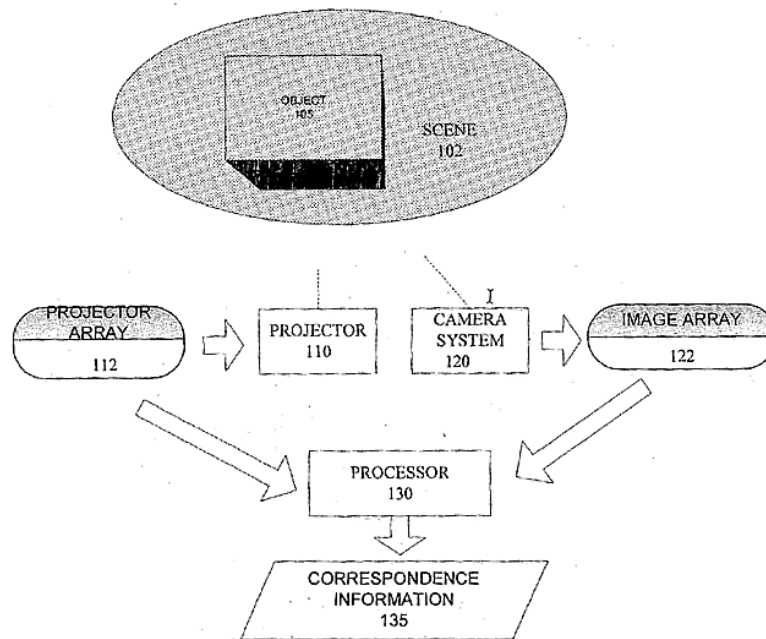


FIG. 1

Figure 1 of Tomasi is a block diagram of an image correspondence system. Ex. 1004 ¶ 10.

As depicted in Figure 1 of Tomasi, projector 110 projects array 112 of coded light onto scene 102. *Id.* ¶ 34. Projector 110 includes a light-emitting source and a mechanism, e.g., a slide having a pattern, that causes light projecting from it to be coded. *Id.* Camera 120 captures an image of scene 102. *Id.* ¶ 38. When coded light is cast on scene 102, the resulting image has a representation of projection array 112. *Id.* The image of projection array 112 is at least partially captured in image array 122. *Id.* Processor 130 receives data representing image array 122 and projection array 112, and determines correspondence information between elements of image array 122 and projection array 112. *Id.* ¶ 39. The correspondence between image array 122 and projection array 112 is used to determine depth

information for elements of image array 122. *Id.* ¶ 42. In this way, a three-dimensional image of scene 102, including object 105, can be obtained. *Id.*

2. *Vinther* (Ex. 1005)

Vinther is a PCT international patent application titled “Coded Structured Light,” published on May 31, 2007. Ex. 1005, codes (43), (54). Vinther discloses a system and method for creating a three-dimensional model of a surface. *Id.*, code (57). Figure 1 of Vinther is reproduced below.

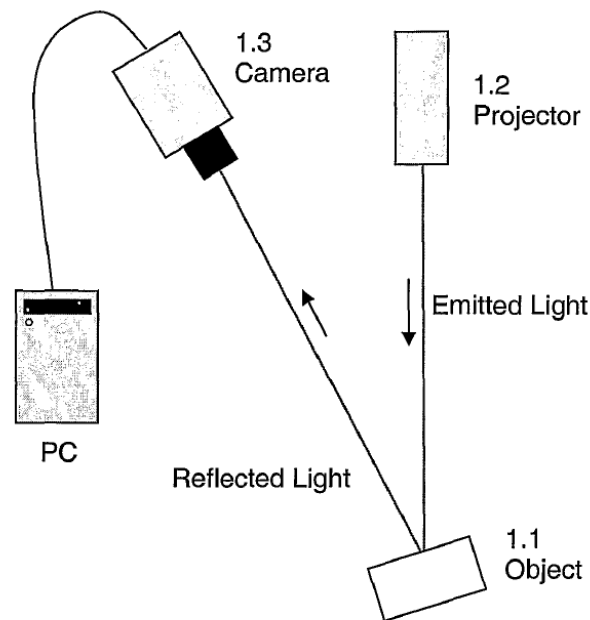


Fig. 1

Figure 1 of Vinther illustrates a structured light scanner with camera and projector. Ex. 1005, 3.

Vinther’s system comprises light source 1.2 that projects a pattern of continuous line segments onto the surface, wherein each line segment is coded with a unique pattern along the line segment, detector 1.3 that records an image of the surface with said projected pattern, and a computer for transforming said image to a three-dimensional model of the surface utilizing said projected pattern. *Id.*, code (57).

3. Vuylsteke (Ex. 1006)

Vuylsteke is an IEEE paper titled “Range Image Acquisition with a Single Binary-Encoded Light Pattern,” published in February 1990. Ex. 1006, 148. Vuylsteke relates to triangulation with structured light for acquiring range pictures of three-dimensional scenes and discloses a coding scheme based on a single fixed binary encoded illumination pattern. *Id.* Figure 1 of Vuylsteke is reproduced below.

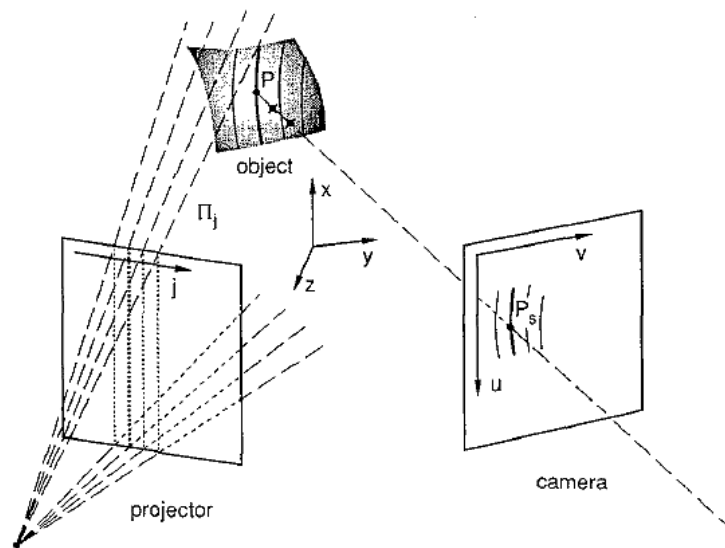


Fig. 1. The identification problem with multiple stripe triangulation. An observed image point P_s on a light stripe may correspond to any of the projected light sheets Π_j . The index value j is required to compute the coordinates of the actual object point P .

Figure 1 of Vuylsteke illustrates system using a projector and a camera, and shows an identification problem with multiple strike triangulation. Ex. 1006, 149.

Vuylsteke discloses projecting an illumination pattern onto a scene with a “standard slide projector” and using a camera to capture an image. *Id.* at 153. Vuylsteke further describes that a computer is used to execute a triangulation algorithm that uses corresponding points in the slide pattern and the captured image for measuring 3D object geometry. *Id.*

E. Asserted Obviousness

Petitioner presents its case for each asserted ground in the form of a claim chart, wherein Petitioner argues that Tomasi and Vinther (for Ground 1) and Tomasi, Vinther, and Vuylsteke (for Ground 2) *each* teach all of the limitations of *each* of the challenged claims. *See, e.g.*, Pet. 26–48 (claim chart for Ground 1, claim 1); *id.* at 77–86 (claim chart for Ground 2, claim 1). Petitioner also argues that the ordinarily skilled artisan would have been motivated to modify Tomasi’s teachings with Vinther “by using, for example, Vinther’s specific structured light pattern, which is very similar to the one disclosed in the ’656 [patent],” and that such modification “would have been a straightforward application of those teachings in a manner that advantageously improves the efficiency of a 3D scanning system.” *Id.* at 24–26.⁸ Petitioner similarly argues that the ordinarily skilled artisan would have been motivated to modify Tomasi with Vinther’s teachings by using, for example, Vuylsteke’s “grouping of coded light symbols within the structured light pattern.” *Id.* at 76.

Patent Owner argues several deficiencies in Petitioner’s showing, asserting: (1) Petitioner fails to provide a construction for “a device for capturing an image,” which Patent Owner contends is a means-plus-function term (Prelim. Resp. 1, 9–17, 40)⁹; (2) Petitioner fails to identify its challenge “with particularity” because Petitioner asserts that all of the references

⁸ Throughout herein, bolding of reference names is omitted in material quoted from the Petition.

⁹ As noted *supra*, we do not take a position as to whether this term was required to be construed as a means-plus-function term because we deny institution on other grounds.

“individually disclose each and every element of both independent claims” (*id.* at 1–2, 17–23); (3) the petition fails to provide the “required specificity” as to why the ordinarily skilled artisan “would have modified Petitioner’s primary reference(s) in view of its secondary reference(s)” (*id.* at 2, 23–30, 41); and (4) the Petition fails to explain how or where the references disclose key elements of the ’656 patent’s challenged claims—specifically, “a device for capturing an image,” “a projector lens characterized by a projector lens vertex,” “a spatial or temporal distribution of an amplitude or a wavelength of said structured light,” and/or a first virtual line with a first group of “coded elements” and a second virtual line with a second group of “coded elements” (*id.* at 3, 30–39, 41–45).

Having reviewed all of the parties’ arguments and evidence, we determine Petitioner does not demonstrate a reasonable likelihood of establishing unpatentability of any of claims 1–4, 6–15, and 17–22. For the following reasons, which are essentially the reasons argued by Patent Owner, we conclude that Petitioner’s overall analysis is conclusory, non-specific, and fails to address persuasively how or where the references disclose key elements of the ’656 patent’s challenged claims.

Our rules require the Petition to contain “a detailed explanation of the significance of the evidence.” 37 C.F.R. § 42.22(a)(2). The instant Petition contains no such explanation. Instead of a meaningful element-by-element analysis with a substantive discussion and explanation of how the prior art teaches or suggests each element, Petitioner provides claim charts that reproduce the claim elements paired with conclusory statements that the reference teaches the element, followed by block quotes and/or string cites from each prior art reference. *E.g.*, Pet. 26–48 (purportedly mapping every

limitation of claim 1 to both Tomasi and Vinther); *id.* at 77–86 (purportedly mapping every limitation of claim 1 to Tomasi, Vinther, and Vuylsteke). In so doing, the claim charts fail to include a detailed discussion of the art as applied to the claim limitations; in particular, Petitioner provides no explanation of *how* it interprets the quoted or cited statements or *why* Petitioner believes that they teach or suggest each limitation. This approach places an undue burden on the Board to sift through the information presented by Petitioner and attempt to discern correspondence and differences between the claimed subject matter and the teachings of the prior art. In similar circumstances, the Board has faulted Petitioner for failing to “address meaningfully the scope and content of the prior art, and any differences between the claimed subject matter and the prior art.” *Google Inc. v. EveryMD.com LLC*, IPR2014-00347, Paper 9 at 24–25 (PTAB May 22, 2014) (denying institution); *see also, e.g., Valeo N. Am., Inc. v. Magna Elecs., Inc.*, IPR2014-01206, Paper 13 at 15 (PTAB Dec. 23, 2014) (denying institution, and noting: “Petitioner’s obviousness analysis is incomplete in that it: fails to state explicitly the differences between the [prior art] and the claimed subject matter, does not explain persuasively the relevance of the evidence, and presents conclusory assertions regarding how the references are combined.”).

Petitioner’s vague and conclusory analysis is compounded by the fact that, as noted above, Petitioner asserts that *each* reference discloses *each* limitation. This leaves the Board guessing what modifications Petitioner proposes as to any reference. *See Matterport, Inc. v. Appliance Computing III, Inc.*, IPR2021-00939, Paper 15 at 16–17 (PTAB Nov. 23, 2021) (denying institution because “Petitioner does not identify differences

between [two prior art references] and element 1.2 or how Petitioner proposes to combine or modify the asserted prior art to meet element 1.2”). In addition, by failing to specify any particular combination, Petitioner effectively presents a myriad of combinations, tacitly inviting the Board to sift through the references and discern a potentially invalidating combination out of the many possible combinations. Again, under similar circumstances, the Board has found the petitioner’s showing to be fatally deficient.

See, e.g., Adaptics Ltd. v. Perfect Co., IPR2018-01596, Paper 20 at 19–21 (PTAB Mar. 6, 2019) (denying institution, noting that Petitioner’s lack of specificity resulted in “hundreds of possible combinations,” effectively presenting “voluminous and excessive grounds,” because “the Petition fails to specify what Petitioner regards as the difference(s) between [the prior art] and the challenged claims”).

Although Petitioner does not discuss any particular combinations in its claim chart, Petitioner does provide a brief discussion of a motivation to combine the references. *See* Pet. 21–26 (combining Tomasi and Vinther); *id.* at 76–77 (combining Tomasi, Vinther, and Vuylsteke). Such discussion, however, consists primarily of describing the similarities of the references (*see id.* at 21–24, 76–77), followed by a conclusory statement that “[i]n light of the above teachings, a POSITA would have had a motivation and a reasonable expectation of success in modifying Tomasi with Vinther’s teachings by using, for example, Vinther’s specific structured light pattern, which is very similar to the one disclosed in the ‘656 [patent].” *Id.* at 24; *see also id.* at 76–77 (providing a similarly conclusory assessment with regard to combining Tomasi, Vinther, and Vuylsteke). The entirety of Petitioner’s reasoning for combining Tomasi with Vinther follows:

Tomasi already teaches that the coded elements “may be assigned a size from a set of two or more sizes.” EX1004, [0035]. Consistent with that, Vinther teaches that “[t]o be able to distinguish the projected lines in a recorded image the invention proposes using a coding along the lines as e.g. varying line width or intensity.” EX1005, 7:18–19. Indeed, it was well understood to a POSITA at the time of the invention to look to other 3D scanning implementations for guidance in how to implement such a system. There is significant technical survey literature in the field of 3D scanning dedicated to reviewing and analyzing various methods and systems for solving issues in 3D scanning. *See, e.g.*, EX1007; EX1008; EX1009. Modifying Tomasi with Vinther’s teachings would have been a straightforward application of those teachings in a manner that advantageously improves the efficiency of a 3D scanning system. EX1003, ¶¶44–56.

Id. at 26. Petitioner’s reasoning for combining Tomasi, Vinther, and Vuylsteke merely parrots the foregoing reasoning:

As previously discussed . . . Tomasi and Vinther teach using structured light patterns having varying coded bits that can be grouped. EX1004, [0035], EX1005, 7:18-19. Vuylsteke also discloses coded elements that can be grouped. EX1006, 150. Indeed, it was also well understood for a designer of a system at the time of the invention to look to other 3D scanning implementations for guidance. *See, e.g.*, section IX.A.2. Modifying Tomasi in view of Vinther with Vuylsteke’s teachings would have been a straightforward application of those teachings in a manner that advantageously improves the efficiency of a 3D scanning system. EX1003, ¶¶57-63.

Id. at 76–77.

As noted, Petitioner’s primary basis as to the motivation for the ordinarily skilled artisan to have modified a portion of Tomasi’s system in view of Vinther (and also in view of Vuylsteke) is that “[i]t was well understood to a POSITA at the time of the invention to look to other 3D

scanning implementations for guidance in how to implement such a system.” Pet. 26, 76–77. But Petitioner also asserts, in its claim charts, that Tomasi’s system already teaches all the elements, including “structured light patterns” (*id.* at 27–29), and Petitioner never suggests or indicates that Tomasi’s patterns would have been insufficient nor does Petitioner attempt to explain *why* the ordinarily skilled artisan would have found Vinther’s (or Vuylsteke’s) light patterns preferable. *Cf.* Ex. 2001 ¶¶ 47–48 (Aikens Decl.). Courts routinely deny obviousness challenges—like the one presented in the Petition—that are based solely on the suggestion that a system *could be* modified to include different interchangeable or modular parts. *See, e.g., Unigene Labs., Inc. v. Apotex, Inc.*, 655 F.3d 1352, 1360 (Fed. Cir. 2011) (“Obviousness requires more than a mere showing that the prior art includes separate references covering each separate limitation in a claim under examination.”).

In short, Petitioner insufficiently explains why the ordinarily skilled artisan would have looked to other 3D implementations beyond Tomasi. Petitioner’s conclusory assertion that modifying Tomasi to use Vinther’s (or Vuylsteke’s) specific structured light patterns would have “improv[ed] the efficiency of a 3D scanning system” (Pet. 26, 76–77) lacks substantive explanation of *how* efficiency would have been improved over what was taught in Tomasi, or *why* the ordinarily skilled artisan would have found the efficiency of Tomasi’s 3D scanning system to be lacking. Under similar circumstances, the Board has denied institution. *See Shopkick, Inc. v. Novitaz, Inc.*, IPR2015-00279, Paper 7 at 29–30 (PTAB May 29, 2015) (denying institution and explaining that “conclusory labels do not substitute for a fact-based analysis . . . establishing what is being modified and why,

based on the differences between the prior art and the claimed invention, it would have been obvious to a person of ordinary skill to make the modification”).

In addition to pointing out foundational deficiencies in Petitioner’s overall analysis for both grounds, with which we agree, Patent Owner also raises deficiencies in Petitioner’s showing as to several claim limitations for each ground. For at least several of these limitations, as further discussed below in the context of each ground, we agree with Patent Owner’s assessment that Petitioner’s arguments and evidence are vague and/or conclusory, and hence fail to satisfy Petitioner’s burden of demonstrating, on this record, a reasonable likelihood that one or more challenged claims are unpatentable.

*1. Ground 1: Obviousness of Claims 1–4, 6–15, and 17–22
over Tomasi and Vinther*

In Ground 1, Petitioner contends that claims 1–4, 6–15, and 17–22 are unpatentable under 35 U.S.C. § 103(a) over the teachings of Tomasi and Vinther. Pet. 16–72. For the reasons explained herein, we are not persuaded that Petitioner has established a reasonable likelihood of establishing unpatentability of at least one of these claims on this basis.

With regard to Limitation [1.A], which recites “a projector lens characterized by a projector lens vertex,” Petitioner asserts that Tomasi discloses this limitation by disclosing “a projector that projects a structured light pattern onto the surface of an object, including a bulb (light source), a slide having a pattern, and a projector optical center (lens vertex).” Pet. 27–29 (citing Ex. 1004, Fig. 1, quoting *id.* ¶¶ 4, 34, 36, 59; also citing (without explanation) *id.* ¶¶ 7, 33, 38, 61, 75, 89). Petitioner also asserts that Vinther

discloses this limitation by disclosing “a projector that projects a structured light pattern onto the surface of an object, including a light source, a slide having a pattern, and a projector optical center (lens vertex).” *Id.* at 29–31 (citing Ex. 1005, Fig. 1; quoting *id.* at 6:31–7:2, 1:14–17, 2:1–2, 2:31–32, 8:28–30).

Patent Owner points out that neither Tomasi nor Vinther discloses an “optical lens,” and contends that Petitioner fails to explain why the disclosure of a “projector” in Tomasi and in Vinther discloses an “optical lens.” Prelim. Resp. 32–34. As Patent Owner also notes, the sole mention by Vinther of a “projector lens” is in the “Background of the Invention” while discussing a different prior art device. *Id.* at 33 (citing Ex. 1004, 2:1–2). Patent Owner also submits the testimony of Mr. Aikens, who explains that a projector may have an optical center without necessarily having an optical lens, and also states that not all projector lenses include a lens vertex—for example, in the case of a non-symmetrical lens. *Id.* at 32–33 (citing Ex. 2001 ¶¶ 74–75). We agree with Patent Owner’s assessment that Petitioner’s showing is vague as to Limitation [1.A], as it improperly places the burden on the Board to draw a connection between the cited disclosures (a projector) and the teaching of the claim limitation (a projector lens vertex).

Patent Owner also points out deficiencies in Petitioner’s showing as to Limitation [1.D], which recites “wherein said slide pattern comprises a plurality of coded elements, where each of said coded elements is characterized by at least one parameter and, where said at least one parameter defines a spatial or temporal distribution of an amplitude or a wavelength of said structured light.” Prelim. Resp. 34. Petitioner asserts, in

its claim chart, that “Tomasi discloses a spatially distributed binary coded pattern comprising a plurality of grid points (coded elements). Each grid point is characterized by parameters including color defining a spatial distribution of wavelength, and/or size defining a spatial distribution of amplitude.” Pet. 36. Petitioner then provides an image of Figure 6 of Tomasi and quotes (without further analysis) paragraphs 35, 89, and 90 of Tomasi, and cites (without quotes or discussion) paragraphs 6, 21, 24, 38, 75, 76, 91, and 103 of Tomasi. *Id.* at 36–37.

As Patent Owner notes, “none of Petitioner’s quoted or cited portions of Tomasi recite either ‘amplitude’ or ‘wavelength.’ In fact, Tomasi never once mentions ‘amplitude’ or ‘wavelength.’” Prelim. Resp. 34 (emphasis omitted). As Patent Owner also notes, “Petitioner does not explain how Tomasi’s disclosures or grid points teach ‘a spatial or temporal distribution of an amplitude or a wavelength of said structured light.’” *Id.* at 34–35 (citing Ex. 2001 ¶¶ 59–60).

We agree with Patent Owner’s assessment. Tomasi never mentions the specific claimed properties. At most, Tomasi broadly discusses a “coding scheme” that “assigns values to specific characteristics of light” (Ex. 1004 ¶ 35), but Petitioner cites nothing in Tomasi that explains what the “specific characteristics” might be, nor does Petitioner offer explanations or expert testimony as to how the ordinarily skilled artisan would have drawn the connection between Tomasi’s disclosure of unidentified light characteristics and the specific parameters and properties recited in claim 1. Rather, Petitioner simply asserts that the parameters recited in claim 1 are disclosed in Tomasi, and then leaves it to the Board to make inferences and assumptions as to Petitioner’s intended showing based on block quotes and

string cites to Tomasi's disclosure. *See* Pet. 36–37. Petitioner's purported showing as to Vinther (which Petitioner asserts also discloses Limitation [1.D]) suffers from similar deficiencies. *See id.* at 38–39; *see also* Prelim. Resp. 35. On this record, even at the institution stage, such a vague and conclusory showing is inadequate to meet Petitioner's burden. *See, e.g., Google Inc. and Twitter, Inc. v. EveryMD.com LLC*, IPR2014-00347, Paper 9 at 25 (PTAB May 22, 2014) (noting that a petitioner should not “place the burden on [the Board] to sift through information presented by the Petitioners, determine where each element [of the challenged claims] is found in [the cited references], and identify any differences between the claimed subject matter and the teachings of [the cited references.]”).

Patent Owner also points out deficiencies in Petitioner's showing as to Limitations [1.F] and [1.G], which recite “a first slide virtual line and a second slide virtual line are defined on said slide surface” and that “said coded elements of said first group are located along said first virtual line and said coded elements of said second group are located along said second virtual line.” Prelim. Resp. 36–39. In its showing for Limitation [1.F] Petitioner contends, in its claim chart:

Tomasi discloses multiple epipolar planes passing through the projector lens vertex and the device lens vertex. Further, Tomasi discloses epipolar line pairs related to each of the projector optical center (lens vertex) and the camera optical center (lens vertex) that exist along the same epipolar plane. Tomasi also discloses that multiple epipolar planes and epipolar line pairs define virtual lines on the slide surface.

Pet. 43 (quoting Ex. 1004 ¶¶ 59, 60, Fig. 3; citing *id.* ¶¶ 61, 74, 75, 90, 92). Petitioner further contends, in its showing for Limitation [1.G], “Tomasi discloses groups of coded elements located along each of the epipolar lines

that are inherent in the epipolar geometry.” *Id.* at 46 (citing ¶¶ 60, 92, 59, 74, 75, 90, 92, Fig. 6). Petitioner’s showing for Vinther, which Petitioner argues also discloses each of these limitations, is similar. *See id.* at 44–48.

Patent Owner contends that Petitioner’s showing is defective because “Petitioner fails to explain why Tomasi’s ‘epipolar line,’ or any other line, teaches the claimed ‘virtual lines.’ Nor does Petitioner explain how these purported epipolar lines are ‘defined on said slide surface,’ as claimed.” Prelim. Resp. 36 (citing Ex. 2001 ¶ 64).

As noted *supra*, Petitioner contends that “the term ‘virtual line’ as properly construed refers to the ‘meridians’ described in the patent specification, which are themselves commonly referred to as the epipolar lines inherent in the geometry of a structured light 3D imaging system including a projector and a camera.” Pet. 16 (citing Ex. 1003 ¶ 43).¹⁰ Thus, Petitioner’s apparent position is that the term “virtual lines,” as used in the ’656 patent claims, is synonymous with the term “meridians” as used in the Specification, which in turn is synonymous with “epipolar lines,” as used in Tomasi. *See id.*; *see also id.* at 43. Petitioner does not, however, offer any persuasive reasoning or evidence in support of this position. Rather, Petitioner states its position conclusorily, asserting that “in examining the specification, the term ‘virtual line’ as properly construed refers to the ‘meridians’ described in the patent specification.” *Id.* at 16. Petitioner does not cite to any portion of the Specification in support of this contention. Petitioner’s further assertion that “meridians” would be understood to be the

¹⁰ The Petition cites to paragraph 43 of the Gupta Declaration, but the cited subject matter appears in paragraph 44.

“epipolar lines inherent in the geometry of a structured light 3D imaging system” (*id.*) similarly lacks persuasive reasoning or evidentiary support. As noted above, Petitioner cites only to a paragraph in the Gupta Declaration, which merely parrots Petitioner’s argument followed by a cite to the ’656 patent (Ex. 1001, 5:11–19) and a string cite to several paragraphs of Tomasi (Ex. 1004 ¶¶ 12, 57–64, 103–104). *See* Ex. 1003 ¶ 44.

Patent Owner does not, as noted *supra*, expressly take a position on the construction of “virtual line.” Rather, Patent Owner contends that “Petitioner fails to explain why Tomasi’s ‘epipolar line,’ or any other line, teaches the claimed ‘virtual lines.’” Prelim. Resp. 36. Patent Owner points out that Petitioner’s position is even farther afield with regard to Vinther, which does not mention “epipolar” or “polar,” and Patent Owner contends that “Petitioner fails to explain why Vinther allegedly discloses epipolar geometry and planes.” *Id.* at 37.

We need not resolve the construction of virtual lines, because even if we were to accept Petitioner’s contention that “virtual lines” as recited in the ’656 patent claims, reads on “epipolar lines” as described in Tomasi and Vinther, Petitioner’s arguments and evidence are still deficient. As Patent Owner notes, “the Petition lacks the requisite particularity because Petitioner does not identify which of the purported ‘multiple epipolar planes and epipolar line pairs’ constitute the ‘first slide virtual line’ and the ‘second slide virtual line.’” Prelim. Resp. 37 (citing 35 U.S.C. § 312(a)(3)); *see also id.* at 37–38 (noting similar deficiencies in Petitioner’s showing as to Vinther). Patent Owner also points out that “Petitioner makes no attempt to explain or show how each of the purported first and second virtual lines in

Tomasi or Vinther include the corresponding claimed first and second groups of coded elements along those lines.” *Id.* at 38–39.

For essentially the reasons asserted by Patent Owner, we agree that Petitioner fails to persuasively show how Tomasi or Vinther teach or suggest Limitations [1.F] and [1.G]. As is the case for other limitations discussed above, Petitioner’s purported showing for these limitations consists simply of a statement that each limitation is disclosed in each cited prior art reference, followed by block quotes and string cites from the cited references. At best, this is an invitation for the Board to sift through the cited material to discern support for Petitioner’s conclusory statements. As such, Petitioner’s showing is inadequate to meet Petitioner’s burden.

Our analysis of the merits of Petitioner’s arguments takes into account Petitioner’s submission of Dr. Gupta’s testimony. Notably, with regard to Petitioner’s showing as to the foregoing claim limitations, Petitioner does not even offer citations in its claim chart to Dr. Gupta’s testimony. In any event, because it is essentially verbatim to Petitioner’s arguments, citations to Dr. Gupta’s testimony would not cure the deficiencies in Petitioner’s positions. *Compare* Pet. 26–48 (claim chart for claim 1), *with* Ex. 1003 ¶¶ 58 (pp. 40–62) (reproducing Petitioner’s claim chart). As the Board has explained, declaration testimony that “is conclusory and unsupported” and “adds little to the conclusory assertion for which it is offered to support . . . is entitled to little weight.” *Xerox Corp. v. Bytemark*, IPR2022-00624, Paper 9 at 15 (PTAB Aug. 24, 2022) (precedential).

For the foregoing reasons, Petitioner does not demonstrate a reasonable likelihood of establishing that independent claim 1 would have been obvious over Tomasi and Vinther. Independent claim 12 recites

limitations similar to Limitations [1.A], [1.D], [1.F], and [1.G], and for those limitations Petitioner simply cites back to its analysis presented for claim 1. *See* Pet. 66–69. Further, Petitioner’s arguments and evidence regarding dependent claims 2–4, 6–11, 13–15, and 17–22 do not cure the deficiencies in Petitioner’s challenge to claims 1 and 12. *See* Pet. 48–72.

Therefore, we conclude the information presented does not demonstrate a reasonable likelihood that Petitioner would prevail in establishing that any of the challenged claims are unpatentable on Ground 1.

*2. Ground 2: Obviousness of Claims 1–4, 6–15, 17–22
over Tomasi, Vinther, and Vuylsteke*

In Ground 2, Petitioner alternatively contends claims 1–4, 6–15, and 17–22 would have been obvious over the teachings of Tomasi, Vinther, and Vuylsteke. Pet. 73–98. In the claim chart for Ground 2, Petitioner refers back to its analysis for Ground 1 for its showing with regard to Tomasi and Vinther, and additionally asserts that Vuylsteke also discloses each claim element. *See, e.g., id.* at 77–86 (claim chart for claim 1).

As we noted *supra* with regard to Petitioner’s showing generally, and with regard to Ground 1 in particular, Petitioner’s contentions of obviousness are overall conclusory in nature, amounting essentially to statements that each reference discloses each limitation, followed by block quotes and string cites that lack sufficient supporting argument and explanation. Petitioner’s showing in Ground 2 does not improve with the addition of the Vuylsteke reference.

Limitation [1.D] recites “wherein said slide pattern comprises a plurality of coded elements, where each of said coded elements is

characterized by at least one parameter and, where said at least one parameter defines a spatial or temporal distribution of an amplitude or a wavelength of said structured light.” Ex. 1001, 8:31–36. Petitioner asserts, in its claim chart, that “Vuylsteke discloses that it was known to use a slide pattern with varying wavelength,” and then asserts “Vuylsteke discloses a slide pattern with a plurality of coded elements, spatially distributed and having varying amplitude.” Pet. 80 (quoting Ex. 1006, 150, Fig. 3).

For reasons similar to those presented with regard to Ground 1, Patent Owner contends Petitioner’s showing in Ground 2 is deficient.

Prelim. Resp. 41–43. Patent Owner first points out that Petitioner’s citation to Vuylsteke as describing “varying wavelength” is actually a description of a different reference (Tajima), and Patent Owner additionally notes that such description in Vuylsteke is critical of Tajima because it “identifies several problems with Tajima’s system that Vuylsteke’s system attempts to solve.” *Id.* at 42 (citing Ex. 1006 at 148; Ex. 2001 ¶ 61). Patent Owner elaborates:

For example, Vuylsteke explains that “acceptable range accuracy” using Tajima’s system can be difficult to achieve, and that “it is not obvious [how] to deal with the effects of mutual illumination from nearby reflecting surfaces” caused by Tajima’s system. *Id.* The Petition does not explain how Vuylsteke’s disparagement of Tajima’s system constitutes a disclosure of using varying wavelengths in Vuylsteke system. Moreover, given Vuylsteke’s disparagement of Tajima, the Petition does not explain why a POSITA would have been motivated by Vuylsteke’s disclosure to use Tajima’s “gradually increasing wavelength” technique in combination with Tomasi and Vinther. Ex. 2001 ¶ 61.

Id.

Patent Owner also takes issue with Petitioner's assertion that Vuylsteke discloses "varying amplitude" through Vuylsteke's use of grid points. *Id.* (citing Pet. 80–81 (quoting Ex. 1006 at 150, Figs. 2–3)). As Patent Owner contends, "Petitioner's identified disclosure states that 'every grid point is individually marked with *a bright or a dark spot*,'" and notes that "Petitioner does not explain how Vuylsteke's disclosures of making a certain grid point either bright or dark (*see* Ex. 1006 at 150, Fig. 3) constitute a variation in amplitude as claimed." *Id.* at 42–43 (citing Ex. 2001 ¶ 62).

We agree, for essentially the reasons set forth by Patent Owner, that Petitioner's showing is inadequate to meet Petitioner's burden, even at the institution stage. Again, Petitioner's statements that each prior art reference discloses each limitation, followed by block quotes and string cites, amount to little more than an invitation for the Board to sift through the cited material to piece together support for Petitioner's conclusory statements.

As it did in the context of Ground 1, Patent Owner also points out deficiencies in Petitioner's showing in Ground 2 as to Limitations [1.F] and [1.G], which recite "a first slide virtual line and a second slide virtual line are defined on said slide surface" and that "said coded elements of said first group are located along said first virtual line and said coded elements of said second group are located along said second virtual line." Prelim. Resp. 43–45. For the purported virtual lines, Petitioner asserts that "Vuylsteke discloses light sheets (planes) projected through the projector lens vertex, and virtual planes passing through the projector lens vertex and the camera lens vertex. The structured light pattern is designed in a grid-like fashion such that defined rows and columns intersect with the light sheets." Pet. 82.

As Patent Owner contends, “[t]he Petition again fails to explain how the purported light sheets and virtual planes result in or disclose a first and second ‘slide virtual line’ and why any such virtual line would be ‘defined on said slide surface,’ both of which are required by the claims.” Prelim. Resp. 43–44 (citing Ex. 2001 ¶ 67).

For the groups of coded elements, the claim chart in the Petition states that Vuylsteke discloses “groups of coded elements located along varying virtual lines,” “how triangulation with structured light involves the intersection of lines and planes,” “how codebits exist within the context of columns and planes,” “groups of coded elements, containing at least two coded elements,” and “how coded elements exist in the context of a grid topology.” Pet. 84–86. Patent Owner contends that “none of these unsupported conclusions show or even allege that a first group of coded elements is located on a first virtual line and that a second group of coded elements is located on a second virtual line.” Prelim. Resp. 44 (citing Ex. 2001 ¶ 71). For example, as Patent Owner points out,

Petitioner’s assertion that “groups of coded elements located along varying virtual lines”—even if accepted as true—merely states that “varying virtual lines” include “groups of coded elements.” But this does constitute an assertion that a first virtual line includes a first grouping *and* that a second virtual lines includes a second grouping, as required by the claims.

Id. For essentially the reasons presented by Patent Owner, we agree that Petitioner’s showing is too vague and conclusory to meet Petitioner’s burden, even at the institution stage.

For the foregoing reasons, Petitioner does not demonstrate a reasonable likelihood of establishing that independent claim 1 would have

been obvious over Tomasi, Vinther, and Vuylsteke. Independent claim 12 recites limitations similar to Limitations [1.A], [1.D], [1.F], and [1.G], and Petitioner simply cites back to its analysis presented for claim 1.

See Pet. 92–95. Further, as in connection with Ground 1, Petitioner’s arguments and evidence in Ground 2 regarding dependent claims 2–4, 6–11, 13–15, and 17–22 do not cure the deficiencies in Petitioner’s challenge to claims 1 and 12. *See* Pet. 86–98.

Therefore, we conclude the information presented does not demonstrate a reasonable likelihood that Petitioner would prevail in establishing that any of the challenged claims are unpatentable on Ground 2.

III. CONCLUSION

Because we determine that the information presented in the record does not establish a reasonable likelihood that Petitioner would prevail with respect to at least one challenged claim of the ’656 patent, we do not institute an *inter partes* review.

IV. ORDER

For the reasons given, it is

ORDERED that the Petition is *denied* and no trial is instituted.

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