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Paper 31
Date: January 9, 2024

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

NEARMAP US, INC.,
Petitioner,

v.

EAGLE VIEW TECHNOLOGIES, INC.,
Patent Owner.

IPR2022-01090
Patent 8,078,436 B2

Before THOMAS L. GIANNETTI, GARTH D. BAER, and RUSSELL E. CASS, *Administrative Patent Judges*.

BAER, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

A. BACKGROUND

Nearmap US, Inc. ("Petitioner") filed a Petition requesting an *inter partes* review of claims 1–42 and 46–66 (the "challenged claims") of U.S. Patent No. 8,078,436 B2 (Ex. 1001, "the '436 patent"). Paper 2, 1 ("Pet."). Eagle View Technologies, Inc. ("Patent Owner") filed a Preliminary Response. Paper 6 ("Prelim. Resp."). Pursuant to 35 U.S.C. § 314, we instituted this *inter partes* review as to all of the challenged claims and all grounds raised in the Petition. Paper 9. Following institution, Patent Owner filed a Response. Paper 13 ("PO Resp."). Petitioner filed a Reply to Patent Owner's Response (Paper 18, "Pet. Reply"), and Patent Owner filed a Sur-reply (Paper 24, "PO Sur-reply"). On September 21, 2023, we held an oral hearing. A transcript of the hearing is included in the record. Paper 30.

We have jurisdiction under 35 U.S.C. § 6. This decision is a Final Written Decision issued pursuant to 35 U.S.C. § 318(a). For the reasons we discuss below, we determine that Petitioner has proven by a preponderance of the evidence that the challenged claims are unpatentable.

B. RELATED PROCEEDINGS

The parties identify the following related matters: *Eagle View Technologies, Inc. v. Nearmap US, Inc.,* 2:21-cv-00283, (D. Utah); *Eagle View Technologies, Inc. v. GAF Materials LLC*, 2:22-cv-00215 (D. Utah); *Pictometry International Corp. v. Roofr, Inc.*, 1:21-cv-01852 (D. Del); *Eagle View Technologies, Inc. v. Xactware Solutions, Inc.*, 1:15-cv-07025 (D.N.J); *Eagle View Technologies, Inc. v. Xactware Solutions, Inc.*, Appeal to the Court of Appeals for the Federal Circuit, Case Nos. 2021-1048, 2021-1049, and 2021-1743 (consolidated); *Eagle View Technologies, Inc. v. GAF*

Materials LLC, 1-21-cv-10669 (D.N.J.); *Eagle View Technologies, Inc. v. Aerialogics, LLC*, 2:12-cv-00618 (W.D. Wash); *Eagle View Technologies, Inc. v. RoofWalk, Inc.*, 2-12-cv-00544 (W.D. Wash). Pet. 98; Paper 6, 2–3. U.S. Patent No. 8,670,961, which is related to the patent at issue in this case, is the subject of IPR2022-01009.

C. Real Parties in Interest

Petitioner identifies itself as the only real party in interest. Pet. 97. Patent Owner identifies itself and Pictometry International Corp., which are both subsidiaries of Eagle View Technology Corporation, as real parties in interest. Paper 23, 1.

D. The '436 Patent

The '436 patent is directed to a "roof estimation system, which generates and provides roof estimate reports annotated with indications of the size, geometry, pitch and/or orientation of the roof sections of a building." Ex. 1001, code (57). The system can include "a roof estimating software program and a location-linked, image file database." *Id.* at 1:67–2:1. "During use, the physical address or location information of a building is provided to the program, which then presents aerial images of roof sections on the building at the specific address location." *Id.* at 2:2–5. After the aerial images are received, "[a]n image analysis and calibration is then performed either manually and/or via a software program that determines the geometry, the slopes, the pitch angles, and the outside dimensions of the roof sections." *Id.* at 2:6–9.

Figure 3 is reproduced below.

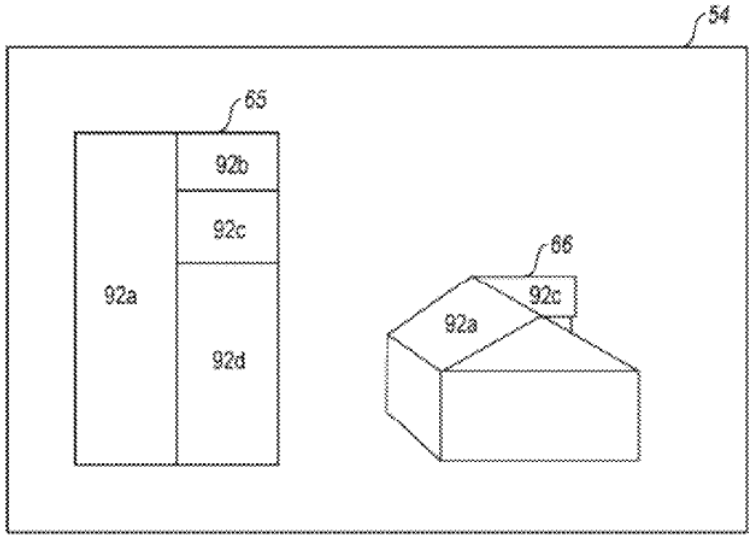


Fig. 3

Figure 3 shows top and perspective views of a building. *Id.* at 3:33–34, 4:9–10.

In certain embodiments, the roof estimation system includes a roof modeling engine that "generates a model of the roof of the specified building" and a report generation engine that "generates a final roof estimate report based on a 3D model." Ex. 1001, 8:15–16, 9:51–52. The report "typically includes one or more plan (top-down) views of the 3D model, annotated with numerical values for the slope, area, and/or lengths of the edges of at least some of the plurality of planar roof sections of the 3D model of the roof." *Id.* at 9:54–57.

E. CHALLENGED CLAIMS

Petitioner challenges claims 1–42 and 46–66. Claims 1, 18, 36, 58, 60, and 63 are independent. Claim 1 is illustrative and is reproduced below.

> 1. A computing system for generating a roof estimate report, the computing system comprising:
>
> a memory;

a roof estimation module that is stored on the memory and that is configured, when executed, to:

receive a first and a second aerial image of a building having a roof, each of the aerial images providing a different view of the roof of the building, wherein the first aerial image provides a top plan view of the roof and the second aerial image provides an oblique perspective view of the roof, and are not a stereoscopic pair;

correlate the first aerial image with the second aerial image;

generate, based at least in part on the correlation between the first and second aerial images, a three-dimensional model of the roof that includes a plurality of planar roof sections that each have a corresponding slope, area, and edges; and

generate and transmit a roof estimate report that includes one or more top plan views of the three-dimensional model annotated with numerical values that indicate the corresponding slope, area, and length of edges of at least some of the plurality of planar roof sections using at least two different indicia for different types of roof properties.

Ex. 1001, 15:58–16:12.

F. Asserted Grounds of Unpatentability

Petitioner asserts the following grounds of unpatentability. Pet. 2.

Claims Challenged	35 U.S.C. §	References/Basis
1–4, 6–22, 24–37, 39–42, 46–66	103(a)[1]	Littleworth[2], Linder[3], Middlebrook[4], Nishitani[5]
5, 23, 38	103(a)	Littleworth, Linder, Middlebrook, Nishitani, Heller[6]

Petitioner submits declarations from Dr. David Forsyth (Exs. 1004, 1028), June Ann Munford (Exs. 1015, 1037), and Karina Silverstein (Ex. 1038). Patent Owner submits declarations from Chandrajit Bajaj, Ph.D. (Exs. 2001, 2010) and James L. Mullins, Ph.D. (Ex. 2020).

II. PRELIMINARY MATTERS

A. LEVEL OF ORDINARY SKILL IN THE ART

Petitioner contends a person of ordinary skill in the art at the time of the '880 patent "would have had at least a Bachelor's Degree in an academic

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[1] The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) ("AIA"), included revisions to 35 U.S.C. § 103 that became effective after the filing of the application that led to the '961 patent. Therefore, we apply the pre-AIA version of 35 U.S.C. § 103.

[2] R.M. Littleworth et al., *Three-Dimensional Mapping and As-Built Computer Modeling by Analytical Photogrammetry*, International Archives of Photogrammetry and Remote Sensing 29 (1992)[2] (Ex. 1005, "Littleworth").

[3] Linder, *Digital Photogrammetry Theory and Applications*, Springer-Verlag (2003) (Ex. 1012, "Linder").

[4] Mark Middlebrook, *AutoCAD 2005 for Dummies*, Wiley Publishing (May 13, 2004)[4] (Ex. 1016, "Middlebrook").

[5] JP 2006-185367A, July 13, 2006 (English translation) (Ex. 1006, Nishitani).

[6] Heller, "The Site-Model Construction Component of the RADIUS Testbed System," in Proceedings: ARPA Image Understanding Workshop (1997) (Ex. 1007, "Heller").

area emphasizing the design of electrical, computer, or software technologies, or a similar discipline, and at least two years of experience related to computerized image analysis and three-dimensional modeling." Pet. 4. Further, "education could compensate for a deficiency in work experience, and vice-versa." *Id.* Although Patent Owner presents its own formulation, *see* PO Resp. 23, Patent Owner notes that "there does not appear to be any meaningful distinction between" the parties' formulations. PO Sur-reply 29–30. We adopt Petitioner's description as it is consistent with the prior art and '436 patent's specification. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (prior art itself may reflect an appropriate level of skill). Our decision would not change under either party's definition of the level of ordinary skill.

B. Claim Construction

1. "not a stereoscopic pair"

Petitioner proposes that images that "are 'not a stereoscopic pair,'" as required in claims 1 and 18 "mean[s] that the two images are 'captured independently of each other and without metadata (or other information) relating angles of cameras that captured the images.'" Pet. 5 (quoting Ex. 1004 ¶ 20). In addition to its expert, Petitioner cites as support the patent's prosecution history, in which Patent Owner asserted this definition. *Id.* at 5–6 (citing Ex. 1003, 167–169; Ex. 1004 ¶ 21). Patent Owner does not propose a construction for this limitation. We agree with Petitioner that images that are not a stereoscopic pair means that the two images are captured independently of each other and without metadata (or other information) relating angles of cameras that captured the images.

2. "aerial images"

Patent Owner argues that an aerial image is "an image taken from the air, rather than from a ground-based platform." PO Resp. 23. Petitioner asserts that aerial images include those taken from ground-based platforms, including nearby buildings. Pet. Reply 10. We addressed this issue based on the same arguments in our Final Written Decision in *Nearmap US, Inc. v. Eagle View Techs., Inc.*, IPR2022-01009, Paper 28 (PTAB Dec. 14, 2023) ("IPR2022-01009"). *See* PO Resp. 23–26; Pet. Reply 7–10; IPR2022-01009 Paper 28 at 11–15. As we explained, we disagree with Patent Owner's construction because the specification clearly and expressly states that aerial images may include images obtained via raised, ground-based platforms. IPR2022-01009 Paper 28 at 13–15; *see* Ex. 1001, 8:8–14. For the same reasons explained in IPR2022-01009, we agree with Petitioner that an aerial image "include[s] an image taken from a raised, ground-based platform, such as a building, hill, or tower, that appears to have been taken from the air." IPR2022-01090 Paper 28 at 15.

C. DESCRIPTION OF PRIOR ART REFERENCES

1. Littleworth (Ex. 1005)

Littleworth is a paper entitled "Three-Dimensional Mapping and as-Built Computer Modelling by Analytical Photogrammetry," and "describes how and why analytical photogrammetry, interfaced with a CAD system, has been used to create 3-dimensional computer models of development sites and engineering structures." Ex. 1005, Abstract. Littleworth explains that "[w]ith the introduction of industry wide CAD packages (e.g. Microstation, Autocad) the potential for introducing analytical photogrammetric techniques to new users has greatly expanded," but that "the accuracy achievable

creating 3-dimensional computer models is restricted given the geometric restraints imposed by the CAD system." *Id.* at 754. Littleworth states that the "Engineering Photogrammetry Unit (EPU) was launched in 1988" by City University in London "following the purchase of an Intergraph Intermap Analytic Photogrammetric Workstation (IMA)." *Id.* Littleworth provides "examples of some recent projects undertaken by EPU" to "illustrate the evolution of [a] 3-dimensional photogrammetric product" for "potential new photogrammetric users." *Id.*

Littleworth describes a project involving the "Hatfield Aerodrome" as "one of the first projects undertaken by EPU." Ex. 1005, 754. For this project, EPU used "several aerial photographic libraries and archives held by various organisations" in the United Kingdom, including "[s]uitable vertical aerial photography at a scale of 1:5000" for "this particular site." *Id.* at 755. Littleworth explains that "it was necessary to adapt the approach so that the detail digitised not only represented ground features accurately but gave a good visual impression of how these features actually appear." *Id.* This is shown in Figure 1, reproduced below.

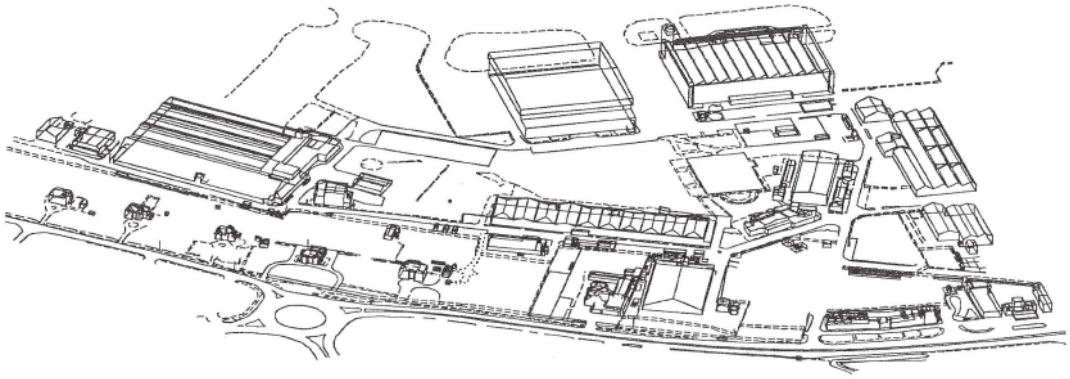


Fig.1 3-d model representing Hatfield Aerodrome.

Figure 1 of Littleworth shows a 3-d model representing Hatfield Aerodrome. Ex. 1005, 754.

Littleworth further explains that, for this project, "[r]oof detail was digitised indicating their pitch, major details on the roofs themselves, tree canopies indicating height and spread, fences and walls showing width and height." Ex. 1005, 755. Littleworth also states "[t]he ground surface was represented by 0.25 metre contours" which "were derived from pertinent ground detail (kerb lines, boundaries etc.), a grid of spot heights and supplementary height points on important natural changes of slope processed using a digital terrain model package." *Id.* This is shown in Figure 2, reproduced below.

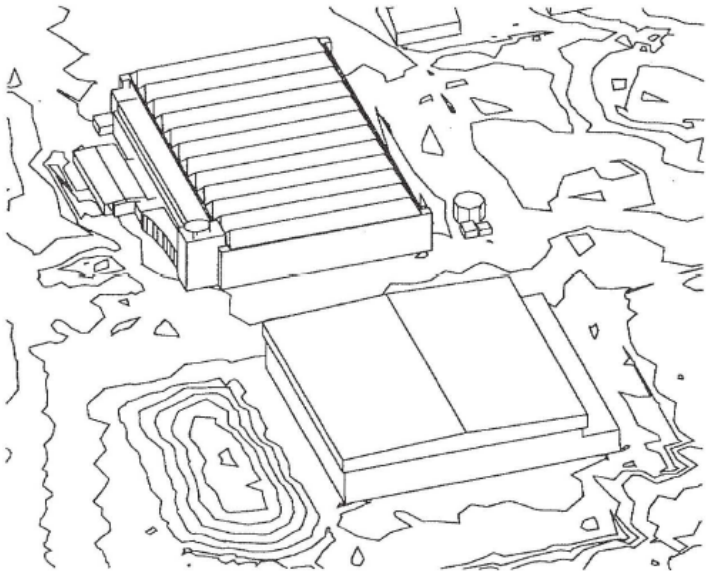


Fig. 2 3-d detail with DTM derived contours

Figure 2 shows a 3-d detail of the Hatfield Aerodrome model with the ground surface represented by 0.25 meter contours. Ex. 1005, 755.

2. Linder (Ex. 1012)

Linder is a textbook entitled "Digital Photogrammetry Theory and Applications" by Wilfried Linder. Ex. 1012. Linder states that "photogrammetry can be defined as the 'science of measuring in photos,' and

is a part of the field of remote sensing (RS)." *Id.* at 1.[7] According to Linder, "Photogrammetry provides methods to give you . . . quantitative data," such as the dimensions of a house that no longer exists from historic photos of the house. *Id.* As Linder explains, "[i]f you would like to determine distances, areas, or anything else, the basic task is to get object (terrain) co-ordinates of any point in the photo from which you can then calculate geometric data." *Id.* Additionally, according to Linder, the principle of "stereoscopic viewing" is "used to get three-dimensional information in photogrammetry," since with "two (or more) photos from the same object but taken from different positions" one can "easily calculate the three-dimensional co-ordinates of any point which is represented in both photos." *Id.* at 1–2. Linder defines "the main task of photogrammetry" as "[f]or any object point represented in at least two photos . . . calculat[ing] the three-dimensional object (terrain) co-ordinates." *Id.* at 2.

3. Middlebrook (Ex. 1016)

Middlebrook is a book entitled "AutoCAD 2005 for Dummies." Ex. 1016, cover. Middlebrook describes the use of "dimensions" in AutoCAD, which "are special text labels with attached lines that together indicate unambiguously the size of something" in an object. Ex. 1016, 229.[8] Middlebrook explains that "as you edit an object—by stretching it for example—AutoCAD automatically updates the measurement displayed in the dimension text label to indicate the object's new size." *Id.*

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[7] The citations to Linder refer to the original pages of the book, not to the page numbers added by Petitioner.
[8] The citations to Middlebrook refer to the original pages of the book, not to the page numbers added by Petitioner.

Middlebrook states that the "most common types" of dimensions are shown in Figure 10-3, reproduced below.

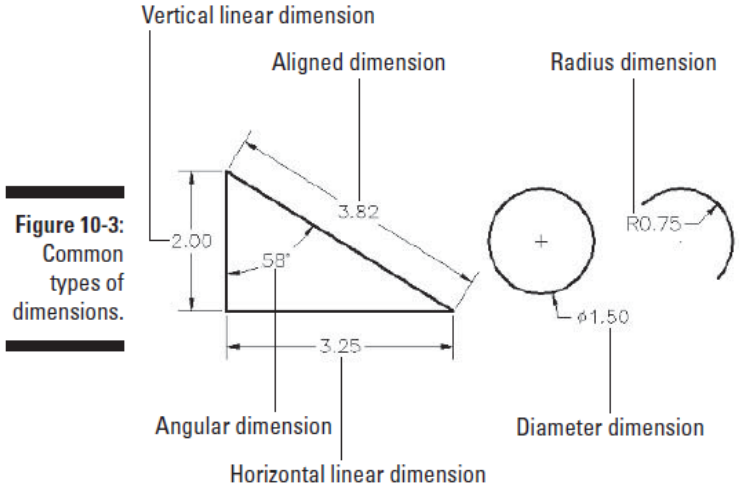


Figure 10-3: Common types of dimensions.

Figure 10-3 of Middlebrook illustrates common types of dimensions used in AutoCAD. Ex. 1016, 232–233.

Middlebrook states that each drawing includes a "paper space," which "is a separate space in each drawing for composing a printed version of that drawing." Ex. 1016, 62. First, Middlebrook explains, "[y]ou create the drawing itself, called the *model*, in *model* space," and then "can create one or more plottable views," each of which "is called a *layout*." *Id.* Middlebrook also states that a "paper space layout" includes one or more "viewports, each showing the 3D model from a different perspective." *Id.* at 65. A user can "[d]efine the arrangement of viewports that AutoCAD should create." *Id.* Figure 8-1 from Middlebrook shows a layout including multiple viewports showing different views of a three-dimensional model:

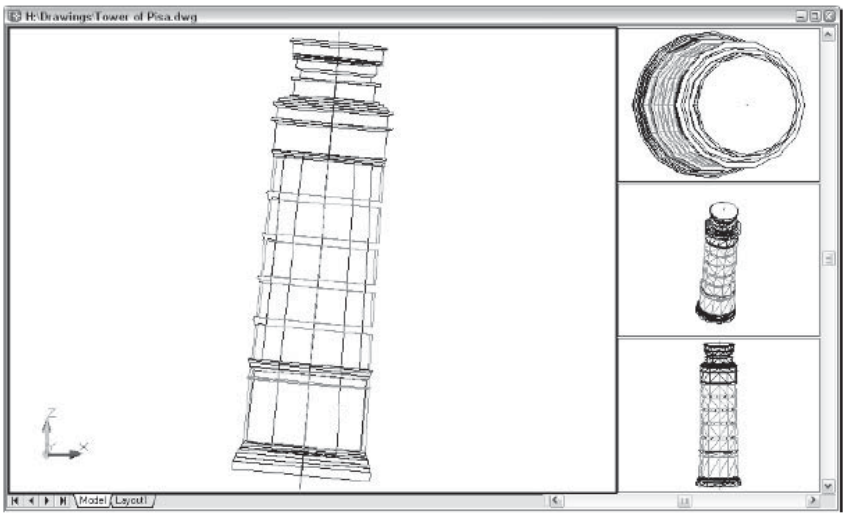


Figure 8-1: Leaning toward 3D.

Figure 8-1 of Middlebrook shows a layout with multiple viewports showing different views of a three dimensional model. Ex. 1016, 180.

4. Nishitani (Ex. 1006)

Nishitani describes a system for "estimating . . . [the] installation cost of a solar power generating apparatus." Ex. 1006, 1. According to Nishitani, "[a] customer desiring an estimate for a solar power generating apparatus uses the customer information inputting means . . . to access a webpage of a solar power generating apparatus installation supporting system that is the present invention, to input customer information following a customer information inputting screen." *Id.* ¶ 43. Nishitani's Figure 4 is reproduced below.

[FIG. 4]

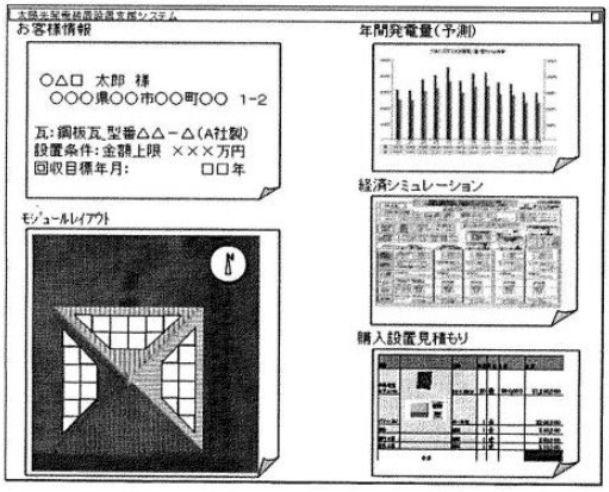
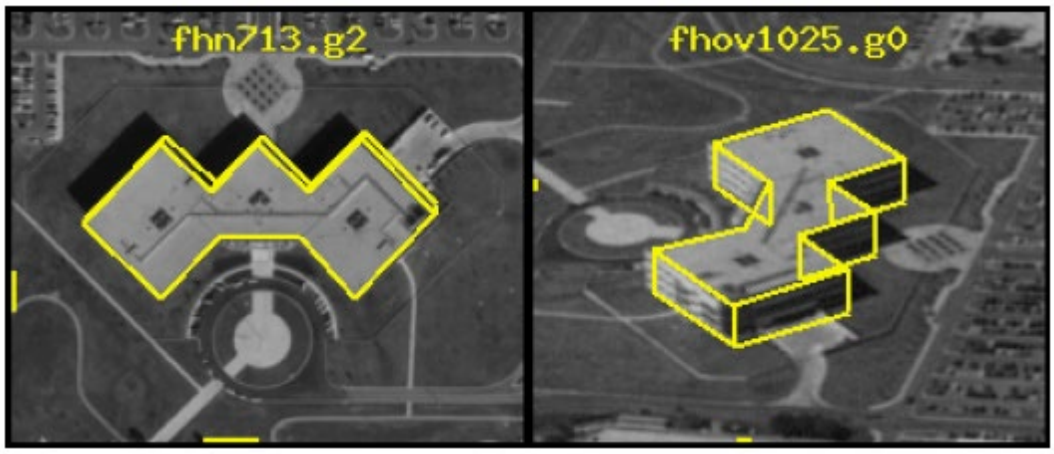


Figure 4 is "an example of an inputting screen for a solar power generating apparatus installation supporting system." *Id.* ¶ 59.

5. Heller (Ex. 1007)

Heller discloses a "the RADIUS model-supported image exploitation paradigm," that "creat[es] a 3-dimensional model that captures the basic geometry of the site under examination." Ex. 1007, Abstract. Heller's Figure 5 is reproduced, in part, below.



The Figure 5 excerpt shows a "model [of] a complex-shaped building." *Id.* at 7.

III. OBVIOUSNESS ANALYSIS

Petitioner contends that claims 1–4, 6–22, 24–37, 39–42, and 46–66 would have been obvious over Littleworth, Linder, Middlebrook, and Nishitani. Pet. 2. Petitioner adds a fourth reference, Heller, to challenge dependent claims 5, 23, and 38. *Id*. For the reasons explained below, we find Petitioner has shown by a preponderance of evidence that the challenged claims would have been obvious over the asserted references.

A. PETITIONER'S ASSERTED COMBINATION

Petitioner argues that "Littleworth discloses generating a three-dimensional model based on a non-stereoscopic pair of images that includes one or more *first* '*vertical aerial photography*' of the 'redevelopment area in London' and a *second 'oblique photography image*.'" *Id*. at 21–22. Petitioner relies on Linder for "generat[ing] three-dimensional coordinates of any point represented by two photographs" by "correlating a first image and a second image based on a particular object point P that is shared between the first and the second images." *Id*. at 23. Petitioner then relies on Middlebrook for teaching "enable[ing] users to annotate a . . . model with numerical values (or other visual indicia)." *Id*. at 24. Petitioner adds Nishitani for teaching "transmitting the generated and annotated three-dimensional model to a user device using a roof estimate report." *Id*. at 25–26.

Petitioner argues that one of ordinary skill would have been motivated to modify Littleworth's three-dimensional model generation system "to correlate images based on identified control points based on the teachings of Linder." *Id*. at 29. Petitioner asserts that "Littleworth teaches that images are 'studied and suitable control points [are] selected' as part of generating a three-dimensional model," but "does not describe in detail how these selected

control points within the images are utilized to generate the model." *Id.* However, according to Petitioner, "Linder describes that images are correlated based on control points within the images as part of generating a three-dimensional model." *Id.* Thus, Petitioner asserts, one of ordinary skill "would have been motivated to correlate the images described in Littleworth based on the selected control points in order to allow the images to be utilized in the three-dimensional model generation process, as taught by Linder." *Id.*

Petitioner further argues that one of ordinary skill "would have been motivated and found it obvious to modify the Littleworth-Linder combination with the teachings of Nishitani in order to communicate the results of Littleworth's three-dimensional modeling process in a manner that is easily understandable by users and in a format that can be easily used to guide construction tasks." *Id.* at 30. Further, according to Petitioner, a skilled artisan "would have been motivated and found it obvious to modify the three-dimensional modeling and reporting system of the Littleworth-Linder-Nishitani combination, based on the teachings of Middlebrook, to select and print different views of a three-dimensional model generated by the system including numerical annotations indicating various features of the model." *Id.* at 31.

Petitioner adds Heller to address a limitation in dependent claims 5, 23, and 38 requiring line drawings on the generated model. *See* Pet. 94–96. According to Petitioner, a skilled artisan would have been motivated to add Heller's annotated-lines feature "to increase the speed and accuracy with which a user can annotate the outlines of [a] three dimensional representation of a property." *Id.* at 94.

Patent Owner raises several objections to Petitioner's obviousness showing. We address those issues below.

B. Whether Littleworth and Linder Are Prior Art

Patent Owner asserts Petitioner failed to demonstrate that Littleworth and Linder are prior art. PO Resp. 9–19; PO Sur-reply 9–11. We addressed this issue based on the same arguments in IPR2022-01009. *See* PO Resp. 9–19; Pet. Reply 31–35; IPR2022-01009, Paper 28 at 21–27, 28–31. As we explained, the evidence of record supports that Littleworth and Linder were publicly available before the critical date. IPR2022-01009, Paper 28 at 25–27, 31. Thus, for the same reasons explained in IPR2022-01009, we maintain Petitioner has shown sufficiently that Littleworth and Linder were publicly available before the critical date.

C. Correlating a Top Plan View and Oblique Perspective View

Independent claim 1 requires "correlat[ing] the first aerial image with the second aerial image" where "the first aerial image provides a top plan view of the roof and the second aerial image provides an oblique perspective view of the roof." Independent claim 58 has similar language requiring correlating a top plan view and oblique perspective view. Petitioner asserts the prior art teaches this element because Littleworth teaches using control points from two images (one from vertical aerial photography and a second from oblique photography) to create a three-dimensional model, while Linder details the process of correlating images using control points. Pet. 35–37; *see id.* at 22–23.

Patent Owner asserts that Petitioner's challenge fails because "Linder does not disclose a correlation between a top plan view image and an oblique perspective view image." PO Resp. 29. We disagree with Patent Owner's

argument because it attacks the references individually rather than addressing the asserted combination, as set forth in the Petition. Specifically, Petitioner relies on Linder's correlation teaching, applied to Littleworth's images. *See* Pet. 22–23, 35–37. Thus, it does not matter if Linder fails to teach correlating top- and oblique-view images as Patent Owner asserts, because Petitioner relies on Littleworth in combination with Linder for teaching that feature. *See id*. Given Petitioner's analysis as outlined above, we agree with Petitioner that its proposed combination of Littleworth and Linder teaches correlating two aerial images, where one provides a top plan view of the roof and the second provides an oblique perspective view.

D. CORRELATING TWO IMAGES THAT ARE NOT A STEREOSCOPIC PAIR

Independent claims 1 and 18 require correlating first and second aerial images that are not a "stereoscopic pair." Petitioner asserts the prior art teaches this element because Littleworth teaches using control points from two non-stereoscopic images to create a three-dimensional model, while Linder details the process of correlating images using control points. Pet. 35–37; *see id*. at 22–23. Petitioner further argues that Littleworth teaches using "one or more first '***vertical aerial photography***' images of the 'redevelopment area in London'" and "supplement[ing] the [one or more first] vertical aerial photography [images] with [***a second***] ***oblique photography*** [***image***]," and that these images "are not a stereoscopic pair, because the images were captured independently without metadata relating angles of cameras that captured the images three years apart." *Id.* at 35–36 (citing Ex. 1005, 755–756; Ex. 1004, 72).

Patent Owner asserts that Petitioner's challenge fails because "nothing in Linder describes a process for measuring or correlating images that are *not*

stereoscopic pairs." PO Resp. 32; *see id.* at 34 ("Linder is limited to stereoscopic pairs of images"). We disagree with Patent Owner's argument because it once again attacks the references individually rather than addressing Petitioner's asserted combination. Specifically, as explained above, Petitioner relies on Linder's correlation teaching, applied to Littleworth's images. *See* Pet. 22–23, 35–37. Thus, it does not matter if Linder fails to teach correlating non-stereoscopic images as Patent Owner asserts, because Petitioner relies on Littleworth in combination with Linder for teaching that feature. *See id*. Given Petitioner's analysis as outlined above, we agree with Petitioner that its proposed combination of Littleworth and Linder teaches correlating two images that are not a stereoscopic pair.

E. PETITIONER'S RATIONALE FOR COMBINING LITTLEWORTH AND LINDER

As noted above, Petitioner asserts one of ordinary skill "would have been motivated to correlate the images described in Littleworth based on the selected control points in order to allow the images to be utilized in the three-dimensional model generation process, as taught by Linder." Pet. 29. Patent Owner argues that one of ordinary skill would not have been motivated to combine Littleworth and Linder as Petitioner proposes because Linder is limited to corresponding stereoscopic images and would not have been suitable for correlating Littleworth's non-stereoscopic imagery. PO Resp. 40–46. We addressed this issue based on the same arguments in IPR2022-01009. *See* PO Resp. 40–46; Pet. Reply 10–22; IPR2022-01009, Paper 28 at 48–57. As we explained there, the evidence of record, including Dr. Forsyth's testimony and relevant passages from Linder, supports that Linder's correlation method applies more broadly than to just stereoscopic images, and none of the additional material Patent Owner cites undermines

Petitioner's proposed combination. *See* IPR2022-01009, Paper 28 at 52–54, 56–67. Thus, for the same reasons explained in IPR2022-01009, we maintain Petitioner has articulated sufficient rationale to support that its proposed combination of Littleworth and Linder would have been obvious.

F. AERIAL IMAGES

Independent claims 1, 18, 58, 60, and 63 recite receiving at least two "aerial" images. Petitioner corresponds Littleworth's vertical aerial photography and oblique photography image to the claimed two aerial images. *See, e.g.*, Pet. 36. Patent Owner argues that "Littleworth's 'oblique photography' cannot disclose or render obvious an 'aerial' image because Littleworth states that its 'oblique photography' is captured from a ground-based (or terrestrial) camera located on a nearby building, rather than from the air." PO Resp. 47. We addressed this issue based on the same arguments in IPR2022-01009. *See* PO Resp. 46–48; Pet. Reply 23–24; IPR2022-01009, Paper 28 at 41–42. As we explained, Patent Owner's argument is based on Patent Owner's claim construction of "aerial image" as excluding all "ground-based" images, which we did not adopt. IPR2022-01009, Paper 28 at 42. Given Petitioner's analysis as outlined above, we agree with Petitioner that Littleworth's vertical aerial photography and oblique photography image fall within the scope of the claimed aerial images.

G. DETERMINING A PITCH

Independent claim 63 requires "determining a pitch of a plurality of sections of the roof." Petitioner relies alternatively on Littleworth and Middlebrook for this element. *See* Pet. 83–86. Specifically, Petitioner explains, Littleworth teaches this feature because it describes that "***[r]oof detail was digitized indicating their pitch***," depicts roof models that include

roof pitch visualizations. *Id.* at 83–84 (citing Ex. 1005, 755, Fig 5). Further, Petitioner notes, Middlebrook teaches "calculat[ing] distances and dimensions" including "'[a]ngular dimensions' (i.e., pitch) as shown in FIG. 10-3 from Middlebrook." *Id.* at 84 (citing Ex. 1016, 42, 232–33). Patent Owner challenges Petitioner's showing regarding pitch determination in both Littleworth and Middlebrook. PO Resp. 48–57. We addressed this issue based on the same arguments in IPR2022-01009. *See* PO Resp. 48–57; Pet. Reply 24–26; IPR2022-01009, Paper 28 at 57–67. As we explained there, Petitioner made a sufficient showing regarding how Littleworth and Middlebrook teach pitch determination, and Patent Owner's arguments to the contrary were not persuasive. IPR2022-01009, Paper 28 at 63–67. Thus, for the same reasons explained in IPR2022-01009, we maintain that Petitioner has made a sufficient showing as to this pitch-determination limitation.

H. Petitioner's Reason to Combine a Third Aerial Image from Nishitani

Independent claims 58 and 60 require "receiving a third aerial image" that represents a different view than the first and second aerial images. Petitioner relies on Nishitani to teach this third aerial image. Pet. 79. Patent Owner asserts that Petitioner's challenge to claims 58 and 60 fails because "all Petitioner does is identify the existence of three images in Nishitani," but "provides no explanation of how or why a POSITA would have used Nishitani's alleged teachings." PO Resp. 58. We disagree with Patent Owner's argument.

Specifically, Petitioner explains that its proposed combination "entails the use of known solutions to improve similar systems and methods in the same way." Pet. 32 (citing Ex. 1004 ¶ 63). As Petitioner notes, "when a

patent 'simply arranges old elements with each performing the same function it had been known to perform' and yields no more than one would expect from such an arrangement, the combination is obvious." *Id.* (quoting *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007)). Here, we agree with Petitioner that Nishitani's three-image capture technique was a known way of capturing and storing a set of images for model generation and that combining it with Littleworth's three-dimensional model generator using Linder's image correlation yields only predictable results—i.e., generating a three-dimensional model using a three-image set. Pet. Reply 26; *see* Ex. 1028 ¶¶ 44–45. In addition, we agree with Petitioner that in some cases, "having a greater number of images" would have "facilitated model generation where a model would not have been able to be generated absent those images" and "create[d] a more accurate model given a larger library of images." Ex. 1028 ¶¶ 47. Given Petitioner's analysis, Petitioner has articulated sufficient reasoning with rational underpinning to support its assertion that it would have been obvious to combine Nishitani's three-image capture technique to its proposed Littleworth/Linder model generation system. *See KSR*, 550 U.S. at 418, 419.

I. CLAIM 36'S PREAMBLE

Independent claim 36's preamble requires "[a] non-transitory computer-readable storage medium" with "computer executable instructions." Patent Owner asserts that Petitioner's challenge to claim 36 fails because it does not address this non-transient-computer-memory feature, but instead relies on its earlier analysis that addresses claims that do not recite that feature. PO Resp. 60–61. We disagree with Patent Owner's argument.

The Petition's analysis for claim 36's preamble incorporates its analysis of other claims that plainly connects Littleworth's IMA workstation to the claim's memory and instructions elements. *See* Pet. 72 (citing previous analysis of limitation [1a] at Pet. 34–35), *id.* at 34–35 (explaining that "Littleworth uses an [IMA] Workstation to generate three-dimensional models" and "[a] POSITA would have understood that such a workstation includes a memory"). In addition, the at-issue memory language appears in claim 36's preamble. As a general rule, a claim's preamble is not limiting unless it "is necessary to give life, meaning and vitality to the claim." *Allen Eng'g Corp. v. Bartell Indus., Inc.*, 299 F.3d 1336, 1346 (Fed. Cir. 2002) (internal quotation marks omitted). Although, as Patent Owner notes, a different preamble term ("a building having a roof") provides the antecedent basis for later-used terms, *see* PO Resp. 59, that "does not necessarily convert the entire preamble into a limitation." *TomTom, Inc. v. Adolph*, 790 F.3d 1315, 1323 (Fed. Cir. 2015). Here, claim 36 does not recite any step related to the preamble's memory. Because claim 36 describes a structurally complete invention without the preamble's non-transient computer memory, we find that phrase is not limiting.

J. RECEIVING AERIAL IMAGES FROM AN IMAGE SOURCE COMPUTING SYSTEM

Dependent claim 4 requires that "the roof estimation module is further configured to receive the first and second aerial image from an image source computing system." Petitioner asserts that the asserted prior art teaches this feature in two ways: "(i) a scanning device (or other input device) that generates input images for storage into the memory of Littleworth's IMA workstation, or (ii) the computing sub-system components that access a

memory storing a scanned image, which may include subsets of Littleworth's IMA workstation itself." Pet. Reply 29; *see* Pet. 51–52; Ex. 1028 ¶¶ 52, 53.

Patent Owner raises three objections in challenging Petitioner's showing for this element. First, relying on Figure 7 of the '436 patent, Patent Owner contends the roof estimation system and image source computing system must be "separate[d] . . . across a network." PO Resp. 61; *see* PO Sur-reply 23. We disagree with Patent Owner's argument because it reads in an additional limitation (i.e., separating the roof estimation system and image source computing system over a network) beyond what the claim language recites. Nothing in claim 4's plain language indicates that the roof estimation module and image source computing system must be remote from each other and connected over a network.

Second, Patent Owner contends Petitioner's challenge fails because "Petitioner's arguments . . . repeatedly and only refer to an 'image source system,' whereas claim 4 requires an 'image source computing system." PO Sur-reply 22. We disagree. Patent Owner does not explain why the prior art's scanner or computing modules of the IMA workstation that organize and facilitate retrieval of aerial images are not computing systems, even though both involve computing. *See id.*; Ex. 1028 ¶¶ 52, 53 (explaining that "at least some rudimentary file system would have been employed to organize the stored aerial images in the memory and facilitate access and retrieval of these stored aerial images" and "a scanner that scans physical image[s] into a memory of Littleworth's IMA workstation would have performed computer operations to generate the image stored in the IMA workstation memory").

Third, Patent Owner contends "Petitioner sets forth entirely new theories" in its Reply brief and "cross[es] the line from being responsive to Patent Owner's arguments to proceeding in a new direction with a new approach." PO Sur-reply 21 (citing *Ariosa Diagnostics v. Verinata Health, Inc.*, 805 F.3d 1359, 1368 (Fed. Cir. 2015)). Again, we disagree. In addressing this element, the Petition identified both the scanner and the components that access images stored in a memory. *See* Pet. 51. Petitioner's Reply merely fleshed out and further explained Petitioner's arguments in response to Patent Owner's argument that the claimed roof estimation system and image source computing system must be separated across a network. Petitioner's arguments did not add "an entirely new theory" of unpatentability to the Petition. *See Corephotonics, LTD. v. Apple Inc.*, 84 F.4th 990, 1008 (Fed. Cir. 2023).

Given Petitioner's analysis as outlined above, we agree with Petitioner that the asserted prior art teaches "receiv[ing] the first and second aerial image from an image source computing system," as claim 4 requires.

K. Remaining Uncontested Limitations

As for the remaining limitations of claims 1–42 and 46–66, Petitioner provides a detailed analysis demonstrating that Littleworth's, Linder's, Middlebrook's, Nishitani's, and Heller's combined disclosures teach every element of the challenged claims. *See* Pet. 33–96. Other than the arguments addressed above, Patent Owner does not additionally challenge Petitioner's obviousness showing. We have reviewed Petitioner's arguments and evidence and, based on that analysis, we find Petitioner has shown by a preponderance of the evidence that claims 1–42 and 46–66 would have been obvious over the asserted prior art.

IV. CONCLUSION

For the foregoing reasons, we determine Petitioner has demonstrated by a preponderance of the evidence that claims 1–42 and 46–66 of the '436 patent are unpatentable.[9] Our conclusions are summarized in the following table.

Claim(s)	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not shown Unpatentable
1–4, 6–22, 24–37, 39–42, 46–66	103	Littleworth, Linder, Middlebrook, Nishitani	1–4, 6–22, 24–37, 39–42, 46–66	
5, 23, 38	103	Littleworth, Linder, Middlebrook, Nishitani, Heller[10]	5, 23, 38	
Overall Outcome			1–42 and 46–66	

V. ORDER

In consideration of the foregoing, it is hereby:

[9] Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner's attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. *See* 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. *See* 37 C.F.R. § 42.8(a)(3), (b)(2).

[10] We do not reach this ground because it would not change the outcome of this case.

ORDERED that claims 1–42 and 46–66 of the '436 patent are unpatentable; and

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

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