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Paper 59
Date: November 26, 2025

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ARASHI VISION (U.S.) LLC (D/B/A INSTA360),
Petitioner,

v.

GOPRO, INC.,
Patent Owner.

IPR2024-00984
Patent 10,015,413 B1

Before WILLIAM V. SAINDON, NABEEL U. KHAN, and BRIAN D. RANGE, *Administrative Patent Judges.*

KHAN, *Administrative Patent Judge*.

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

I. INTRODUCTION

A. Background and Summary

Arashi Vision (U.S.) LLC (d/b/a/ Insta360) ("Petitioner") filed a Petition (Paper 2, "Pet.") requesting an *inter partes* review of claims 1–20 of U.S. Patent No. 10,015,413 B1 ("the '413 patent," Ex. 1001). After the Petition was filed, Patent Owner filed a Statutory Disclaimer of claims 2–5 and 8–20 of the '413 patent leaving claims 1, 6, and 7 as the remaining challenged claims. Ex. 2022. Upon consideration of the Petition, Preliminary Response and the record evidence, we instituted review to determine the patentability of the challenged claims on all grounds. Paper 13 ("Dec. Inst.").

After institution, Patent Owner filed a Patent Owner Response (Paper 25, "PO Resp."), Petitioner filed a Reply (Paper 32, "Pet. Reply"), and Patent Owner filed a Sur-Reply (Paper 37, "PO Sur-reply"). An oral hearing was held on October 7, 2025, and the hearing transcripts are included in the record. Papers 57, 58 ("Tr.").

We have jurisdiction under 35 U.S.C. § 6. This Final Written Decision, issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73, addresses issues and evidence raised during the *inter partes* review. For the reasons that follow, Petitioner demonstrates by a preponderance of the evidence that claims 6 and 7 of the '413 patent are unpatentable but does not demonstrate by a preponderance of the evidence that claim 1 is unpatentable.

B. Related Matters

The parties identify the following pending matters as involving the '413 patent: *In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith*, Inv. No. 337-TA-1400 (USITC); *GoPro, Inc. v. Arashi Vision Inc. et al.*, No. 8:24-cv-00681-HDE-JCV (C.D. Cal.). Pet.

108; Paper 4, 2. Patent Owner also identifies the following proceeding that "may affect or be affected by a decision in this proceeding": *Arashi Vision Inc. v. GoPro, Inc.*, IPR2024-01052 (PTAB).

C. The '413 Patent (Ex. 1001)

The '413 patent, titled "Conversion Between Aspect Ratios in Camera," relates to a camera system for capturing an image in a source aspect ratio and transforming the image to scale and warp the image to generate an output image having a different aspect ratio. Ex. 1001, codes (54), (57). According to the '413 patent, "[c]onverting between aspect ratios is a common problem in the field of image and video processing," but conventional conversion techniques "result in a perceivable reduction in the quality of the image or video." *Id.* at 1:6–15.

Figures 2A and 2B of the '413 patent, reproduced below, show a flowchart of a process and set of example images converting an image from a source aspect ratio to a target aspect ratio. Ex. 1001, 1:31–35.

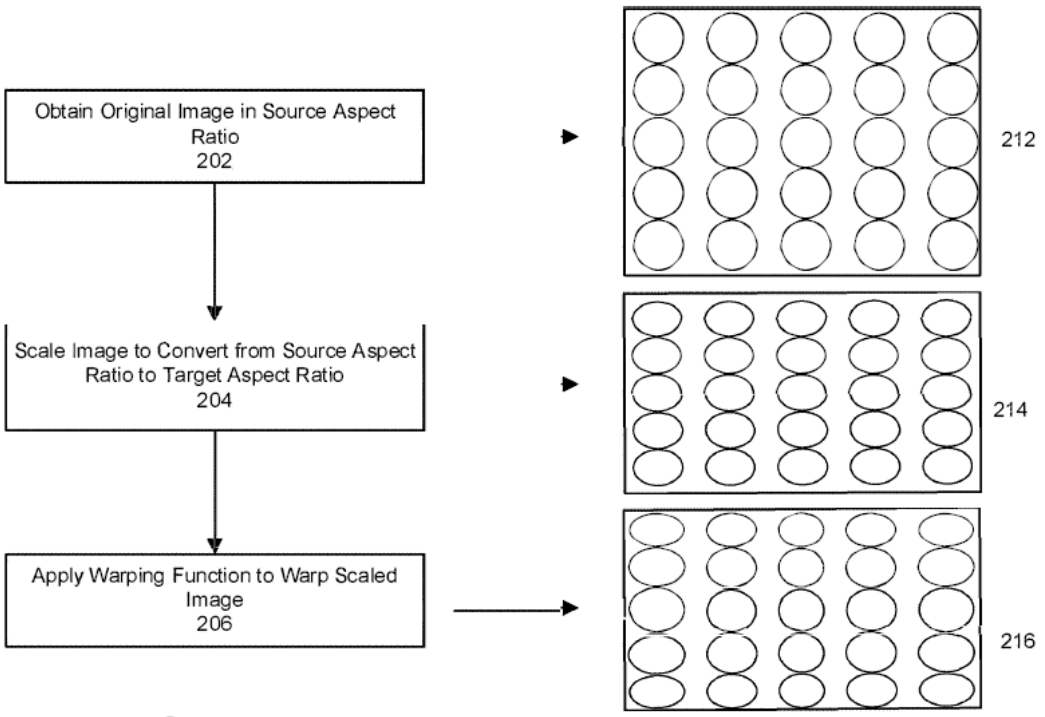

FIG. 2A FIG. 2B

Figures 2A and 2B, above, illustrate a process for converting from a source aspect ratio to a target aspect ratio in a camera system. Ex. 1001, 3:61–63, 4:2–3. At step 202, shown in Figure 2A, an input image is obtained in a source aspect ratio. *Id.* at 3:63–65. At step 204, the input image is scaled from the source aspect ratio to a target aspect ratio using a linear scaling function. *Id.* at 3:65–4:1. At step 206, a non-linear warping is applied to the scaled image. *Id.* at 4:1–2.

Figure 2B illustrates the process of Figure 2A as applied to an image 212. Ex. 1001, 4:2–3. Image 212 shown in Figure 2B contains an array of circles. *Id.* Image 214 depicts an array of circles that have been stretched horizontally and compressed vertically after applying the linear scaling function at step 204. *Id.* at 4:3–6. The array of circles in image 214 have been stretched and compressed equally. *Id.* at 4:6–9. Image 216 depicts an array of circles that have been stretched and compressed after applying the

non-linear scaling function of step 206. *Id.* at 4:9–13. The array of circles in image 216 have been stretched and compressed by different amounts depending on their horizontal and vertical positions. *Id.*

The ’413 patent explains that image 216 preserves the full field of view of the original image 212. Ex. 1001, 4:14–16. Some areas of the image are “fully corrected geometrically, while some other areas are distorted.” *Id.* at 4:18–19. In image 216, the center circle is fully corrected so that it maintains the original circular shape, while the circles become more distorted as they approach the edges of the image. *Id.* at 4:22–30.

D. Illustrative Claims

Claim 1 is the only remaining independent claim of the ’413 patent at issue in this proceeding, and is reproduced below with limitation identifiers in brackets corresponding to claim analysis headings in the Petition. *See, e.g.*, Pet. 11–40. Claims 6 and 7 depend from claim 2, which has been disclaimed. Below are independent claims 1 and 2 for reference:

> 1.[Preamble] An image capture apparatus, comprising:
>
> 1[a] an image sensor configured to capture an input image having a source aspect ratio, the input image including pixels located at input positions defined along a first axis and a second axis, the first axis perpendicular to the second axis;
>
> 1[b] a display coupled to one or more physical processors; and
>
> 1[c] the one or more physical processors configured by machine-readable instructions to:
>
> 1[d] obtain the input image;
>
> 1[e] determine a portion within the input image, the portion including a subset of the pixels; and
>
> 1[f] apply a transformation to the input image to generate an output image, the output image having a target aspect ratio different than the source aspect ratio, the output image including

the pixels located at output positions defined along the first axis and the second axis,

1[g] wherein: the transformation non-uniformly shifts the pixels from the input positions to the output positions based on (1) the input positions along the first axis, and (2) the input positions along the second axis; and

1[h] the transformation non-uniformly shifts the pixels such that differences between the input positions and the output positions of the subset of the pixels within the portion are less than differences between the input positions and the output positions of others of the pixels; and

1[i] present the output image on the display.

Ex. 1001, 8:65–9:27.

2.[Preamble] A system that converts between aspect ratios, the system comprising:

2[a] one or more physical processors configured by machine-readable instructions to:

2[b] obtain an input image, the input image having a source aspect ratio, the input image including pixels located at input positions defined along the first axis and a second axis;

2[c] determine a portion within the input image, the portion including a subset of the pixels; and

2[d] apply a transformation to the input image to generate an output image, the output image having a target aspect ratio different than the source aspect ratio, the output image including the pixels located at output positions defined along the first axis and the second axis;

2[e] wherein: the transformation non-uniformly shifts the pixels from the input positions to the output positions based on (1) the input positions along the first axis, and (2) the input positions along the second axis; and

2[f] the transformation non-uniformly shifts the pixels such that difference between the input positions and the output positions of the subset of the pixels within the portion are less than

> differences between the input positions and the output positions of others of the pixels.

Ex. 1001, 9:28–9:55.

E. Evidence

The Petition relies on the following references:

Name	Reference	Exhibit No.
Fleming	US 7,158,158 B1; filed Mar. 12, 2003; issued Jan. 2, 2007	1004
Liu	US 8,649,635 B2; filed Mar. 28, 2011; issued Feb. 11, 2014	1005
Obara	US 2006/0279583 A1; filed June 9, 2006; published Dec. 14, 2006	1006
Meulen	US 7,693,500 B2; filed June 5, 2006; issued Apr. 6, 2010	1007
Chao	US 2008/0095470 A1; filed Oct. 23, 2006; published Apr. 24, 2008	1008

Petitioner also relies on the Declaration and Reply Declaration of Dr. Aggelos Katsaggelos (Exs. 1002, 1014) in support of its arguments. Patent Owner relies on the Declaration and Supplemental Declaration of Hassan Foroosh Ph.D (Exs. 2001, 2027) and the Declaration of Pablo Lema (Ex. 2024)[1]. The parties rely on other exhibits as discussed below.

F. Asserted Grounds of Unpatentability

Petitioner asserts that claims 1, 6, and 7 would have been unpatentable based on the following grounds[2]:

[1] We cite to the public versions of these declarations.

[2] We list only the grounds that challenge remaining claims 1, 6, and 7 and we use the ground number used in the Petition.

Ground	Claim(s) Challenged	35 U.S.C. §[3]	Reference(s)/Basis
1	1, 6, 7	103	Fleming
3	1, 6, 7	103	Obara, Liu
4	1, 6, 7	103	Meulen, Chao

II. ANALYSIS

A. Principles of Law

Petitioner bears the burden of persuasion to prove unpatentability of the claims challenged in the Petition, and that burden never shifts to Patent Owner. *Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015).

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 skill in the art; and (4) any objective evidence of obviousness or non-obviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

[3] The Leahy-Smith America Invents Act ("AIA"), Pub. L. No. 112-29, 125 Stat. 284, 287–88 (2011), amended 35 U.S.C. §§ 102 and 103 and became effective March 16, 2013. Because the '413 patent was filed after this date, the AIA versions of §§ 102 and 103 apply.

B. Level of Ordinary Skill in the Art

In determining the level of ordinary skill in the art, various factors may be considered, including the "type of problems encountered in the art; prior art solutions to those problems; rapidity with which innovations are made; sophistication of the technology; and educational level of active workers in the field." *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995).

Petitioner argues that a person of ordinary skill in the art in the relevant field "would have a bachelor's degree in engineering or computer science, or equivalent field, and two years of experience working on image or video processing, or digital cameras," or alternatively "would have four years of experience working on image or video processing, or digital cameras." Pet. 6. Petitioner further argues that an "advanced graduate degree" may "make up for the work experience." *Id.* (citing Ex. 1002 ¶¶ 33–34). "Patent Owner applies Petitioner's proposed level of skill." PO Resp. 4–5 (citing Ex. 2027 ¶¶ 19–20).

We adopt Petitioner's proposed level of ordinary skill because it is consistent with the level of skill in the art at the time of the invention as reflected by the '413 patent and the cited prior art.

C. Claim Construction

We apply the same claim construction standard used in district court actions under 35 U.S.C. § 282(b), 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) (2020).

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. "In determining

the meaning of the disputed claim limitation, we look principally to the intrinsic evidence of record, examining the claim language itself, the written description, and the prosecution history, if in evidence." *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 469 F.3d 1005, 1014 (Fed. Cir. 2006) (citing *Phillips*, 415 F.3d at 1312–17). Only claim terms in controversy require express construction, "and only to the extent necessary to resolve the controversy." *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017); *see also Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999).

1. Non-Uniformly Shifts the Pixels

Petitioner argues that "a POSITA would have understood 'non-uniform' means not the same in all parts or areas." Pet. Reply 1 (citing Ex. 1016). Patent Owner, on the other hand, argues "that a transformation that 'non-uniformly shifts' pixels requires a ***non-linear*** transformation." PO Sur-Reply, 1. At the core of the dispute between the two parties is a dispute about whether the claim requires that "[n]o two pixels will have the same amount of shift." PO Resp. 27.

For the reasons explained here, and partly in our analysis of limitation 2[e] below (§ II.D.4.f), we adopt Petitioner's proposed construction that "non-uniformly shifts the pixels" means that not all of the pixels of the input image are shifted the same amount in all parts or areas. We also note that, in contradiction to Patent Owner's argument that "[n]o two pixels will have the same amount of shift," we determine that, although not all of the pixels are shifted the same amount, "non-uniformly shifts the pixels" still allows for the possibility that some pixels will be shifted the same amount.

"It is a 'bedrock principle' of patent law that 'the claims of a patent define the invention to which the patentee is entitled the right to exclude.'"

Phillips, 415 F.3d at 1312 (quoting *Innova/Pure Water Inc. v. Safari Water Filtration Systems, Inc.*, 381 F.3d 1111 (Fed. Cir. 2004)). "[W]e look to the words of the claim themselves . . . to define the scope of the patented invention." *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996). "[T]he words of a claim 'are generally given their ordinary and customary meaning'" at the time of the invention and "in the context of the entire patent, including the specification." *Phillips*, 415 F.3d 1312–13 (quoting *Vitronics*, 90 F.3d at 1582). The claims 'must be read in view of the specification, of which they are a part'" because "the specification 'is always highly relevant to the claim construction analysis.'" *Id.* at 1315 (quoting *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 979 (Fed. Cir. 1995); *Vitronics*, 90 F.3d at 1582).

From the outset we note that the words of the claim recite "non-uniformly shift[ing] the pixels" and do not recite a "non-linear" transformation. This favors Petitioner's position, which is based directly off the definition of "non-uniform," over Patent Owner's position, which substitutes "non-linear" for "non-uniform."

Generally, then, we would determine the ordinary and customary meaning of the claim term in the context of the entire Specification. Here, however, the '413 patent does not mention "uniform" or "non-uniform" shifting of pixels anywhere except in the claims. The Specification, therefore, provides limited guidance, by itself, as to the ordinary and customary meaning of the term. Nonetheless, even reviewing the portions of the Specification cited by the parties, we see no clear or unambiguous effort to limit the challenged claims to require only non-linear transformations in which the pixels to which a transformation is applied do not have the same amount of shift.

For example, Petitioner argues that Figure 2B shows that non-uniform is not non-linear. Pet. Reply 1. Specifically, Petitioner argues that the center circle of Figure 2B maintains the original circular shape after the transformation is applied to the image which contradicts Patent Owner's argument that no two pixels will have the same amount of shift. Pet. Reply 1–2. We agree. In Figure 2B of the '413 patent, the center of the image is chosen to be the region of interest. Ex. 1001, 4:19–21. After the input image goes through linear scaling (step 204) and then non-linear warping (step 206) the circles become more vertically compressed as they approach the top and bottom edges and more horizontally stretched as they approach the left and right edges. *Id.* at 4:22–30. But "the center circle is fully corrected so that it maintains the original circular shape of the corresponding circle in the input image 212." *Id.* at 4:23–25. This means that at least some pixels, such as those of the center circle, undergo the same amount of shift after being transformed.

Patent Owner responds by pointing out that the "center circle in Figure 2B only appears non-distorted because the image is firstly linearly scaled (resulting in Figure 2A) and then ***non-linearly*** warped." PO Sur-Reply 3. We disagree. The center circle goes through a transformation that ultimately results in its pixels not being shifted, which means that some of the pixels in the input images were shifted the same amount (overall zero shift). The fact that in there are intermediary steps that involve non-linear warping does not change the ultimate result of the transformation shifting some pixels by the same amount. Patent Owner also responds that its statement that "[n]o two pixels will have the same amount of shift" was not directed to portions of the image that do not undergo a shift. PO Sur-Reply 4 ("PO's position . . . was that the nonlinear equations described in the

patent result in no two pixels having the same amount of shift, not that a non-linear transformation must shift every pixel in the entire image."). But the center circle does undergo a transformation, as Patent Owner's own argument indicates. PO Sur-Reply 4 ("Petitioner's suggestion that pixels of the center circle are not shifted is therefore untrue."). The fact that the pixels of the center circle are "fully corrected" after the transformation does not mean that they were not transformed. Instead, it demonstrates that a non-uniform transformation allows for some pixels to be shifted the same amount.

Patent Owner argues that "both parties' experts agree that a transformation that 'non-uniformly shifts' pixels requires a ***non-linear*** transformation." PO Sur-Reply 1 (citing Ex. 2026, 34:7–13). But Dr. Katsaggelos testifies that Meulen, which discloses using piece-wise linear transformation, "discloses a non-uniform 'image compression and/or scaling.'" Ex. 1002 ¶ 161. To the extent Dr. Katsaggelos's testimony implies that non-uniform shifting requires non-linear transformation, Dr. Katsaggelos position is clear that the use of different piece-wise linear transformations results in an overall non-uniform shifting of pixels even when none of the individual transformations were non-linear.[4]

Finally, as we noted, the written description of the '413 patent does not mention the words uniform or non-uniform shifting of pixels. In such situations we find that it may be appropriate to look to extrinsic evidence, such as dictionary definitions, to discern the meaning of a claim term. The

[4] Because this discussion relates to analysis of the prior art Meulen reference, we continue our explanation below in our analysis of limitation 2[e] (§ II.D.4.f).

extrinsic evidence in the record shows that the term "non-uniform" means "not the same in all parts or areas." Ex. 1016, 1. In the context of the claim then, "non-uniformly shifts" means that not all of the pixels are shifted the same amount in all parts or areas.

2. Determine a Portion Within the Input Image

The parties dispute whether the steps performed by the "machine-readable instructions" of claims 1 and 2 must occur in a particular order. Specifically, Patent Owner argues that the step of "determine a portion within the input image" must occur after "obtain[ing] an image" and before "apply[ing] a transformation to the input image." PO Resp. 17 (citing Ex. 2027 ¶ 59). Petitioner argues, on the other hand, that the specification does not require such an order and, in fact, describes an embodiment where such an order is not followed. Pet. 3. We determine that the "determine a portion within the input image" step does not need to occur after the "obtain an image" step and before the "apply a transformation to the input image" step.

As Patent Owner itself points out, claims 1 and 2 are apparatus and system claims respectively, and an ordering of the limitations of such claims is not necessary. PO Resp. 17. Even if we were to treat the apparatus and system claims as reciting the steps of a method, "as a general rule the claim is not limited to performance of the steps in the order recited, unless the claim explicitly or implicitly requires a specific order." *Baldwin Graphic Systems, Inc. v. Siebert, Inc*., 512 F.3d 1338, 1345 (Fed. Cir. 2008) (*citing Interactive Gift Express, Inc. v. Compuserve Inc.*, 256 F.3d 1323, 1342–43 (Fed. Cir. 2001)). We see nothing in the claims that would cause us to break this general rule. Patent Owner argues that the claims imply a "specific order because the 'determine a portion' requirement operates on 'the [obtained] input image' and defines the 'portion' that is necessary for the

subsequently recited transformation." PO Resp. 17 (citing Ex. 2026, 26:21–23; Ex. 2027 ¶ 59). Although the steps are recited in a specific order in the claim, as they necessarily must be, the claim does not expressly specify that the certain steps must occur before or after other instructions, nor does logic imply such a requirement. For example, if certain characteristics of the image are known before the image is obtained (e.g. the size, dimensions, resolution, aspect ratio, or content etc.) the determination of the portion of the image could be made before the image is obtained. These characteristics may be based on the specific device taking the image or the subject matter of the image, both of which may be known before the image is captured or obtained. It is, therefore, not necessary that the image be obtained in order for a portion of the image to be determined.

Similarly, we do not find the written description to expressly or implicitly specify an order the claimed step of "determine a portion of the input image." For example, the written description of the '413 patent states that in Figure 2B "the center of the image is chosen to be the region of interest that is most fully corrected and the distortion increases in each direction as the frame boundary is approached." Ex. 1001, 4:19–22. Patent Owner emphasizes that this disclosure implies that an input image is obtained before the center portion is chosen. PO Resp. 19 (citing Ex. 1001, 3:63–64, 4:19–22). But the description of this embodiment does not expressly recite an order. For example, the description of Figure 2A explains that "an input image is obtained" in step 202, "the image is then scaled" in step 204, and a "non-linear warping is then applied" in step 206. Ex. 1001, 3:63–4:3. This description does not mention "determin[ing] of a portion of the image" as a separate step or as part of the listed steps, and therefore, does not specify an order in which this step must occur.

Similarly, the ’413 patent explains that in Figure 2B “the warp module is configured so that some areas of the image are fully corrected geometrically, while some other areas are distorted. . . . [T]he center of the image is chosen to be the region of interest that is most fully corrected and the distortion increases in each direction.” *Id.* at 4:17–19. This excerpt from the ’413 patent, which the Patent Owner specifically relies on (PO Resp. 19), also does not specify an order in which the determination step (choosing of the region of interest) takes place. Moreover, because the ’413 patent states that the warp module is configured so that some areas are fully corrected while others are not, the determination step could take place at the time the warp module was configured, presumably before the image was obtained.

Finally, the ’413 patent states that “in the case, of video, the area may dynamically change between images (e.g. to follow a moving object).” Ex. 1001, 4:34–36. Patent Owner argues that this description “requires first obtaining the image in order to locate the object that is being followed.” PO Resp. 19–20. This embodiment is related to the case of video or a moving object, which the challenged claims do not mention. We, therefore, decline to limit the scope of the claim based on this embodiment. *Phillips v. AWH Corp.,* 415 F.3d 1303, 1323 (Fed. Cir. 2005) (en banc) (“[A]lthough the specification often describes very specific embodiments of the invention, we have repeatedly warned against confining the claims to those embodiments.”).

Petitioner points to the equations listed in the ’413 patent used to apply a transformation as evidence of embodiments where “determin[ing] a portion within the input image” is performed before the image is obtained. Pet. Reply 3 (citing Ex. 2027 ¶¶ 37–38; Ex. 1014 ¶¶ 12–15); Ex. 1001, 7:6–42. Patent Owner, argues that “a system programmed with predefined warp

functions can meet the claims so long as there is a mechanism to select amongst warp functions and determine which one is applied to a particular input image." PO Sur-Reply 8 (citing Ex. 1001, 6:46–48, 7:64–8:2). According to Patent Owner "[t]hat a particular option for a warp function is pre-programmed does not contradict PO's interpretation." *Id.* We disagree with Patent Owner. There is no indication in the portion of the Specification discussing "tunable parameters" that such tuning happens after the image is obtained. *See* Ex. 1001, 6:46–7:52. Moreover, even if the tunable parameters were adjusted after obtaining the image, we do not discern from the written description that the various equations are necessarily selected as part of the tunable parameters. *Id.*

For the reasons stated here, we do not agree with Patent Owner that the "determine a portion step" must occur after the "obtain an image" step and before the "apply a transformation to the input image" step.

D. Ground 4 – Obviousness over Meulen and Chao

Petitioner argues claims 1, 6, and 7 of the '413 patent would have been obvious over the combination of Meulen and Chao. Pet. 81–105. Below, we provide a brief overview of the prior art references and then analyze Petitioner's contentions in light of Patent Owner's arguments.

1. Overview of Meulen

Meulen is titled "Panoramic Display for a Wireless Device," and describes "a need for improved display systems and techniques for a wireless device." Ex. 1007, code (54), 1:29–31. Figure 1 of Meulen is reproduced below.

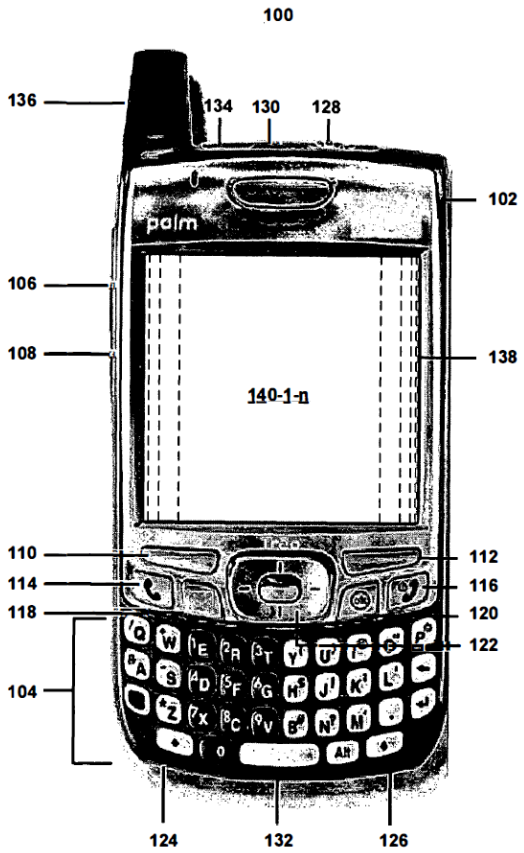

FIG. 1

Figure 1 of Meulen illustrates one embodiment of its wireless device. Ex. 1001, 2:8. The display 138 may display media source content received by the wireless device. *Id.* at 3:26–27. The media source content may have an aspect ratio that differs from the aspect ratio of the display. *Id.* at 4:13–15. For example, the media source content may have an aspect ratio of 3:2 while the display may have an aspect ratio of 1:1. *Id.* at 4:15–18. In such situations, image compression and/or scaling may be applied to the media source content that is to be displayed on one or more of the display regions. *Id*. at 4:37–39. Meulen explains that its image compression or scaling "may be applied progressively to the media source content based on the proximity of the display region to the edge of the display." *Id.* at 4:42–45. "For example, more image compression and/or scaling may be applied to the

media source content that is to be displayed closer to the edges of the display 138, than to the media source content that is to be displayed closer the center of the display 138." *Id.* at 4:45–49.

2. Overview of Chao

Chao is titled "Digital Image Auto-Resizing," and relates to methods and systems "for automatically resizing an image while maintaining the original design intent of the original image." Ex. 1008, code (54), ¶ 22. When resizing an image, Chao discloses separating foreground elements from background elements. *Id.* ¶ 25. The background elements are re-sized without maintaining its original aspect ratio and then repositioned in order to maintain the design intent of the original image. *Id.* ¶¶ 28–29. The foreground elements are re-sized to fit the new image size while maintaining the original aspect ratio and repositioned. *Id.* ¶¶ 30–31.

3. Combination of Meulen and Chao

Petitioner relies on Meulen for nearly all limitations of claims 1, 2, 6, and 7 except that Petitioner relies on Chao for its teachings of a camera display screen (Pet. 97, 98, and 104; Ex. 1002 ¶¶ 291–292, 310), an image sensor configured to capture an input image (Pet. 104; Ex. 1002 ¶ 312), and for providing details on how to perform scaling (Pet. 91–92; Ex. 1002 ¶¶ 262–262). Petitioner argues that Meulen mentions scaling, "but does not disclose the details of how to perform scaling" and for this reason "a POSITA would have been motivated to turn to a prior art reference that discloses the details of scaling (known technique)." *Id.* (citing Ex. 1002 ¶ 262).

Patent Owner argues that "Petitioner provides no motivation to combine Meulen and Chao," and "does not at all discuss how the combination would reasonably expect to succeed." PO Resp. 35 (citing Pet.

92; Ex. 1002 ¶ 264; Ex. 2027 ¶ 75). Patent Owner also argues that a POSITA would not have been motivated to combine Meulen and Chao and that the two references address different problems arising in different contexts. *Id.* at 36 (citing Ex. 2027 ¶¶ 89–91).

Having reviewed the parties' arguments and cited evidence we determine Petitioner has established, by a preponderance of the evidence, that a POSITA would have been motivated to combine Meulen and Chao. For example, Petitioner argues that "[i]t would have been obvious that when performing image scaling, pixels from the input to output positions are shifted based on a scaling factor." Pet. 91. Meulen teaches scaling but does not provide the details regarding scaling. *E.g.*, Ex. 1007, 1:55–56, 4:37–49. We agree that in light of Meulen's disclosure of scaling, a POSITA would have looked to other references, such as Chao, for further details on how to perform scaling. Dr. Katsaggelos provides credible support, testifying that "Meulen mentions 'compression and/or scaling,' and provides details on how to perform compression. But Meulen does not disclose the details of how to perform scaling. A POSITA when faced with Meulen and having the knowledge about scaling would have been motivated to turn to a prior art reference that discloses the details of scaling." Ex. 1002 ¶ 262.

Patent Owner argues that Petitioner provides no motivation to combine other than asserting that it involves combining prior art elements. PO Resp. 35 (quoting Pet. 92). As explained above, however, Petitioner does more than just assert that the motivation involves combining prior art elements. Instead, Petitioner explains that Meulen discusses both compression and scaling, and provides details regarding compression but does not provide details on how to scale. Pet. 91–92; Ex. 1002 ¶¶ 262–262. Thus, Meulen teaches that scaling was a known technique. *See Hybritech,*

Inc. v. Monoclonal Antibodies, Inc., 802 F.2d 1367, 1384 (Fed. Cir. 1986) ("a patent need not teach, and preferably omits, what is well known in the art"). Dr. Katsaggelos testifies that, in this situation, a POSITA would have looked to Chao for details regarding scaling. Ex. 1002 ¶¶ 262–263. We determine this establishes, by a preponderance of the evidence, that a POSITA would have had reason to combine Meulen's teachings with Chao.

Patent Owner draws a distinction between Meulen and Chao, arguing that "Meulen is concerned with modifying content from a media source to be displayed on a device's screen while Chao, by contrast, is directed to changing the aspect ratio of a document intended for ***printing***." *Id.* at 36 (citing Ex. 2027 ¶¶ 89–90). Patent Owner's argument is contradicted, however, by Chao's disclosure which states that "after all the background and foreground elements in the image have been resized . . . [t]he image may be output by displaying the image on or as part of: a display screen such as a computer monitor, camera screen, printer screen, printed page, projected image, or the like." Ex. 1008 ¶ 32.

Patent Owner argues that Meulen's system avoids distortion near the middle where the user's focus is more likely to be, while Chao, on the other hand, is directed to avoiding distortion of stylized borders on differently sized pages. PO Resp. 36–37 (citing Ex. 1006, 1:26–29; Ex. 1008 ¶¶ 1, 25; Ex. 2027 ¶¶ 91–92). This argument reads the prior art too narrowly and does not address Petitioner's combination. Petitioner does not rely on Chao for its teaching of avoiding distortion near the borders of the image, but rather on its teaching of scaling the image while maintaining the design intent of the original image. Ex. 1008 ¶ 22; Ex. 1014 ¶ 67. Thus, Petitioner is applying Chao's techniques of scaling (regardless of where the area of

interest is) to Meulen where the area of interest in the center. *See* Pet. 88–92.

Finally, Patent Owner argues that Chao's approach of stretching/shrinking only the background and uniformly scaling entire foreground objects is suitable for graphic design but incompatible with Meulen which is concerned with adapting externally derived media source content for display on a fixed size screen. PO Resp. 37–38 (citing Ex. 2027 ¶ 93). We disagree with Patent Owner's argument because it does not address Petitioner's combination. Petitioner relies on Chao's teaching of stretching/shrinking of background elements and applies that stretching/shrinking to Meulen's images displayed on its screen. Pet. 91–92 (citing Ex. 1008 ¶¶ 28, 63; Ex. 1002 ¶ 263). The fact that Chao applies its teaching to graphic design does not prevent a POSITA from applying those teachings to Meulen's media content displayed on its screen.

4. Analysis of Claim 2[5]

Petitioner contends that the combination of Meulen and Chao renders obvious the preamble and limitations 2[a]–2[f]. Pet. 85–94. Petitioner supports its arguments with citations to Meulen and Chao and to the testimony of Dr. Katsaggelos. Below, we analyze Petitioner's contentions in light of Patent Owner's arguments.

[5] Claim 2 has been disclaimed. Ex. 2022. We analyze claim 2, nonetheless, because remaining claims 6 and 7, which have not been disclaimed, depend from claim 2.

a) Preamble

The preamble[6] of claim 1 recites "[a] system that converts between aspect ratios, the system comprising." Ex. 1001, 9:28–29. Petitioner relies on Meulen's disclosure that its wireless device 100 "applies 'image compression and/or scaling . . . to media content having ***an aspect ratio and/or resolution that is different from the aspect ratio and/or resolution*** of the ***display***." Pet. 85 (citing Ex. 1007, 1:55–58; Ex. 1002 ¶ 248) (color omitted).

Patent Owner does not separately dispute Petitioner's contentions regarding the preamble. We determine the combination of Meulen and Chao teaches the preamble for the reasons provided in the Petition.

b) Limitation 2[a]

Limitation 2[a] recites "one or more physical processors configured by machine-readable instructions to." Petitioner relies on Meulen's disclosures that its wireless device may comprise control hardware consisting of processors, controllers, applications, drivers, programs, modules, subroutines, instruction sets, instructions, computing codes etc. Pet. 86–87 (citing Ex. 1007, 4:50–53, 4:55–60, 4:62–66; Ex. 1002 ¶¶ 249–250).

Patent Owner does not separately dispute Petitioner's contentions regarding this limitation. We determine the combination of Meulen and Chao teaches this limitation for the reasons provided in the Petition.

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[6] Because we determine Petitioner has shown sufficiently for purposes of institution that the prior art satisfies the recitation in the preamble, the issue of whether the preamble is limiting need not be resolved at this stage.

c) Limitation 2[b]

Limitation 2[b] recites "obtain an input image, the input image having a source aspect ratio, the input image including pixels located at input positions defined along a first axis and a second axis, the first axis perpendicular to the second axis." Petitioner argues that "Meulen's 'media source content [is] received by the wireless device 100'" and that the media source content "may have an aspect ratio of 3:2 with a resolution of 480x320" or "an aspect ratio of 2:1 with a resolution of 640x320." Pet. 87 (citing Ex. 1007, 3:26–27, 4:16–21; Ex. 1002 ¶ 251). Petitioner also contends "[i]t would have been obvious that the media source content being transformed into an image for display would have pixels located at input positions defined along columns and rows" and that "[a] POSITA would have understood that columns are perpendicular to rows." Pet. 87 (citing Ex. 1007, 1:55-58; Ex. 1002 ¶ 251).

Patent Owner does not separately dispute Petitioner's contentions regarding this limitation. We determine the combination of Meulen and Chao teaches this limitation for the reasons provided in the Petition.

d) Limitation 2[c]

Limitation 2[c] recites "determine a portion within the input image, the portion including a subset of the pixels." Petitioner contends the "Meulen's media source is an 'input image'" with the central display region within the media source content includes a subset of source pixels. Pet. 88 (citing Ex. 1007, 6:27–31; Ex. 1002 ¶¶ 252–253).

Having reviewed Petitioner's contentions in light of Patent Owner's arguments, which we address below, we determine Petitioner has demonstrated, by a preponderance of the evidence, that Meulen teaches limitation 2[c]. Specifically, Meulen discloses Table 1, in which "the central

display region 140-3 may comprise 200 pixels and require the media source content to undergo no image compression (e.g., 200 source pixels to 200 display pixels)." Ex. 1007, 5:52–60, 6:27–30. By disclosing the identification of a central region of 200 pixels of the media source content (i.e. 200 pixels of the pixels making up the input image), we agree with Petitioner that Meulen teaches "determin[ing] a portion within the input image, the portion including a subset of pixels."

Patent Owner argues that Petitioner has failed to show that Meulen discloses the "determine a portion" step that occurs after obtaining an image and before transformation of the image. *See* PO Resp. 18–19 (arguing that Petitioner has failed to show that Meulen's processor performs the separate step of determining the "central display region" after the image is obtained and prior to the transformation of the image), 20 ("Meulen merely states that a certain portion of the image has less compression. But nowhere does Meulen suggest or teach that this less-distorted portion was determined as a separate step between receipt of the image and transformation of the image"), 20–21 ("the various tables in Meulen simply describe different embodiments of ***pre-assigned*** portions that are a result of the compression itself"), 21 ("what this means is that Meulen's algorithms are designed in advance by pre-assigning different compression ratios to different portions of an image.") This argument is based on Patent Owner's proposed construction requiring that "determin[ing] a portion within the input image" must occur after obtaining the image and before applying the transformation. Because we do not adopt this construction, we determine these arguments to be unavailing. Specifically, we determine that tables in Meulen (e.g. Table 1) that identify the central region of an input image as the region that

undergoes no image compression teach the limitation even if the identification occurs before the input image is obtained.

Moreover, even if we were to agree with Patent Owner's construction, we determine Meulen teaches the claim limitation. Patent Owner argues that because Meulen's algorithms are designed in advance and that its tables pre-assign different compression ratios to different portions of the image, such advance pre-assignment does not disclose a separate step of determining a portion within the input image. PO Resp. 20–21. But even if Meulen's algorithms are designed in advance, they are applied to the image after the image is obtained. Thus, an algorithm that computes the relevant portion of the image to compress (or not compress) after the image is obtained satisfies the claim limitation even if the algorithm itself was written or designed in advance.

Patent Owner argues that "determine a portion" is a step that is separate from transformation step and criticizes Petitioner's expert for testifying that the determination of the portion instruction and application of the transformation instruction are coupled together. PO Resp. 21 (Meulen "simply executes an algorithm consistent with the pre-designed portions ***without*** a separate step of determining the portion"), 21–22 (criticizing Dr. Katsaggelos for testifying that "the 'determining' step and 'transformation' step can be 'all done in one step'" or testifying that "the determination of the portion and the application of a transformation is coupled together") (citing Ex. 2026, 28:15–23, 30:2–18, 30:24–31:8). According to Patent Owner, "Petitioner's invalidity grounds is based on the flawed theory that the 'transformation' step necessarily results in the 'determination' step" and that such a theory is contrary to the law requiring limitations to not be rendered superfluous. PO Resp. 22 (citing *Wasica Fin. GmbH v. Cont'l Automotive*

Systems, Inc., 853 F.3d 1272, 1288 n.10 (Fed. Cir. 2017)); *see also id.* at 19 (citing *Becton, Dickinson and Co. v. Tyco Healthcare Grp., LP*, 616 F.3d 1249, 1257 (Fed. Cir. 2010)).

Contrary to Patent Owner's argument, our agreement with Petitioner's position does not render the "determine a portion" limitation superfluous. Meulen discloses an identification of the center region of the image. Ex. 1007, 6:27–31, Table 1. This identification satisfies the "determin[ing] a portion" limitation even if it is "coupled together" or "integral" to the transformation. This is in distinction to the facts in *Wasica* in which a construction allowing for an "empty, zero-bit sequence effectively remove[d]" the various bit sequence limitations from the claim. *Wasica*, 1272 F.3d at 1288 n.10. Here, we give effect to the limitation and determine that Meulen teaches it.

We also do not agree that Meulen does not disclose "determin[ing] a portion" as a separate step. Meulen's identification of the center region of the image demonstrates that it teaches an instruction performed by its processor to "determine a portion of the input image." Moreover, this determination is separate from Meulen's transformation (as illustrated by analysis of limitation 2[d] below). The determine step is taught by Meulen's identification of the center region of the input image (Ex. 1007, 6:27–31, Table 1) while, as we explain below, the transformation is taught by Meulen's compression and/or scaling of the input image (Ex. 1007, 1:55–58, 5:5–7, 6:27–37). The circumstances here are therefore distinct from Becton in which the Federal Circuit found that a claim listing "a hinged arm" and a "spring means connected to said hinged arm" required that the hinged arm and spring means are separate structures. *Id.* at 1254–55. Additionally, also unlike *Becton*, in which the specification confirmed that the "hinged arm"

and "spring means" are separate elements (*id.*), the Specification of the '413 patent provides at least one example embodiment where the equations used to determine the vertical warp distortion of the image (i.e. the transformation of the image) also identify the portion of the image to be transformed. *See* Ex. 1001, 7:5–43 ("the vertical warp distortion can be represented as a family of equations ΔV/Vn, where 'n' is the horizontal coordinate expressed as a percent of the total horizontal image size.") In this way, the '413 patent is similar to Meulen because both delineate equations, tables, or algorithms that are pre-defined and relate to the transformation being applied and also identify the portion to which the transformation is to be applied all before obtaining the image.

For these reasons we determine Petitioner has demonstrated, by a preponderance of the evidence, that Meulen teaches limitation 2[c].

e) Limitation 2[d]

Limitation 2[d] recites "apply a transformation to the input image to generate an output image, the output image having a target aspect ratio different than the source aspect ratio, the output image including the pixels located at output positions defined along the first axis and the second axis."

Petitioner argues that Meulen's media source is an 'input image' having a source aspect ratio. Pet. 88 (citing Ex. 1007, 4:16–21). Petitioner also argues that Meulen's disclosure of "image compression and/or scaling may be applied to media content having an aspect ratio and/or resolution that is different from the aspect ratio and/or resolution of the display" and other disclosures related to image compression teach the limitation. Pet. 88–90 (Ex. 1007, 1:55–58, 4:16–22, 5:5–7, 6:27–37, Tables 1–4; Ex. 1002 ¶¶ 254–258.) Petitioner also contends that "[t]he display image includes pixels

located at output positions defined along columns and rows." (Ex. 1007, 1:13–16, 1:55–58; Ex. 1002 ¶ 259.)

Patent Owner argues the challenged claims "require that the claimed transformation be applied to an 'input image' by the same 'image capture apparatus' or 'camera' that captured the image" and yet, argues Patent Owner, "Meulen never discloses that its wireless device obtains 'media source content' from the wireless device's embedded camera or image sensor." PO Resp. 13 (citing Ex. 2027 ¶ 54). Instead, according to Patent Owner, "Meulen is clear that the 'media source content' comes from an external source." *Id.*

Petitioner, in its Reply Brief, argues that claim 2 does not require the 'input image' to be captured by an image sensor of the claimed system, only that the processor obtain the input image and apply a transformation to it. Pet. Reply 4 (citing Ex. 1014 ¶¶ 16–18). Patent Owner does not seem to dispute Petitioner's reply arguments, at least with respect to claim 2.[7]

We agree with Petitioner that claim 2 does not require the input image to be captured by the same device that applies the transformation. As support for its argument that the challenged claims require the same image capture apparatus to both capture the image and apply a transformation to it, Patent Owner cites only to the claim language of claim 1. PO Resp. 13. Unlike claim 1, however, claim 2 does not recite "an image sensor configured to capture an input image." Instead, claim 2 recites that the system's processors "obtain an input image." We determine that this

[7] Patent Owner addresses claim 6 in its Sur-Reply, arguing that it requires the transformation to be performed by the same camera that captured the image. PO Sur-Reply 9. Patent Owner, however, does not address claim 2.

language is broad enough to encompass obtaining an input image from an external source.

Under the proper scope of claim 2, we determine that Petitioner has demonstrated, by a preponderance of the evidence, that Meulen discloses the limitation by disclosing that it compresses and/or scales an input image ("appl[ies] a transformation") having an aspect ratio different from the aspect ratio of the display (e.g. image having an aspect ratio of 3:2 and the display having an aspect ratio of 1:1) to output an image including pixels located at output positions defined along the first axis and the second axis. *See* Ex. 1007, 4:13–23, 1:55–58, 5:5–7, 6:27–37, Tables 1–4; Ex. 1002 ¶¶ 254–258.

f) Limitation 2[e]

Limitation 2[e] recites "wherein: the transformation non-uniformly shifts the pixels from the input positions to the output positions based on (1) the input positions along the first axis, and (2) the input positions along the second axis." Petitioner contends that Meulen teaches non-uniform image compression and/or scaling for the reasons given in its contentions for limitation 2[d]. Pet. 91. Namely, Meulen discloses, in Table 1, non-uniform image compression of the input image. *Id.* at 89–90.

Petitioner also contends that it would have been obvious, when performing image scaling, that pixels would be shifted from input to output positions and to the extent Meulen itself does not explicitly disclose shifting pixels, Chao does. Pet. 91. Specifically, according to Petitioner, Chao discloses non-uniform scaling that scales the foreground and background elements differently. *Id.* (citing Ex. 1008 ¶¶ 28, 30). Petitioner contends that Meulen discloses shifting pixels along the horizontal axis and also shifting of pixels along a vertical axis. Pet. 92 (citing Ex. 1002 ¶ 264).

Patent Owner argues that non-uniform transformation refers to non-linear transformation and that Meulen does not disclose a non-linear transformation. PO Resp. 23–24 (citing Ex. 2026, 34:7–13; Ex. 1001, Abstract, 1:12–18, 3:61–4:13; Ex. 2027 ¶¶ 68–69). Instead, according to Patent Owner, Meulen "describes piece-wise linear transformation that merely approximates a non-linear transformation using multiple linear transformations." *Id.* at 24 (citing Ex. 2027 ¶ 70). Patent Owner also argues that neither Meulen nor Chao disclose pixel shifting and that even if they did, they do not do so based on both the horizontal and vertical axes. PO Resp. 29–31, 32–35, 38–41.

We determine Petitioner has demonstrated, by a preponderance of the evidence, that the combination of Meulen and Chao teaches a "transformation [that] non-uniformly shifts the pixels" as recited in limitation 2[e]. Specifically, we agree with Petitioner that Meulen's disclosure of image compression of different regions of the input image by different amounts of compression, as shown in, for example, Table 1 of Meulen, teaches a non-uniform transformation. Table 1 of Meulen is reproduced below.

TABLE 1

	Region					
	1	2	3	4	5	Total
Pixels/Region	10	50	200	50	10	320
Compression Ratio	4:1	2:1	none	2:1	4:1	
Source Pixels	40	100	200	100	40	480

Table 1 of Meulen shows that "central display region 140-3 may comprise 200 pixels . . . [and] undergo[es] no image compression . . . lateral display regions 140-1 and 140-5 each may [undergo] . . . a 4:1 image compression ratio . . . . [t]he lateral display regions 140-2 and 140-4 each

may [undergo] . . . a 2:1 image compression ratio." Pet. 89–90 (citing Ex. 1007, 6:27–37, Tables 2–4). The central and lateral regions are shown in Figure 2 of Meulen, reproduced below.

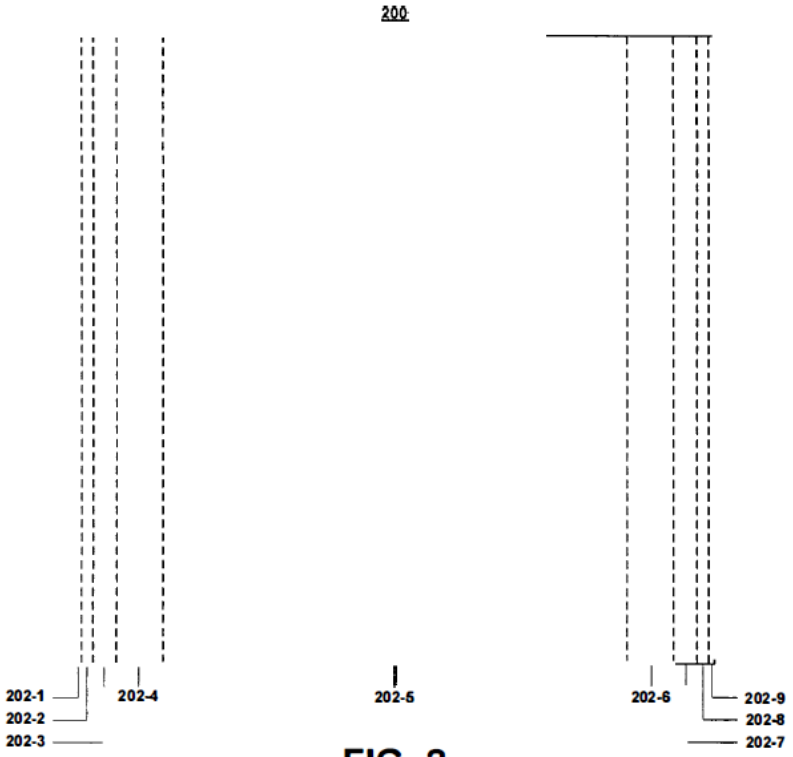

FIG. 2

Figure 2 of Meulen shows the panoramic display of Meulen's device that includes the central display region 202-5 and lateral display regions 202-1, 202-2, 202-3, 202-4, 202-6, 202-7, 202-8, and 202-9. Ex. 1007, 6:55–59. Although Figure 2 does not directly correspond with Table 1[8], it helps visualize that the central region and each of the lateral regions are transformed with different amounts of compression. Because a different amount of compression is used for the various regions of the input image,

[8] Figure 2 shows a panoramic display that corresponds more closely with Tables 2–4 of Meulen. *See e.g.* Ex. 1007, 7:34–35 ("Table 2 illustrates a low compression implementation for a panoramic display 200 comprising display regions 202-1-9.").

we agree with Petitioner that Meulen teaches a "transformation [that] non-uniformly shifts the pixels."

Patent Owner's argument that a non-uniform transformation refers to a non-linear transformation is based on a construction that we do not adopt. Instead, as we explained in our analysis of the construction of the term "non-uniformly shifts," the claim requires that not all of the pixels of the input image are shifted the same amount in all parts or areas. Because Meulen discloses compressing or scaling some regions a different amount than other regions of the input image, we determine Meulen teaches a non-uniform transformation.

Moreover, even if we were to agree with Petitioner's construction that a non-uniform transformation refers to a non-linear transformation, we still determine that Meulen teaches limitation 2[e]. Patent Owner argues that Meulen discloses a piece-wise linear transformation and that "merely approximates a non-linear transformation using multiple linear transformations." PO Resp. 24. According to Patent Owner, in Meulen's piece-wise linear transformation, different compression ratios are applied to different regions, but "the compression ratio is constant (*i.e.*, linear) within any single partition." PO Resp. 25 (citing Ex. 2027 ¶ 72). We disagree with Patent Owner that this shows Meulen does not teach non-linear transformation. Instead, we agree with Petitioner that the "overall transformation of the entire image with different shifts is a non-linear transformation." Pet. Reply 11. This is because the claim limitation recites that the transformation non-uniformly shifts *the pixels* which refers back to the pixels of the input image and which Petitioner has mapped to all of the pixels of the display screen. *See* Pet. 87 ("[T]he 'resolution or aspect ratio of a display screen generally refers to the number of pixels that can be

displayed . . . ."). Thus, even though the Meulen linearly transforms each single region with a constant compression ratio, the transformation across multiple regions of the input image is not constant and thus non-linear.

We also agree with Petitioner that Chao teaches non-uniform pixel shifting. Pet. 91–92 (citing Ex. 1008 ¶¶ 28, 30; Ex. 1002 ¶ 262). Chao teaches that "[T]he [foreground] element is re-sized to fit the new page size, while maintaining the original aspect ratio of the element." Ex. 1008 ¶ 30. "[T]he background element" on the other hand "is re-sized, by stretching or shrinking, as necessary, to fit the new page size. . . . [T]he resizing of the background element is performed without regard to the original aspect ratio of the element." Ex. 1008 ¶ 28. Dr. Katsaggelos credibly testifies that "[a] POSITA would have understood that stretching/shrinking means shifting the pixels positions to achieve a different size (resizing)." Ex. 1002 ¶ 263. By teaching that the background elements are stretched or shrunk, we agree with Petitioner that Chao teaches shifting of pixels.

Patent Owner argues that "Chao never describes that stretching/shrinking involves shifting pixels, *i.e.* moving pixels from one position to a new position as opposed to adding/subtracting pixels through an interpolation or compression process." PO Resp. 32 (citing Ex. 2027 ¶¶ 84–85). Specifically, Patent Owner argues that Chao describes "shifting is of entire ***objects*** (*e.g.* the ducks), and does not teach or suggest non-uniform ***pixel*** shifting, as claimed." PO Resp. 33 (citing Ex. 2027 ¶86).

We disagree with Patent Owner's arguments. Patent Owner acknowledges that Chao discloses shifting but argues that the shifting is of entire objects rather than pixels. The objects in the images of Chao, however, are formed by pixels and thus, to shift an object, Chao shifts pixels.

Addressing Figure 16 of Chao, Patent Owner argues "that while the foreground objects may be shifted, this does not involve a non-uniform transformation." *Id.* at 34 (citing Ex. 2027 ¶ 88). This argument, however, does not address that Meulen teaches non-uniform transformation, as we explain above. Regardless, the background elements of Chao are stretched or shrunk, which we determine teaches non-uniform transformation of pixels. Ex. 1008 ¶ 28. Patent Owner does not address the background elements of Chao, focusing its arguments instead on the foreground elements of Chao. Moreover, as Petitioner points out, Chao discloses that its transformation preserves the aspect ratio of the foreground objects but changes the aspect ratio of the background objects. Pet. Reply 16 (citing Ex. 1008 ¶¶28, 90). Dr. Katsaggelos testifies, credibly, that "[t]his difference in aspect ratios between the foreground and the background results in shifting the pixels of the foreground differently than shifting the pixels of the background." Ex. 1014 ¶ 63. The fact that Chao transforms its foreground elements differently than its background images demonstrates that Chao discloses a non-uniform transformation.

Finally, Patent Owner argues that "Meulen does not disclose non-uniform pixel shifting based on both the horizontal and vertical axes." PO Resp. 39 (citing Ex. 2027 ¶ 96). We disagree. Meulen discloses that "image compression and/or scaling may be applied in a horizontal and/or in a vertical direction. When applied in both the horizontal and vertical direction, the image compression and/or scaling may allow expansion of the lateral display regions . . . ." Ex. 1007, 10:19–26. This disclosure sufficiently teaches that Meulen's non-uniform shifting of pixels is based on both the horizontal and vertical axes. Dr. Katsaggelos credibly testifies that creating a magnified effect, as Meulen discloses, would require enlarging

some pixels and compressing others which supports the conclusion that "Meulen teaches non-uniform compression/scaling in the vertical direction." Ex. 1014 ¶ 72.

Patent Owner argues that Meulen does not disclose that the compression in the vertical direction is performed non-uniformly and that Meulen "merely describes the possibility of applying the previously disclosed piecewise linear horizontal compression followed by a ***uniform*** vertical scaling." PO Resp. 40. Similarly, in its Sur-Reply, Patent Owner argues that because Meulen describes that 'image compression and/or scaling may be applied to the media source . . . in ***one*** . . . of the display regions,'" it discloses "a uniform compression." PO Sur-Reply 24 (citing Ex. 1007, 5:67–6:3, 8:15–18). But these arguments are based on Patent Owner's contention that Meulen does not disclose non-uniform shifting of pixels, which as we explain above, is contrary to the preponderance of the evidence.

For the foregoing reasons, we determine the combination of Meulen and Chao teaches limitation 2[e].

g) Limitation 2[f]

Limitation 2[f] recites "the transformation non-uniformly shifts the pixels such that difference between the input positions and the output positions of the subset of the pixels within the portion are less than differences between the input positions and the output positions of others of the pixels." Petitioner contends that, based on Meulen's disclosure of Table 1 and associated description, "[t]he compression factor is the lowest in the ***central region***, and is higher (progressively increases) in the lateral regions." Pet. 93 (citing Ex. 1007, 6:27–37, 10:32–36, Tables 1–4, Fig. 4A Ex. 1002 ¶¶ 265–270). Petitioner adds that, it would have been obvious when

"applying scaling factor(s), such as disclosed in Chao, results in pixels that shift according to the 'differences between the input and output positions' of element 2[f]." *Id.* at 94. The combination of Meulen and Chao, therefore, teaches re-sizing at the central region being less than at the lateral regions. *Id.* (citing Ex. 1002 ¶ 271).

Patent Owner does not separately dispute Petitioner's contentions regarding this limitation. We determine the combination of Meulen and Chao teaches this limitation for the reasons provided in the Petition.

h) Conclusion – Claim 2

Accordingly, we determine Petitioner has demonstrated, by a preponderance of the evidence, that the combination of Meulen and Chao teaches the limitations of claim 2.

5. Analysis of Claim 6

Claim 6 depends from claim 2 and further recites "wherein the one or more physical processors are included within a camera." Petitioner argues that Meulen's wireless device include one or more processors or controllers and may comprise a camera. Pet. 97 (citing Ex. 1007, 4:55–60, 3:29–31, 12:62–13:1; Ex. 1002 ¶¶ 289–290). Petitioner also relies on Chao's disclosure that its "image may be output by displaying the image on or as part of: a display screen such as a . . . camera screen." Pet. 97 (quoting Ex. 1008 ¶ 32) (citing Ex. 1002 ¶ 291).

Patent Owner does not separately dispute Petitioner's contentions regarding this limitation. We determine the combination of Meulen and Chao teaches this limitation for the reasons provided in the Petition.

6. Analysis of Claim 7

Claim 7 depends from claim 6 and further recites "wherein the output image is presented on a display of the camera." Petitioner relies on

Meulen's disclosure that its "wireless device may include a display." Pet. 98 (citing Ex. 1007, Abstract). Petitioner argues that Meulen discloses that its wireless device displays content from a media source and that its device may comprise a camera. *Id.* (citing Ex. 1007, 1:44–46, 3:29–31, 12:62–13:1; Ex. 1002 ¶ 193). Petitioner also argues "Chao discloses the output image is presented on a display of the camera." *Id.* (citing Ex. 1002 ¶¶ 294–295).

Patent Owner does not separately dispute Petitioner's contentions regarding this limitation. We determine the combination of Meulen and Chao teaches this limitation for the reasons provided in the Petition.

7. Analysis of Claim 1

Petitioner's contentions for claim 1 overlap significantly with its contentions for claim 2. *See* Pet. 104–105. We focus on limitation 1[f] because it is dispositive for this claim.

a) Limitation 1[f]

Limitation 1[f] recites, pertinent part, "apply a transformation to the input image to generate an output image." Petitioner argues that limitation 1[f] mirrors limitation 2[d] and thus relies on its contentions for limitation 2[d] (Pet. 104), in which it argues "Meulen's media source content is an 'input image' having a source aspect ratio." Pet. 88.

Patent Owner makes the same argument for limitation 1[f] as it did for limitation 2[d]. Namely, Patent Owner argues that "when limitation 1[f] recites 'apply a transformation to the input image,' it is referring to the same input image captured by the image capture device that is applying the transformation." PO Resp. 13. Patent Owner argues that "Meulen never discloses that its wireless device obtains 'media source content' from the wireless device's embedded camera or image sensor." *Id.* (citing Ex. 2027

¶ 54). Instead, Patent Owner asserts that "the 'media source content' comes from an external source." *Id*.

We agree with Patent Owner. Claim 1 recites an "image capture apparatus, comprising: an image sensor configured to capture an input image" and further recites to "apply a transformation to the input image." Patent Owner is therefore correct that the recited "transformation" is applied to the same input image captured by the image sensor of the image capture apparatus.

Petitioner identifies Meulen's "media source content" as the recited "input image." Pet. 88 (citing Ex. 1007, 4:16–21). We agree with Patent Owner that Meulen describes its "media source content" as content from media sources external to Meulen's wireless device, and therefore not captured by the device itself. For example, Meulen describes "media source content" as being "received" by, or "deliver[ed]" to, Meulen's wireless device. Ex. 1007, 3:26–27 ("The display 138 may be arranged to display media source content received by the wireless device 100"), 3:44–45 ("The media source generally may comprise any source capable of delivering media source content to the wireless device 100."). Meulen also provides a nearly exhaustive list of examples of media sources, none of which include the internal camera of Meulen's wireless device and all of which are sources external to the wireless device. Meulen's list is reproduced below:

> An example of a media source may include a source for static or video image information, such as from a computer to a display. The media source may include a server, such as a web server arranged to deliver web content. Another example of a media source may include a source for A/V information such as television signals. The media source may be arranged to deliver standard analog television content, digital television content, HDTV content, and so forth. The media source may provide

> broadcast or streaming analog or digital video content. The media source may include a device arranged to deliver pre-recorded media content stored in various formats, such as DVD device, a Video Home System (VHS) device, a digital VHS device, a digital camera[9], video camera, a portable media player, a gaming device, and so forth.

Ex. 1007, 3:53–67. Meulen also describes that its wireless device "receive[s] media source content through one or more wireless wide area network (WWAN) data communication services." *Id.* at 4:1–12. These disclosures strongly support Patent Owner's argument that "media source content" refers to content from a media source external to the device.

Petitioner argues that Meulen describes "media source content from an internal source and 'stored in the frame buffer 506.'" Pet. Reply 4 (citing Ex. 1007, 11:66–12:5). Relying on Figure 5 of Meulen, Petitioner argues that external media sources come from communication interface 512 which is not connected to frame buffer 506 and this lack of direct connection is because the frame buffer stores content from other internal media sources. *Id.* at 4–5.

We are unpersuaded by this argument. Meulen discloses "the frame buffer 506 may be arranged to store media source content having an aspect ratio and/or a resolution that differs from the aspect ratio and/or the resolution of the display 502." Ex. 1007, 11:53–54. Meulen further discloses "the display controller 504 may be arranged to apply image compression and/or scaling to the media source content stored in the frame

[9] The reference to a "digital camera" or "video camera" in this context does not refer to the camera of Meulen's wireless device and instead refers to "a device arranged to deliver pre-recorded media content stored in various formats." Ex. 1007, 3:62–67.

buffer 506." *Id.* at 11:66–12:1. Contrary to Petitioner's argument, internal media is not mentioned in any of the cited portions of Meulen discussing frame buffer 506. Moreover, we agree with Patent Owner that the cited portions of Meulen do not disclose that internal media from Meulen's camera is processed to transform its aspect ratio.

Relying on evidence introduced after Patent Owner filed its response, Petitioner argues that Meulen is directed to Palm Treos which have a built-in camera and have a display with an aspect ratio that does not match the aspect ratio of its image sensor. Pet. Reply 6–7 (citing Ex. 1018, 63; Ex. 1022, Ex. 1023, Ex. 1024). Petitioner relies on the Palm Treo evidence to show that Meulen would have applied a transformation to images taken by its own camera. *See id.* at 6. Similarly, Petitioner also cites to Meulen's camera application as evidence that "images previewed on the display 502 are captured by its built-in camera." Pet. Reply 5 (citing Ex. 1007, 12:66–13:4; Ex. 1015, 93:3–94:21; Ex. 1014 ¶¶ 23–29).

Even if we were to consider the newly introduced evidence and arguments related to Palm Treos, we determine these arguments are unpersuasive. Petitioner identifies Meulen's "media source content" as its input image (Pet. 88) and as explained above, the phrase "media source content" in Meulen refers to content from external media sources. The documents related to Palm Treos, do not mention the phrase "media source content" and do not support a conclusion that such media source content would include images taken by Meulen's own device. Similarly, Meulen's disclosure that is device includes a camera application does not show that images taken by Meulen's own camera are included as "media source content." Indeed, just four lines after mentioning the camera application, Meulen immediately states "the processor 510 may be arranged to receive

information, such as media source content, through communications interface 512." Ex. 1007, 13:5–7. Repeatedly, Meulen makes clear that its use of the term "media source content" refers to a media source external to Meulen's wireless device.

b) Conclusion – Claim 1

Accordingly, we determine Petitioner has not demonstrated, by a preponderance of the evidence, that the combination of Meulen and Chao teaches the limitations of claim 1.

8. Objective Indicia of Non-Obviousness

Patent Owner identifies "SuperView" as the feature of its GoPro cameras that it argues practices the '413 patent. PO Resp. 41–49. Patent Owner argues "[t]here is strong and indisputable objective evidence of nonobviousness directed to the SuperView functionality found in GoPro's cameras." *Id.* at 42. This evidence of nonobviousness presented by Patent Owner relates to copying, industry praise, commercial success, and long felt need of its SuperView functionality. PO Resp. 41–59.

Objective indicia of nonobviousness may include long-felt but unsolved need, failure of others, unexpected results, commercial success, copying, licensing, industry praise, and expert skepticism. *Mintz v. Dietz & Watson, Inc.*, 679 F.3d 1372, 1379 (Fed. Cir. 2012). Objective indicia are only relevant to the obviousness inquiry if there is a nexus between the claimed invention and the objective indicia of nonobviousness. *In re Affinity Labs of Tex.*, LLC, 856 F.3d 883, 901 (Fed. Cir. 2017). A rebuttable presumption of nexus applies only "when [a patent owner] shows that the asserted objective evidence is tied to a specific product and that product 'embodies the claimed features, and is coextensive with [the claims].'" *Fox Factory, Inc. v. SRAM, LLC*, 944 F.3d 1366, 1373 (Fed. Cir. 2019) (quoting

Polaris Indus. v. Arctic Cat, Inc., 882 F.3d 1056, 1072 (Fed. Cir. 2018)). On the other hand, a patent owner is not entitled to a presumption of nexus if the patented invention is only a component of a commercially successful machine or process. *Id.* (reaffirming the importance of the "coextensiveness" requirement).

(1) Copying

Patent Owner argues "there is significant direct evidence of copying" based on Petitioner's use of a "remarkably similar-sounding feature called ActionView." PO Resp. 51 (citing Ex. 2027 ¶¶ 156–157, Ex. 2009). Patent Owner argues that that Petitioner did extensive research into GoPro's cameras including its SuperView feature. *Id.* at 52 (citing Ex. 2033, 1, 5–7). According to Patent Owner, Petitioner used this information to copy GoPro's SuperView feature for its own ActionView feature. *Id.* (citing Ex. 2034; Ex. 2035, 4; Ex. 2027 ¶ 158). Finally, Patent Owner argues that others have also copied GoPro's SuperView feature, citing two such examples. PO Resp. 52 (citing Ex. 2011; Ex. 2012).

We determine that the evidence presented is insufficient to show copying of Patent Owner's products. Copying requires evidence of efforts to replicate a specific product based on access to that product. *Tokai Corp. v. Easton Enterprises, Inc.*, 632 F.3d 1358, 1370 (Fed. Cir. 2011); *Institut Pasteur & Universite Pierre Et Marie Curie v. Focarino*, 738 F.3d 1337, 1347–48 (Fed. Cir. 2013); *Iron Grip Barbell Co. v. USA Sports, Inc.*, 392 F.3d 1317, 1325 (Fed. Cir. 2004). Here, Patent Owner relies on a document that includes a high-level comparison of the features of its own product with features of other competitive products, including the SuperView feature of GoPro's cameras. Ex. 2033, 1, 5–7. Thus, even if there was nexus, we determine that these general, non-technical analyses of competing products

and descriptions of their features, fall short of showing that Petitioner accessed Patent Owner's products at the level required to show copying.

The cited documents of the software projects also fall short of showing replication of Patent Owner's products. In fact, the cited documents expressly state that they are "not a 1-1 copy of the GoPro algorithm, but an attempt to reach a similar quality of output using the open-source FFmpeg encoder." Ex. 2011, 2; Ex. 2012, 2. Thus, even if there was a nexus between Patent Owner's products and the challenged claims, we determine Patent Owner's evidence of copying is insufficient to be weighed heavily in the obviousness analysis.

(2) Industry Praise

As evidence of industry praise, Patent Owner points to an article that characterizes the SuperView feature as "clever" and "designed to capture a more immersive wide angle perspective." PO Resp. 52–53 (citing Ex. 2013). Patent Owner also cites reviews from users of GoPro's products and from users of a competitor's product. *Id.* at 33 (citing Ex. 2015; Ex. 2016; 2017; Ex. 2027 ¶¶ 161–162). Finally, Patent Owner cites to various awards it won for its HERO7 Black camera, including the 2019 Consumer Electronics Show ("CES") award, the 'Lucie' award, and also the 73rd Technology and Engineering Emmy award. PO Resp. 54 (citing Ex. 2036; 2037; 2038).

Praise in the industry for a patented invention and specifically praise from a competitor may indicate that the invention was not obvious. *Kinetic Concepts, Inc. v. Smith & Nephew, Inc.*, 688 F.3d 1342, 1370 (Fed. Cir. 2012); *see, also Apple Inc. v. Samsung Electronics Co., Ltd.*, 839 F.3d 1034 (Fed. Cir. 2016) ("Evidence that the industry praised a claimed invention . . . that embodies the patent claims weighs against an assertion that the same

claimed invention would have been obvious. Industry participants, especially competitors, are not likely to praise an obvious advance over the known art.")

The article cited by Patent Owner is a general review of GoPro's Hero camera's that lists and describes many of the camera's features, including SuperView. *See* Ex. 2013. Patent Owner does not provide any evidence that the author of the article is a competitor or industry participant. We find that the brief mention of the SuperView feature being "clever" followed by a description of the invention in the same words used in GoPro's own materials, is at best, a fairly weak form of industry praise. *Compare* Ex. 2010 (GoPro's own materials describing SuperView as allowing "an immersive, wide angle perspective" *with* Ex. 2013 (article describing SuperView as allowing "a more immersive wide angle perspective"). Similarly, reviews from users of GoPro's or its competitors' products, who are not industry participants, do not weigh heavily in our obviousness analysis.

Finally, the evidence cited regarding CES and Lucie awards make no mention of SuperView. In this context, we have very little evidence of a nexus[10] between SuperView and the evidence of industry praise, which in

[10] In its Sur-Reply, Patent Owner argues that Dr. Foorsh [sic] established that GoPro's 'SuperView' algorithm directly practiced and was coextensive with the '413 Patent." PO Sur-Reply 24 (citing Ex. 2027 ¶¶ 130–154). We do not rely on a presumption of nexus because we do not agree that the SuperView feature can properly be considered a "product" in this context and within the ambit of *Fox Factory*. For example, there is no allegation that the CES and Lucie awards were directed to SuperView by itself (without being embodied in a camera having other features). The product is the GoPro camera, and the camera is not coextensive with the claims here.

this case are the CES, Lucie, and Technology & Engineering awards. Patent Owner relies on Senior Vice President of Product, Pablo Lema, who testifies that the "market impact of HERO7 Black was also reflected in industry recognition. I had the honor of accepting a Technology & Engineering Emmy award on behalf of GoPro in 2022 for our in-camera sensor and software image stabilization—technology introduced in HERO7 Black." Ex. 2024 ¶ 22. Mr. Lema further testifies that GoPro "received a CES Innovation Award in 2019 and a Lucie Technical Award for best special-purpose compact camera, both recognizing HERO7 Black." *Id.* We determine this testimony is insufficient in establishing nexus between the awards won and the SuperView feature of the GoPro cameras. Instead, Mr. Lema's testimony demonstrates that the awards were directed to the "special-purpose compact camera" that included other features such as software image stabilization. *Id.* Furthermore, as Mr. Lema himself testifies, SuperView was a feature that "was available before HERO7." *Id.* ¶ 8. Awards won for HERO7 Black camera, on their own, do not establish nexus of the awards to the patented features at issue here.

(3) Commercial Success

Patent Owner argues that "Mr. Lema testifies that GoPro saw significant success with the HERO7 Black, which SuperView contributed to." PO Resp. 55 (citing Ex. 2024 ¶ 5–13). Patent Owner also relies on surveys that it argues show that SuperView was a top driver of demand for GoPro's cameras. *Id.* (citing Ex. 2024 ¶¶ 14–20; Ex. 2040, 10–14; 2019, 14; Ex. 2018, 23; Ex. 2027 ¶¶ 165–67).

The preponderance of the evidence supports Patent Owner's position that its products are commercially successful. In terms of nexus[11], however, the evidence does not strongly support that SuperView is sufficiently responsible for this commercial success. For example, Patent Owner's argument that Mr. Lema's testimony "GoPro saw significant success with the HERO7 Black, which SuperView contributed to" is somewhat contradicted by his own testimony that SuperView was a feature that "was available before HERO7." (Ex. 2024 ¶ 8).

Similarly, the cited surveys show that while SuperView may have contributed somewhat to the commercial success of GoPro's products, it did not contribute very much. First, we note that the surveys never mention the SuperView feature expressly. Instead, they mention a "Wide variety of modes and settings," which Mr. Lema testifies is a category at this time that would have encompassed GoPro's SuperView technology but also encompassed other technology. Ex. 2024 ¶ 17. These surveys show that the feature of "Wide variety of modes and settings" ranks between seventh and twenty-first among a set of features that customers preferred. Ex. 2024 ¶ 18. Based on the wide range of ranking of preferences combined with the fact that SuperView is not clearly included in the ranking, we find SuperView contributed at best slightly to the commercial success of GoPro's products, and we, therefore, weigh this objective evidence of non-obviousness only slightly in our overall analysis.

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[11] Again, we do not rely on a presumption of nexus because Patent Owner has not shown that the GoPro cameras for which evidence of commercial success is presented, are coextensive with the claimed feature of SuperView. Instead, the documents relied upon show that SuperView was one of many features of the GoPro cameras.

(4) Long Felt But Unmet Need

Patent Owner argues there is evidence of a long-felt need and unexpected results with respect to the SuperView feature. PO Resp. 55–59. This evidence consists of background information from the ’431 patent explaining that converting between aspect ratios was a common problem in the field of image and video processing (*id.* (citing Ex. 1001, 1:6–7, 11–18)), testimony from Dr. Foroosh that at the time of the ’413 patent conventional wisdom was that introducing distortion into images was undesirable (*id.* (citing Ex. 2027 ¶¶ 168–169), testimony from Dr. Katsaggelos (Ex. 2026, 87:21–23 (“If one has to choose distortion or non-distortion, one probably would choose the non-distortion option”)), GoPro’s website, dated September 6, 2023, that states “[a]void using SuperView when people are on the edges of the frame since they will be stretched a bit” (Ex. 2010, 1) and finally a prior art camera that, according to Patent Owner, applied conventional cropping techniques that the ’413 patent improved upon (Ex. 2020, 120–121).

We determine that the evidence presented is insufficient to show long felt but unmet need of Patent Owner’s products. The need must have been a persistent one that was recognized by those of ordinary skill in the art. *Orthopedic Equip. Co. v. All Orthopedic Appliances, Inc.*, 707 F.2d 1376, 1383 (Fed. Cir. 1983); *see also Iron Grip Barbell Co., Inc. v. USA Sports, Inc.*, 392 F.3d 1317, 1325 (Fed. Cir. 2004) (“Absent a showing of long-felt need or the failure of others, the mere passage of time without the claimed invention is not evidence of nonobviousness”). The statements made in its own challenged patent do not establish a long-standing persistent need, nor do they give an indication of the length of time those in the industry recognized the need. Similarly, Dr. Foroosh’s testimony largely repeats the

Patent Owner's arguments without adding any additional evidence regarding the time period any such need existed. Dr. Katsaggelos' testimony merely states that non-distortion is preferred over distortion and also does not sufficiently show a long felt need. Ex. 2026, 87:21–23. The evidence regarding GoPro's website is dated September, 6, 2023, well after the relevant time period, and merely states that SuperView should not be used "when people are on the edges of the frame." Ex. 2010, 1. Like the other pieces of evidence, the website does not establish a long felt need. Finally, Patent Owner also does not provide sufficient evidence of failure of others in addressing the need. Thus, even if there was a nexus between Patent Owner's products and the challenged claims, we determine Patent Owner's evidence of long felt need is insufficient to be weighed heavily in the obviousness analysis.

9. Conclusion – Ground 4

Having reviewed the parties' arguments and weighing both the evidence of obviousness and nonobviousness we determine Petitioner has demonstrated, by a preponderance of the evidence, that claims 6 and 7 are unpatentable but has not established that claim 1 is unpatentable.

E. Remaining Grounds 1 and 3

Petitioner argues claims 1, 6, and 7 of the '413 patent would have been obvious over Fleming and also obvious over the combination of Obara and Liu. Pet. 8–26, 28–30, 48–64, and 71–74. Below we provide a brief overview of the prior art references and then analyze Petitioner's contentions in light of Patent Owner's arguments.

1. Overview of Fleming (Ex. 1004)

Fleming is titled "Method and Apparatus for Nonlinear Anamorphic Scaling of Video Images," and relates "to scaling of video images." Ex.

1004, code (54), ¶ 1. Fleming explains that a video image is typically scaled linearly in the vertical and/or horizontal directions to fit the entire video image onto a target display area. *Id.* at 1:24–26. Figure 3 of Fleming, reproduced below, depicts an example of nonlinear anamorphic scaling. *Id.* at 2:42–44.

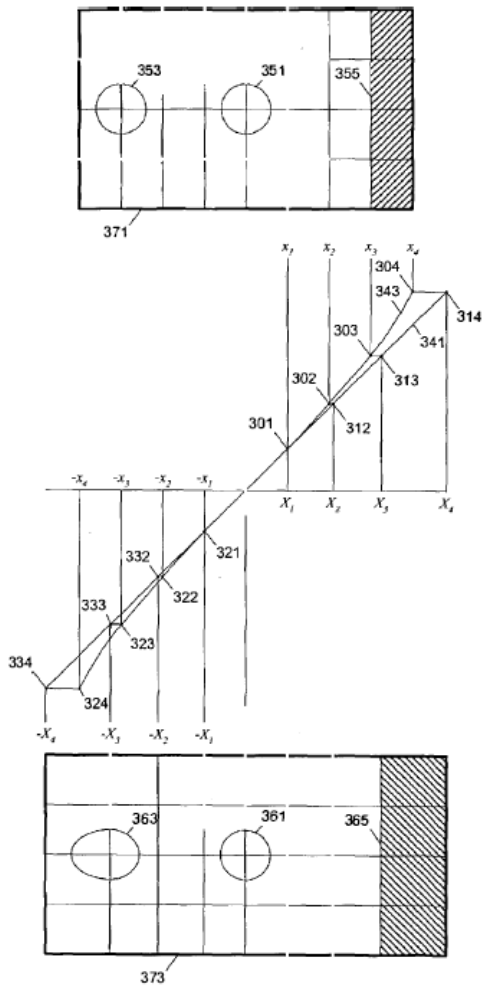

Fig. 3

Figure 3, above, illustrates nonlinear scaling in the horizontal direction. Ex. 1004, 5:33–34. As shown in Figure 3, image 371 is scaled nonlinearly in the horizontal direction to increase the width to that of image 373. *Id.* at 5:17–19. Circle 351 in the center strip of image 371 is displayed

as circle 361 in the center strip of image 373, while circle 353 is distorted as curve 363. *Id.* at 5:27–29. Fleming explains that "the nonlinear scaling in the example preserves the original feature of the video image in the area of interest, the center strip." *Id.* at 5:29–32.

2. Overview of Obara (Ground 3)

Obara is titled "Information Processing Apparatus and Image Processing Method," and relates to "a function for displaying non-linear enlarged image data on a display device without using a dedicated circuit." Ex. 1006, code (54), ¶ 11. Obara describes non-linear scaling of an original image such that a central area of the image is horizontally reduced while the size of the original image data "is horizontally altered with enlargement ratios that gradually increase toward both ends." *Id.* ¶ 52.

3. Overview of Liu (Ground 3)

Liu is titled "Image Scaling Method and Apparatus," and "relates to image processing technologies." Ex. 1005, code (54), 1:13–15. Liu discloses "an image scaling method and apparatus to reduce distortion of a scaled image." *Id.* at 2:3–5. Liu describes determining "the distribution direction of the main objects in the source image" and scaling the source image "to the target image through a proper nonlinear scaling method according to the distribution direction." *Id.* 2:25–30. In one embodiment, the scaling takes into account "the distribution of the main objects in the image," and determines "the segments of the source image and the corresponding scaling factor" according to the distribution. *Id.* at 8:30–34. This approach, according to Liu, "reduces the distortion caused in the scaling process, and brings a good visual effect." *Id.* at 8:34–37.

4. Whether Petitioner Has Provided a Sufficient Reason to Include Non-Uniform Shifting in a Camera

Claim 1, recites "[a]n image capture apparatus, comprising: an image sensor . . . [and] one or more physical processors configured [to] . . . apply a transformation [that] non-uniformly shifts the pixels." Ex. 1001, 8:65–9:21. Similarly, claim 6 recites "[t]he system of claim 2, wherein the one or more physical processors are included within a camera." Claims 1, 6, and 7 (which depends from claim 6), therefore, require that the processors that non-uniformly shift pixels be included in an "image capture apparatus" or "camera" recited in those claims.

Petitioner maps Fleming's GPU and CPU and Obara's image processing unit and CPU to the "processors" recited in claims 1, 6, and 7. Pet. 28, 71–72. For both grounds, Petitioner argues that it would have been obvious for the cited processors "to be included within a camera." Pet. 28, 71. There is no dispute, however, that neither Fleming nor Obara expressly disclose such a camera. As a rationale for including these components in a camera, Petitioner argues that at the time of the invention in 2013 digital cameras captured images using an aspect ratio that was different than the aspect ratio that they used to store the images or the aspect ratio used to display the images on their LCD displays. Pet. 28, 71, 72 (citing Ex. 1004, 16:9–11, Ex. 1002 ¶¶ 99–100, 200–202). According to Petitioner, "[s]ince the aspect ratio of the captured image was different than the aspect ratio of the stored file or the LCD display included in the camera, it would have been obvious for the digital camera to include data processing systems to transform the captured image into an output image (having the aspect ratio of the stored file or LCD display) to be presented on the camera display." *Id*. at 28. Petitioner argues that a "POSITA would have been motivated to

have on-camera processing and display capabilities because it would have been less burdensome, cheaper, and saves time. *Id*. at 28–29 (citing Ex. 1002 ¶¶ 99-100).

Patent Owner argues[12] that "Petitioner does not provide a single shred of evidence that any cameras in 2013 had an 'aspect ratio of the captured image [that] was different than the aspect ratio of the stored file or the LCD display included in the camera.'" PO Resp. 62. Supported by Dr. Foroosh's testimony, Patent Owner asserts that "non-linear transformations were expensive to design and implement" and that because cameras in 2013 had limited processing power and battery life, "a POSITA would have found it much more preferable for the camera and display to have the same aspect ratio in order to avoid distortion of the image and the expensive non-linear transformations claimed in the '413 patent." *Id.* at 63 (citing Ex. 2027 ¶¶ 107–108).

In our Decision on Institution, we determined that Petitioner had not established that a POSITA would have included the cited processors of Fleming and Obara into a camera. Dec. Inst., 35. We noted that in the Petition, Petitioner does not appear to rely on any evidence in Grounds 1 and 3, other than the Dr. Katseggelos's testimony, for its assertion that in 2013, cameras captured images in one aspect ratio and stored or displayed those images in a different aspect ratio. *Id.*

After our Decision on Institution, and after Patent Owner filed its Response, Petitioner introduced evidence that it argues shows that "there were digital cameras at the time that captured images with one aspect ratio

[12] Because we determine that this argument is dispositive of Grounds 1 and 3, we do not analyze Patent Owner's other arguments.

and displayed or stored the captured images with another aspect ratio." Pet. Reply 21–22. This evidence is a Canon PowerShot G15 Camera User Guide. Ex. 1028 (Canon User Guide). Petitioner argues that "[t]he PowerShot G15 image sensor had a 4:3 aspect ratio, and it allowed the user to select among 16:9, 3:2, 4:3, 1:1, or 4:5 aspect ratios for displaying the captured image." Pet. Reply 22 (citing Ex. 1028, 80). Quoting the Canon User Guide, Petitioner states that "'[o]nce the setting is complete, the screen aspect ratio is updated.'" *Id.* Petitioner argues that "[t]his shows that PO's expert was wrong that none of the cameras in 2013 had an image sensor and a display with different aspect ratios." *Id.* (citing Ex. 1015, 88:9–89:2, Ex. 1014 ¶¶ 82–83).

Even if we were to consider Petitioner's newly introduced Canon User Guide, we determine the Guide does not sufficiently support Petitioner's argument that "cameras in 2013 had an image sensor and a display with different aspect ratios." Pet. Reply 22. The Canon User Guide explains that the user can "[c]hange the image aspect ratio" by using the "Func" button. "Once the setting is complete, the screen aspect ratio will be updated" with selections for 16:9, 3:2, 4:3, 1:1, or 4:5 aspect ratios. Ex. 1028, 80. Patent Owner is correct, however, that the Canon User Guide refers to settings accessed through the "Func" button as "shooting functions." *Id.* at 47. This supports Patent Owner's argument that this feature applies to changing the aspect ratio prior to image capture. PO Sur-Reply 28 (citing Ex. 1028, 47, 80). Thus, when the Canon User Guide states that when "the setting is complete, the screen aspect ratio will be updated" it is not necessarily referring to the aspect ratio of its own screen, but rather indicating the aspect ratio of the image taken and the screen on which the image is intended to be displayed. For example, the 16:9 aspect ratio states that it is "used for

display on widescreen HDTVs or similar display devices." Ex. 1028, 80. Similarly, the 3:2 aspect ratio is "used for printing images at 5 x 7-inch or postcard sizes." *Id.* Selecting these options does not appear to change the aspect ratio of the camera's screen but rather, indicates the aspect ratio of the image taken.

The aforementioned interpretation of the disclosure of the Canon User Guide is inconsistent with Petitioner's argument that "cameras in 2013 had an image sensor and a display with different aspect ratios." Pet. Reply 22. We, therefore, determine that Petitioner has not sufficiently demonstrated that a POSITA would have been motivated to include the cited processors to be included within a camera.

III. MOTIONS TO STRIKE

A. Patent Owner's Motion to Strike (Paper 39)

Patent Owner moves to strike Petitioner's arguments that "it would have been obvious to apply Meulen to a Palm Treo device, with new evidence suggesting that some Palm Treo devices captured images using a different aspect ratio than that used for its display." Paper 39, 2–3. Patent Owner's motion is moot because, as we explain in our analysis of claim 1 in Ground 4 (§ II.D.7.a), we decide the issue in Patent Owner's favor even if we consider the arguments and evidence related to the Palm Treo.

Patent Owner also moves to strike Petitioner's "new theory combining Meulen with a method called 'sub-sampling'" to teach pixel shifting. Paper 39, 3–4. In our analysis of claim 2 in Ground 4 (§ II.D.4.f), we did not consider Petitioner's "sub-sampling" theory in determining that the combination of Meulen and Chao teaches pixel shifting. To that extent, we grant Patent Owner's motion to strike Petitioner's "sub-sampling" theory.

Patent Owner moves to strike Petitioner's "new evidence and new grounds asserting that it would be obvious to modify various allegedly prior art cameras in view of Fleming or Obara." Paper 39, 4. Specifically, Patent Owner seeks to strike Petitioner's reliance on the Canon User Guide. *Id.* at 5. As we explain above, in our analysis of claim 1 in Grounds 1 and 3 (§ II.D.7.a) we determine that Petitioner has not carried its burden even if we consider the arguments and evidence related to the Canon User Guide. Therefore, Patent Owner's motion to strike these arguments is moot.

B. Petitioner's Motion to Strike

Petitioner moves to strike Patent Owner's Sur-Reply argument that "the sentence describing the 6:65–7:5 equations is '***not*** embodied by'" limitation 2[e] requiring non-uniform shifting along the horizontal direction. Paper 45, 1–2. Similarly, Petitioner moves to strike Patent Owner's Sur-Reply reliance on Meulen's passages at 5:67–6:3 and 8:15–18 and corresponding argument that "Meulen's option of non-uniformly shifting '***one*** or more display regions' means it does not non-uniformly shift all other display regions." Paper 45, 3. Petitioner's motion is moot because, as we explain in our analysis of limitation 2[e] in Ground 4 (§ II.D.4.f), we decide the issue in Petitioner's favor even considering Patent Owner's Sur-Reply arguments. Therefore, Petitioner's motion to strike these arguments is moot.

Petitioner moves to strike Patent Owner's "new argument in its Sur-reply . . . mischaracterizing the motivation presented in both the Petition and the Reply. Nowhere did the Petition or Reply present a motivation against a 'hypothetical . . . [involving] re-uploading the image back to the camera for display.'" Paper 45, 5. As we explain in our analysis of Grounds 1 and 3, we do not consider Patent Owner's argument regarding re-uploading the

image back to the camera in determining that Petitioner has not carried its burden. To that extent, we grant Petitioner's motion to strike this argument.

Finally, Petitioner argues that in the Sur-Reply, Patent Owner switches from arguing a direct nexus between the SuperView feature of its GoPro cameras to arguing a presumptive nexus for SuperView. Paper 45, 5. Petitioner moves to strike this "shift [in] theories." *Id.* In our analysis of objective indicia of non-obviousness, we did not determine that Patent Owner had established a presumption of nexus between SuperView and the GoPro cameras. *See* § II.8. Petitioner's motion to strike is therefore moot.

IV. CONCLUSION[13]

The table below summarizes our conclusions as to the challenged claims.

Claims	35 U.S.C. §	Reference(s) /Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1, 6, 7	103	Fleming		1, 6, 7
1, 6, 7	103	Obara, Liu		1, 6, 7
1, 6, 7	103	Meulen, Chao	6, 7	1
Overall Outcome			6, 7	1

[13] 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).

V. ORDER

For the foregoing reasons, it is

ORDERED that Petitioner has shown, by a preponderance of the evidence, that claims 6 and 7 of the ’413 patent are unpatentable but has not shown, by a preponderance of the evidence, that claim 1 of the ’413 patent is 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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