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Paper 12
Entered: May 25, 2017

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD. and
SAMSUNG ELECTRONICS AMERICA, INC.,
Petitioner,

v.

IMAGE PROCESSING TECHNOLOGIES LLC,
Patent Owner.

Case IPR2017-00347
Patent 8,805,001 B2

Before JONI Y. CHANG, MICHAEL R. ZECHER, and JESSICA C. KAISER, *Administrative Patent Judges*.

KAISER, *Administrative Patent Judge*.

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314 and 37 C.F.R. § 42.108

Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc. (collectively, "Petitioner") filed a Petition pursuant to 35 U.S.C. §§ 311–19 requesting an *inter partes* review of claims 1–4 of U.S. Patent No. 8,805,001 B2, issued on August 12, 2014 (Ex. 1001, "the '001 patent"). Paper 2 ("Pet."). Image Processing Technologies LLC ("Patent Owner") filed a Preliminary Response. Paper 6 ("Prelim. Resp."). Applying the standard set forth in 35 U.S.C. § 314(a), which requires demonstration of a reasonable likelihood that Petitioner would prevail with respect to at least one challenged claim, we grant Petitioner's request and institute an *inter partes* review of all challenged claims.

I. BACKGROUND

A. The '001 Patent (Ex. 1001)

The '001 patent is titled "Image Processing Method." Ex. 1001, at [54]. The Abstract describes the subject matter as follows:

> A method and apparatus for localizing an area in relative movement and for determining the speed and direction thereof in real time is disclosed. Each pixel of an image is smoothed using its own time constant. A binary value corresponding to the existence of a significant variation in the amplitude of the smoothed pixel from the prior frame, and the amplitude of the variation, are determined, and the time constant for the pixel is updated. For each particular pixel, two matrices are formed that include a subset of the pixels spatially related to the particular pixel. The first matrix contains the binary values of the subset of pixels. The second matrix contains the amplitude of the variation of the subset of pixels. In the first matrix, it is determined whether the pixels along an oriented direction relative to the particular pixel have binary values representative of significant variation, and, for such pixels, it is determined in the second matrix whether the amplitude of these pixels varies in a known manner indicating movement in the oriented direction. In each of several domains, histogram of the values in the first and

> second matrices falling in such domain is formed. Using the histograms, it is determined whether there is an area having the characteristics of the particular domain. The domains include luminance, hue, saturation, speed (V), oriented direction (Dl), time constant (CO), first axis (x(m)), and second axis (y(m)).

Id. at [57].

Figure 14a of the '001 patent is reproduced below.

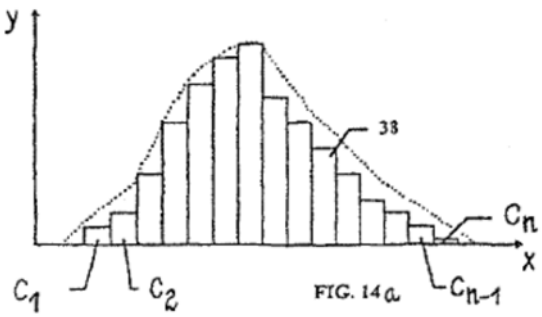


FIG. 14a

Figure 14a depicts a hypothetical velocity histogram with classes C_1–C_n each representing a particular velocity. *Id.* at 20:54–59. Figure 17 of the '001 patent is reproduced below.

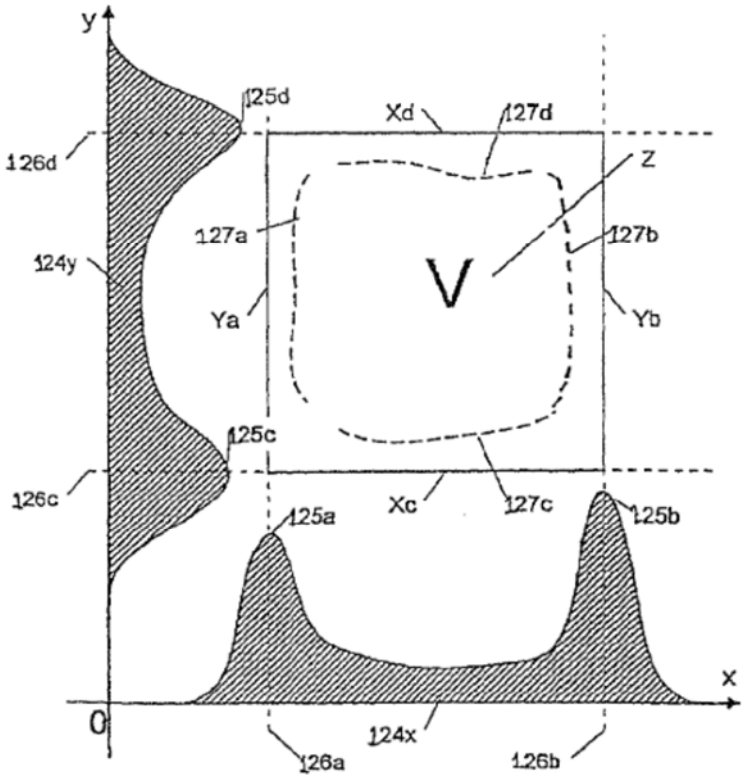


Fig. 17

Figure 17 depicts x axis and y axis histograms of the head of a user in a video conference. *Id.* at 22:10–12, 22:60–23:5. The face V of the user is approximately defined by the peaks in the two histograms. *Id.* at 23:6–14.

Figure 22 of the ’001 patent is reproduced below.

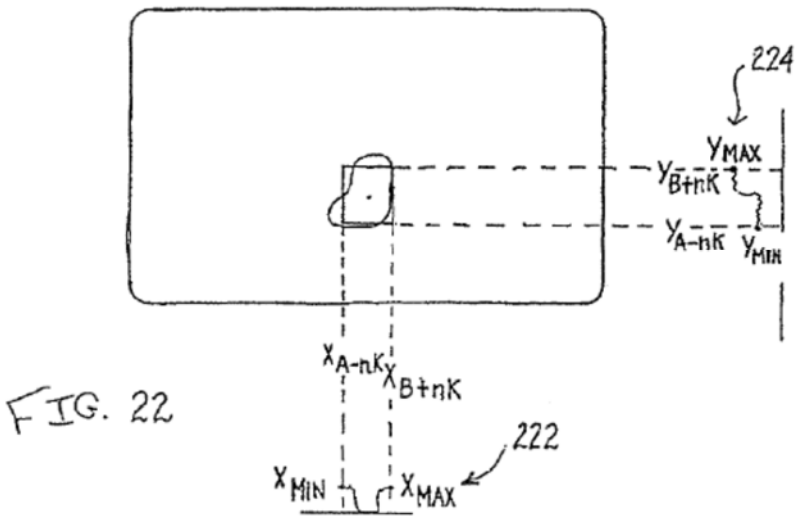


FIG. 22

Figure 22 depicts a circumstance where an area under consideration begins to cross the borders of the target. *Id.* at 24:42–46. In particular, histograms 222 and 224 for x and y projections include pixels in which there is a significant variation, and thus the histograms detect the target edge in the x and y axis. *Id.* at 5:15–18, 24:42–46. The ’001 patent discloses that in a preferred embodiment, the center of the area “is determined to be $(X_{MIN}+X_{MAX})/2$, $(Y_{MIN}+Y_{MAX})/2$, where X_{MIN} and X_{MAX} are the positions of the minima and maxima of the x projection histogram, and Y_{MIN} and Y_{MAX} are the positions of the minima and maxima of the y projection histogram. . . . Other methods of relocating the center of the target box may be used if desired.” *Id.* at 24:50–58.

B. Illustrative Claim

Of the challenged claims, claim 1 is independent and is reproduced below:

> 1. A process of tracking a target in an input signal implemented using a system comprising an image processing system, the input signal comprising a succession of frames, each frame comprising a succession of pixels, the target comprising pixels in one or more of a plurality of classes in one or more of a plurality of domains, the process performed by said system comprising, on a frame-by-frame basis:
>
> forming at least one histogram of the pixels in the one or more of a plurality of classes in the one or more of a plurality of domains, said at least one histogram referring to classes defining said target, and identifying the target in said at least one histogram itself,
>
> wherein identifying the target in said at least one histogram further comprises determining a center of the target to be between X and Y minima and maxima of the target.

Id. at 26:40–54.

C. Related Proceedings

Petitioner and Patent Owner identify a related litigation in the Eastern District of Texas involving the '001 patent, as well as other patents, titled: *Image Processing Techs. LLC v. Samsung Elecs. Co*., No. 2:16-cv-00505-JRG (E.D. Tex.). Pet. 1; Paper 3, 2. Petitioner indicates that it has concurrently filed *inter partes* review petitions for the other patents asserted in that litigation, and Patent Owner also identifies those *inter partes* reviews. Pet. 1; Paper 3, 2.

D. Level of Skill in the Art

Petitioner contends that a person having ordinary skill in the art

> [at] the time of the alleged invention of the '001 Patent would have had either (1) a Master's Degree in Electrical Engineering

> or Computer Science or the equivalent plus at least a year of experience in the field of image processing, image recognition, machine vision, or a related field or (2) a Bachelor's Degree in Electrical Engineering or Computer Science or the equivalent plus at least three years of experience in the field of image processing, image recognition, machine vision, or a related field.

Pet. 4. Petitioner further contends "[a]dditional education could substitute for work experience and vice versa." *Id.* (citing Ex. 1002 (Declaration of Dr. John C. Hart) ¶¶ 44–48). Patent Owner contends a person of ordinary skill "would be someone with an undergraduate degree in electrical engineering or image processing or a related field, followed by at least two years of graduate coursework and also at least early-stage thesis research, in digital image processing." Prelim. Resp. 11–12. At this stage of the proceeding, we determine our decision would not change under either assessment.

E. References

Petitioner relies on the following references:

1. "Gilbert" (Alton L. Gilbert, et al., *A Real-Time Video Tracking System*, PAMI-2 No. 1 IEEE TRANSACTIONS ON PATTERN ANALYSIS AND MACHINE INTELLIGENCE 47–56 (1980)) (Ex. 1005);
2. "Hashima" (U.S. Patent No. 5,521,843; issued May 28, 1996) (Ex. 1006); and
3. "Ueno" (U.S. Patent No. 5,150,432; issued Sept. 22, 1992) (Ex. 1007).

F. Grounds Asserted

Petitioner challenges the patentability of claims 1–4 of the '001 patent on the following grounds:

References	Basis	Claims
Gilbert and Hashima	35 U.S.C. § 103(a)	1–4
Hashima and Ueno	35 U.S.C. § 103(a)	1–4
Ueno and Gilbert	35 U.S.C. § 103(a)	1–4

Petitioner also relies on expert testimony from Dr. Hart (Ex. 1002, "Hart Decl.").

II. ANALYSIS

A. Claim Construction

Claims of an expired patent are given their ordinary and customary meaning in accordance with *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). *See In re Rambus Inc.*, 694 F.3d 42, 46 (Fed. Cir. 2012). On the other hand, claim terms in an unexpired patent are construed according to their broadest reasonable interpretation in light of the specification of the patent in which they appear. *See* 37 C.F.R. § 42.100(b); *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2144–46 (2016).

Petitioner contends the '001 patent will expire on December 2, 2017, which is within 18 months of the Notice of Filing Date Accorded (Paper 5 (according the Petition a filing date of November 29, 2016)) and, thus, Petitioner states that it has applied the *Phillips* standard to all claim construction issues. Pet. 3. We note that Petitioner does not propose any explicit constructions for any claim terms, and Petitioner's expert, Dr. Hart,

states he has "interpreted all claim terms according to their plain and ordinary meaning." *Id.*; Ex. 1002 ¶ 49. Patent Owner "agrees that the *Phillips* standard should apply for purposes of this *inter partes* review," and Patent Owner proposes constructions for several claim terms. Prelim. Resp. 12–23.

In an *inter partes* review, a party may request a district court-type claim construction standard be applied if the challenged patent will expire within 18 months of the entry of the Notice of Filing Data Accorded to Petition. *See* 37 C.F.R. § 42.100(b). In this case, other than the phrase "forming at least one histogram of the pixels in the one or more of a plurality of classes in the one or more of a plurality of domains," as recited in claim 1 and discussed below, we determine explicit construction of any term is not necessary to resolve the issues before us at this stage of the proceeding. *See Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (holding that "only those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy"). We further determine our construction of "forming at least one histogram of the pixels in the one or more of a plurality of classes in the one or more of a plurality of domains," discussed below, would not change based on the claim construction standard applied. Because Patent Owner does not contest that the '001 patent will expire during this proceeding, we construe the claims of the '001 patent under the claim construction standard applicable to expired patents—namely, the district court-type claim construction standard.

Patent Owner argues that "forming at least one histogram of the pixels in the one or more of a plurality of classes in the one or more of a plurality of domains" should be construed as "forming at least one histogram of the

pixels in two or more classes that are in two or more domains." Prelim. Resp. 17. In essence, Patent Owner argues that "one or more of a plurality" requires at least one plurality (i.e., two or more). *Id.* (citing Ex. 2002). Patent Owner further argues that a construction that requires "at least one class selected from multiple classes, and at least one domain selected from multiple domains, would render the term 'plurality' superfluous, so that the claim limitation would be reduced to 'one or more classes in one or more domains.'" *Id.* at 17–18.

We disagree with Patent Owner. "[C]laims are interpreted with an eye toward giving effect to all terms in the claim." *Bicon, Inc. v. Straumann Co.*, 441 F.3d 945, 950 (Fed. Cir. 2006). Here, Patent Owner's proposed construction would render "one or more" in the claim superfluous (i.e., under Patent Owner's construction, the claim could simply read "a plurality of classes that are in a plurality of domains"). On the other hand, interpreting the phrase "forming at least one histogram of the pixels in the one or more of a plurality of classes in the one or more of a plurality of domains" to encompass at least one class from among a plurality of possible classes and at least one domain from among a plurality of possible domains gives effect to all the terms of the claim.

Accordingly, we determine that "forming at least one histogram of the pixels in the one or more of a plurality of classes in the one or more of a plurality of domains" is not limited to "forming at least one histogram of the pixels in two or more classes that are in two or more domains."

B. Asserted Obviousness Over Gilbert and Hashima

1. Overview of Gilbert and Hashima

Gilbert is titled "A Real-Time Video Tracking System," and dated January 1980. Ex. 1005, 47.[1] Gilbert relates to an object identification and tracking system, which includes an image processing system comprising a video processor, a projection processor, a tracker processor, and a control processor. *Id.* at 47–48. Gilbert's video processor receives a digitized video signal in which each field consists of pixels. *Id.* at 48. Gilbert discloses that "[e]very 96 ns, a pixel intensity is digitized and quantized into eight bits (256 gray levels), counted into one of six 256-level histogram memories, and then converted by a decision memory to a 2-bit code indicating its classification (target, plume, or background.)." *Id.* Gilbert's projection processor then uses pixels identified as being part of the target to create x- and y-projections. *Id.* at 50. Figure 4 of Gilbert is reproduced below.

[1] We refer to the original page numbers at the top of the pages rather than the page numbers added by Petitioner.

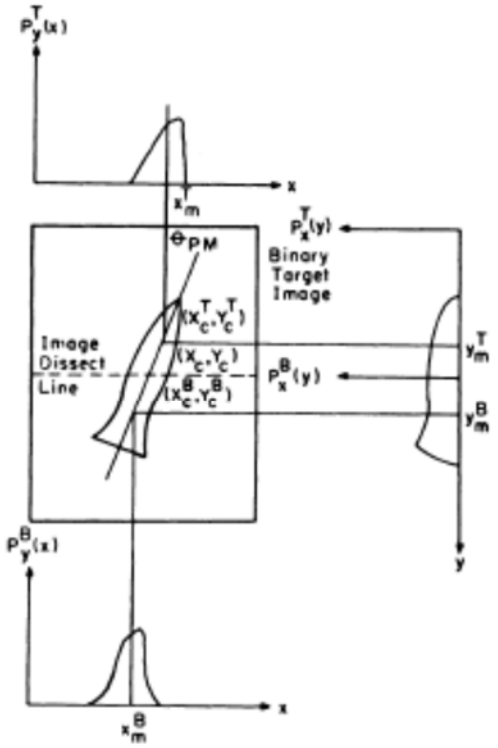


Fig. 4. Projection location technique.

Figure 4 of Gilbert depicts a Y-projection and X-projections of the target. Gilbert's system uses these projections to determine the center of the upper and lower portions of the target, and those points are then used to determine the center of the target (X_C, Y_C). *Id.* at 50–51.

Hashima is titled "System for and Method of Recognizing and Tracking Target Mark," and issued on May 28, 1996. Ex. 1006, at [45], [54]. Hashima relates to a system and method of recognizing and tracking a target mark with a video camera. *Id.* at [57]. In Hashima, the target mark can be a black circle with a white triangle as depicted in Figure 3 (reproduced below).

FIG.3

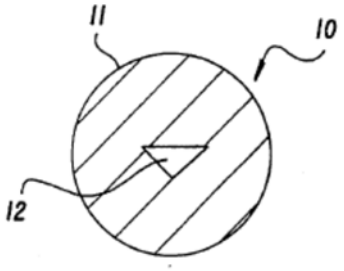


Figure 3 depicts Hashima's target mark. Figure 6 of Hashima is reproduced below.

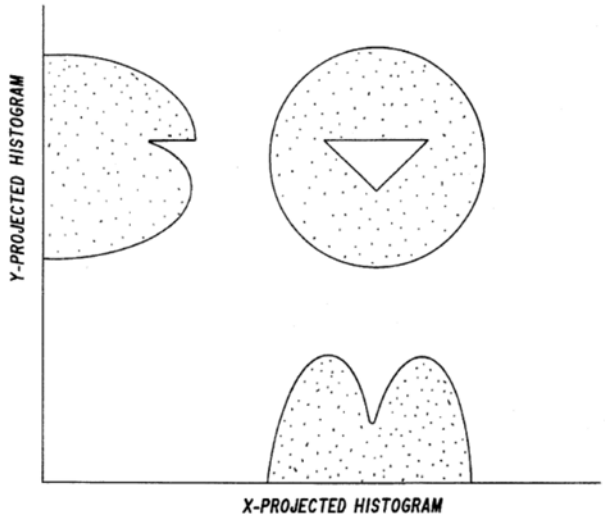


FIG.6

Figure 6 depicts x- and y-projected histograms of a target mark. Hashima describes creating these histograms by summing the number of black pixels at each x- or y- location. *Id.* at 8:18–9:7. Hashima also describes finding the central position of the detected mark as shown in Figure 15 below.

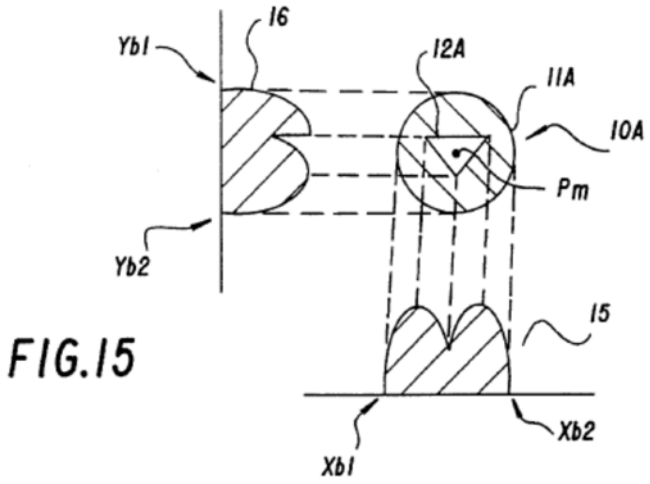


FIG.15

Figure 15 depicts a process of finding central position Pm of the target mark. Hashima describes finding Pm (mx, my) using the equations (1) mx = (Xb1+Xb2)/2 and (2) my = (Yb1+Yb2)/2. *Id.* at 11:6–25.

2. Analysis

A claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the subject matter sought to be patented 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. *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) when in the record, objective evidence of nonobviousness. *See Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). In that regard, an obviousness analysis "need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ." *KSR*, 550 U.S. at 418.

Petitioner contends that claims 1–4 would have been obvious over Gilbert and Hashima. Pet. 32–49. We have reviewed the information provided by Petitioner, including the relevant portions of the supporting Hart Declaration (Ex. 1002), and are persuaded, based on the current record, that Petitioner has demonstrated a reasonable likelihood of prevailing on this obviousness challenge.

For example, for claim 1's preamble,[2] Petitioner contends Gilbert discloses a process of tracking a target (i.e., a missile) and uses a video signal (i.e., input signal) comprising digitized fields with a frame rate of 60 fields/s (i.e., 30 frames/s in a succession of frames), each image frame comprising a matrix of digitized points (i.e., a succession of pixels). Pet. 37 (citing Ex. 1005, 47–48; Ex. 1002 ¶¶ 90–91). Petitioner further contends that Gilbert tracks the target by categorizing pixels into 256 gray-scale levels (i.e., a plurality of classes) according to their pixel intensity (i.e., domain), and Gilbert discloses that a plurality of other domains, such as "texture, edge, and linearity measures" could also be used. *Id.* (citing Ex. 1005, 48). Petitioner contends Hashima also teaches the preamble. *Id.* at 38.

Petitioner contends Gilbert and Hashima each disclose the step of "forming at least one histogram of the pixels in the one or more of a plurality of classes in the one or more of a plurality of domains, said at least one histogram referring to classes defining said target," as recited in claim 1. *Id.* at 38. Specifically, Petitioner relies on Gilbert's intensity histogram (discussed above), as well as Hashima's X- and Y- projection histograms. *Id.* at 38–39 (citing Ex. 1005, 48; Ex. 1006, 24:14–21; Ex. 1002 ¶¶ 95–98).

[2] At this stage of the proceeding, we need not decide whether the claim preamble is limiting. *Vivid Techs.*, 200 F.3d at 803.

For the limitation of "identifying the target in said at least one histogram itself," Petitioner contends the histograms in both Gilbert and Hashima are used to identify a target. *Id.* at 40–41 (citing Ex. 1005, 48–50; Ex. 1006, 8:18–10:24; Ex. 1002 ¶¶ 102–103).

Regarding "wherein identifying the target in said at least one histogram further comprises determining a center of the target to be between X and Y minima and maxima of the target," as recited in claim 1, Petitioner contends "Gilbert determines a center by computing the center of areas of the target's upper and lower halves," and by teaching that "'target nose and tail points' could be used." *Id.* at 41 (citing Ex. 1005, 50–51, Fig. 4; Ex. 1002 ¶ 104). Petitioner further contends that Hashima discloses "determining X-maxima and minima and Y-maxima and minima of the boundaries of the target in the histogram to calculate the center point of the target using the equations $(X_{MIN} + X_{MAX})/2$ and $(Y_{MIN} + Y_{MAX})/2$." *Id.* (citing Ex. 1006, 11:13–24, Fig. 15; Ex. 1002 ¶¶ 105–107).

Although Petitioner appears to contend Gilbert discloses all of the limitations of claim 1, Petitioner contends that, "[t]o the extent Patent Owner argues Gilbert does not disclose the claimed plurality of domains or method of finding the center of the target, it would have been obvious to replace these features of Gilbert with those of Hashima." *Id.* at 41 (citing Ex. 1002 ¶ 101). Petitioner further argues the combination of Hashima and Gilbert teach "an input signal comprising a succession of frames, each frame comprising a succession of pixels," as recited in claim 1. *Id.* at 42.

Petitioner also provides a sufficiently persuasive rationale for combining the teachings of Gilbert and Hashima. For example, Petitioner contends that a person of ordinary skill in the art reading Gilbert would have

been motivated to plot histograms in other domains to increase the likelihood of successfully recognizing the target "because each additional domain provides another opportunity for correlation between that domain and the unique target being tracked." *Id.* at 34. Petitioner also contends that a person of ordinary skill in the art would have been motivated to replace Gilbert's calculation of center points for the top and bottom half of the target with a simpler center calculation for the entire target as taught in Hashima to achieve a "significantly smaller computational burden," and to allow Gilbert to track objects with different shapes. *Id.* at 36. To support its rationales for combining the teachings of Gilbert and Hashima, Petitioner relies upon the supporting testimony of Dr. Hart. Ex. 1002 ¶¶ 79–89.

Petitioner provides further analysis of claims 2–4, detailing where it contends each limitation of those claims is taught by Gilbert and Hashima. *Id.* at 42–46. We have reviewed Petitioner's evidence and argument, and find that, on the current record, Petitioner has sufficiently shown the cited references teach each limitation of the challenged claims, and that Petitioner has provided a sufficiently persuasive rationale for combining those teachings at this stage of the proceeding. *Id.*

Patent Owner argues Gilbert and Hashima, alone or in combination, do not teach "forming at least one histogram of the pixels in the one or more of a plurality of classes in the one or more of a plurality of domains, said at least one histogram referring to classes defining said target," "identifying the target in said at least one histogram itself," and "wherein identifying the target in said at least one histogram further comprises determining a center of the target to be between X and Y minima and maxima of the target," as recited in claim 1. Prelim. Resp. 29–38. Patent Owner argues neither

Gilbert's intensity histograms nor its projection histograms teach these claim limitations. *Id.* at 29–35. Regarding Gilbert's intensity histograms, Patent Owner argues they fail to teach these limitations because (1) they are in a single domain (i.e., intensity), (2) they are not formed of pixels in two or more classes, and (3) they do not determine a center of the target. *Id.* at 29–33. Patent Owner also argues that because Gilbert mentions other parameters (i.e., domains), but does not disclose using more than a single parameter (i.e., intensity) in combination, a person of ordinary skill in the art would have been lead away "from forming histogram(s) of the pixels in two or more selected subsets of parameter values that are in two or more domains, where the histogram(s) refer to selected subsets of parameter values that define the target." *Id.* at 31–32.

Regarding Gilbert's projection histograms, Patent Owner argues they fail to teach the argued limitations because (1) they are formed after the target has been identified, (2) the classes in those histograms do not define the target, (3) they are not used to identify the target by determining a center of the target, and (4) they determine the center of the upper and lower halves of the target. *Id.* at 33–35. Patent Owner also argues that Gilbert "teaches away from identifying and using minima and maxima of the target (i.e., nose and tail)." *Id.* at 34.

Patent Owner further argues that "Hashima does not cure the deficiencies of Gilbert, because the x-axis and y-axis histograms of Hashima on which Petitioner relies do not satisfy the language of the claim." *Id.* at 35. In particular, Patent Owner argues Hashima's histograms (1) include all of the pixels in a window, (2) form separate histograms in the x- and y-position domains, and (3) look for target characteristics such as number of

peaks. *Id.* at 35–37. Patent Owner also argues Hashima's computation of the center of the target is not part of its identification of the target. *Id.* at 37.

At this stage of the proceeding, we are not persuaded by Patent Owner's arguments regarding the references' teachings. As discussed above in our claim construction section, we have not adopted Patent Owner's proposed construction which would require a plurality of domains. *See supra* Section II.A. We also find Petitioner has sufficiently shown the references teach a plurality of classes. For example, Petitioner relies on Gilbert's 256 gray-scale levels in its intensity domain as teaching a plurality of classes. *See* Pet. 37; Ex. 1002 ¶ 52.

We also see no requirement in claim 1 that the classes collectively must comprise less than all of the values in the domain as Patent Owner appears to suggest. *See* Prelim. Resp. 32 (arguing Gilbert's intensity histograms include pixels with all intensity values and, thus, "are not formed of pixels in two or more selected subsets of values of a parameter (classes), in this case, intensity, that define the target"); *id.* at 35 (arguing Hashima's histograms "include *all* of the pixel data in the window"). Specifically, claim 1, which uses the open-ended transition "comprising," recites that the target comprises pixels in one or more of a plurality of classes and that the histogram is formed from those pixels, but it does not preclude the histogram from also including other pixels outside the target.

Patent Owner argues that a target is not identified from Gilbert's projection histograms because the target was already previously identified in Gilbert's intensity histogram. Prelim. Resp. 33–34. We are sufficiently persuaded that identifying the target in the intensity histograms does not preclude the target from also being identified in the projection histograms.

As shown in Gilbert's Figure 4 (depicted above), Gilbert's projection histograms display target pixels and identify the target in the x- and y-domains. *See* Ex. 1002 (Hart Decl.) ¶ 55.

Patent Owner further argues "Petitioner admits that Gilbert's center calculation does not involve x and y minima and maxima of the target, but instead uses the center of areas of the target's upper and lower halves." Prelim. Resp. 34 (citing Pet. 41). Patent Owner argues "Gilbert teaches away from identifying and using minima and maxima of the target (i.e., nose and tail)" because "Gilbert explains that it is difficult to determine nose and tail position and the determination is sensitive to noise." *Id.*

We are not persuaded by Patent Owner's arguments regarding claim 1's determination of a center because these arguments are not commensurate with the scope of the claim, which recites "identifying the target in said at least one histogram further comprises determining a center of the target to be between X and Y minima and maxima of the target." This limitation does not require that the center calculation "involve x and y minima and maxima" or the nose and tail of the target, as Patent Owner argues (Prelim. Resp. 34). Instead, it requires that the center of the target "be between X and Y minima and maxima of the target." As shown in Figure 4 of Gilbert (reproduced above), Gilbert determines a center of the target (X_C, Y_C) which is between the X and Y minima and maxima. Ex. 1005, 50, Fig. 4. At this stage of the proceeding, we do not read claim 1 as precluding Gilbert's intermediate calculation of the center of the top half and bottom half of the target, which are then used to determine the target's center. *See id*. In addition, we note that Patent Owner's arguments do not persuasively address Petitioner's contention that it would have been obvious to combine Gilbert with

Hashima's teaching of determining the center of the target to be between X and Y minima and maxima of the target. *See* Pet. 35–36, 41.

Patent Owner argues Hashima does not cure Gilbert's deficiencies and that Hashima's x-axis and y-axis histograms do not satisfy the limitations of claim 1. Prelim. Resp. 35. At this stage of the proceeding, we do not find these arguments persuasive because they focus on Hashima in isolation, and they do not address the combination of Gilbert and Hashima argued by Petitioner (*see* Pet. 32–36).

Regarding Petitioner's rationale to combine Gilbert and Hashima, Patent Owner contends a person of ordinary skill in the art would not have combined Gilbert and Hashima because Gilbert is directed to tracking an unknown and fast-moving target (e.g., a missile), whereas Hashima is directed to tracking a known target (e.g., for docking a spaceship). Prelim. Resp. 45–52. Patent Owner also argues "Hashima's histogram algorithm is incompatible with Gilbert," and "Petitioner fails to explain why a [person of ordinary skill in the art] would have used Hashima's x- and y-axis histograms in place of Gilbert's intensity histograms, especially given that the target shape and attitude with respect to the camera are not known to the system of Gilbert." *Id.* at 49–50. Patent Owner also reiterates its teaching away argument for Gilbert: "Gilbert teaches away from using [a method of calculating the target center based on the nose and tail points] because it would be overly sensitive to noise in the operating environment of Gilbert." *Id.* at 50–51.

At this stage of the proceeding, we are not persuaded by Patent Owner's arguments. As discussed above, Petitioner provides sufficiently persuasive reasoning for combining the teachings of Hashima with Gilbert,

including that a person of ordinary skill would have been motivated to modify Gilbert to (1) include histograms in multiple domains, as taught in Hashima, to increase the likelihood of successfully recognizing a target in an image frame (Pet. 34–35 (citing Ex. 1002 ¶¶ 84–85)); and (2) use the center calculation of Hashima based on the end-points of a target, which is simpler and would result in a lower number of needed computations (*id.* at 35–36 (citing Ex. 1002 ¶¶ 86–89)). Petitioner's reasoning in this regard is supported by its expert's testimony. Ex. 1002 (Hart Decl.) ¶¶ 84–89.

Based on the current record, we are unpersuaded a person of ordinary skill in the art would not have considered both Gilbert and Hashima because they track different types of targets. It is well-settled that simply because two references have different objectives does not preclude a person of ordinary skill in the art from combining their respective teachings. *In re Heck*, 699 F.2d 1331, 1333 (Fed. Cir. 1983) ("The use of patents as references is not limited to what the patentees describe as their own inventions or to the problems with which they are concerned.") (quoting *In re Lemelson*, 397 F.2d 1006, 1009 (CCPA 1968)); *see also EWP Corp. v. Reliance Universal Inc.*, 755 F.2d 898, 907 (Fed. Cir. 1985) ("A reference must be considered for everything that it teaches, not simply the described invention or a preferred embodiment."). In addition, we do not find Patent Owner's teaching away argument persuasive for essentially the same reasons previously discussed above (i.e., claim 1 does not require a center calculation that uses the nose and tail points).

For the reasons discussed above, based on the current record, we determine Petitioner has shown a reasonable likelihood of prevailing with respect to its obviousness challenge to claims 1–4 over Gilbert and Hashima.

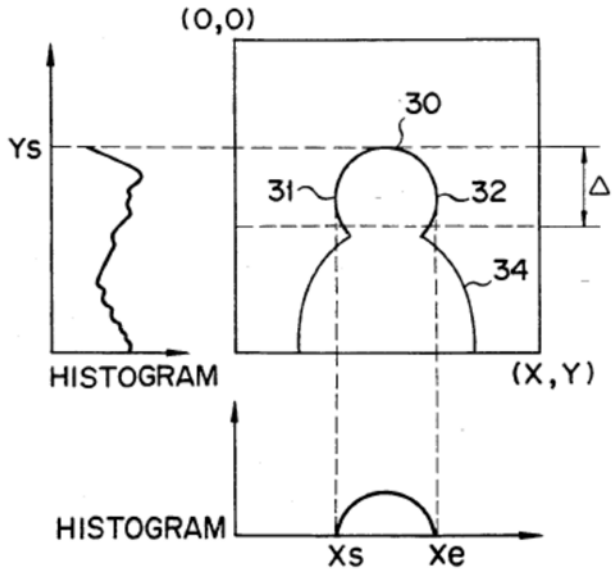
C. Asserted Obviousness Over Ueno and Gilbert

1. Overview of Ueno

Ueno is titled "Apparatus for Encoding/Decoding Video Signals to Improve Quality of a Specific Region," and issued on September 22, 1992. Ex. 1007, at [45], [54]. Ueno's abstract describes its subject matter as follows:

> An image encoding apparatus comprises a region detecting circuit for detecting a specific region from input image signals and outputting the region specifying signals for discriminating the specific region from other regions, a low-pass filter for selectively filtering and outputting the image signals of regions other than the specific region in the input image signals, and an encoding circuit for encoding the image signal output from the low-pass filter.

Id. at [57]. Figure 3 of Ueno is reproduced below.



F I G. 3

Figure 3 shows x- and y-axis histograms in Ueno. Ueno states:

> FIG. 3 shows an interframe difference image input to the facial region detecting circuit 102. Information for the interframe difference image is converted into binary data of "0" or "1" by the preset first threshold level. Then the number of pixels having the binary data value of "1" or the value equal to or more than the first threshold value is counted in the vertical and horizontal directions of the screen and histograms of the pixels (x-and y-axis histograms) are formed. Facial detection is executed according to the histograms.

Ex. 1007, 7:7–16. Ueno detects the top of the head in the y-axis histogram by identifying point Y_S, which exceeds a threshold value. Ueno then determines the left and right sides of the head by selecting points Xs and Xe, which exceed a threshold. Finally, Ueno determines a width Δ from the top of the head so that the region with the shoulders is not detected. *Id.* at 7:17–30.

2. Analysis

Petitioner contends that claims 1–4 would have been obvious over Ueno and Gilbert. Pet. 60–72. We have reviewed the information provided by Petitioner, including the relevant portions of the supporting Hart Declaration (Ex. 1002), and are persuaded, based on the current record, that Petitioner has demonstrated a reasonable likelihood of prevailing on this obviousness challenge.

For example, Petitioner contends Ueno describes a process of tracking a target (i.e., a human face) from a video signal (i.e., an input signal) comprising a succession of frames, each frame comprising a succession of pixels. Pet. 52 (citing Ex. 1002 ¶ 125), 64. Petitioner further contends a face in Ueno is identified in the histograms of the X- and Y-domains (i.e., a plurality of domains). *Id.* at 52 (citing Ex. 1007, 1:44–48, 7:7–16; Ex. 1002 ¶¶ 127–28), 64–67. Petitioner further relies on Gilbert as teaching "wherein

identifying the target in said at least one histogram further comprises determining a center of the target to be between X and Y minima and maxima of the target," as discussed above. *Id.* at 67 (citing Ex. 1005, 50; Ex. 1002 ¶¶ 167–69).

Petitioner also provides a sufficiently persuasive rationale for combining the teachings of Ueno and Gilbert for purposes of this Decision. For example, Petitioner contends a person of ordinary skill would have been motivated to improve Ueno's system to add a step of calculating the target's center, as taught in Gilbert, because a center calculation enables the addition of other functionality, such as adjusting the camera's field of view to follow a target. Pet. 62 (citing Ex. 1005, 52; Ex. 1002 ¶ 148). To support its rationales for combining the teachings of Ueno and Gilbert, Petitioner relies upon the supporting testimony of Dr. Hart. Ex. 1002 ¶¶ 145–150.

Regarding Gilbert's teachings, Patent Owner relies on same arguments presented against the asserted ground in the Petition based on obviousness over Gilbert and Hashima. Prelim. Resp. 43–44. For the same reasons discussed above in Section II.B.2., we are not persuaded by Patent Owner's arguments regarding Gilbert's teachings.

Patent Owner further contends Ueno's x- and y-axis histograms do not teach the limitations of claim 1. *Id.* at 39–43. In particular, Petitioner contends Ueno's y-axis histogram "includes all pixel data in the frame that have an interframe difference, and is not limited to a particular selected subset of y-position values." *Id.* at 40. Similar to our analysis above in Section II.B.2., we are not persuaded by this argument because claim 1 does not require that the classes collectively must comprise less than all of the

values in the domain. Further, Petitioner's expert testifies that each coordinate value on the x- or y-axis is a "class." Ex. 1002 ¶ 129.

Patent Owner also contends that, in Ueno, "all of the pixels representing the facial region [in Ueno] are detected solely based on [the] y-axis projection histogram." Prelim. Resp. 40. Specifically, Patent Owner contends Ueno identifies the facial region in the y-axis histogram using the top of the head and a Δ to calculate the assumed bottom of the facial region. *Id.* at 40–41. Patent Owner contends that, although the x-axis histogram is used to calculate the left and right ends of a person's face, the x-axis histogram "is not the basis on which Ueno identifies the facial region because, unlike the y-axis histogram, no pixels with value '1' in the binary image are excluded from the facial region based on the x-axis histogram." *Id.* at 42.

At this stage of the proceeding, we are not persuaded by Patent Owner's arguments in this regard. Petitioner contends the target being tracked in Ueno is a human face. Pet. 52. Petitioner further contends that Ueno's x-axis histogram is used to identify a human face. *Id.* at 53 (citing Ex. 1007, 7:7–16, Fig. 3; Ex. 1002 ¶ 133). Ueno discloses that, "[a]fter the top of the head 30 is detected, the left end 31 and right end 32 of the head 30 are detected by searching the x-axis histogram from the left and right and selecting the points Xs and Xe which first exceed the second threshold value." Ex. 1007, 7:20–25. Thus, we find Petitioner has sufficiently shown that Ueno's target (i.e., a human face) is identified in its x-axis histogram.

Patent Owner also argues that "Ueno's x-axis and y-axis histograms are not used to identify a target by determining a center of the target to be between x and y minima and maxima of the target, as required by claim 1."

Prelim. Resp. 42. As discussed above, however, Petitioner relies on Gilbert's teaching of determining a center of the target for this limitation. Pet. 67.

Patent Owner contends a person of ordinary skill in the art would not have combined Ueno and Gilbert because Gilbert is directed to tracking an unknown and fast-moving target (e.g., a missile) whereas Hashima is directed to tracking a known target (e.g., a human face). Prelim. Resp. 54–60. Patent Owner also argues a person of ordinary skill would have understood that Ueno and Gilbert are incompatible. *Id.* at 58–59. Patent Owner further contends Petitioner has not shown a credible reason to combine Ueno and Gilbert because a person of ordinary skill "would not see a need to apply Gilbert to determine the center of the target of Ueno—the head-and-shoulders target is easily found based on interframe difference, and the head is found based on a simple assumption, so the location could be tracked without Gilbert." *Id.* at 59–60.

At this stage of the proceeding, we are not persuaded by Patent Owner's arguments. Once again, it is well-settled that simply because two references have different objectives does not preclude a person of ordinary skill in the art from combining their respective teachings. *See Heck*, 699 F.2d at 1333. Moreover, as discussed above, for purposes of this Decision, Petitioner provides sufficiently persuasive reasoning for combining the teachings of Ueno and Gilbert, including that a person of ordinary skill would have been motivated to improve Ueno's system to add a step of calculating the target's center, as taught in Gilbert, because a center calculation enables the addition of other functionality, such as adjusting the camera's field of view to follow a target. Pet. 62 (citing Ex. 1005, 52; Ex.

1002 ¶ 148). Petitioner's reasoning is supported by its expert's testimony. Ex. 1002 (Hart Decl.) ¶¶ 145–50.

For the reasons discussed above, based on the current record, we determine Petitioner has shown a reasonable likelihood of prevailing with respect to its obviousness challenge to claims 1–4 over Ueno and Gilbert.

D. Asserted Obviousness Over Hashima and Ueno

Pursuant to 35 U.S.C. § 316(b), rules for *inter partes* proceedings were promulgated to take into account the "regulation on the economy, the integrity of the patent system, the efficient administration of the Office, and the ability of the Office to timely complete proceedings." The promulgated rules provide that they are to "be construed to secure the just, speedy, and inexpensive resolution of every proceeding." 37 C.F.R. § 42.1(b). As a result, and in determining whether to institute an *inter partes* review of a patent, the Board, in its discretion, may "deny some or all grounds for unpatentability for some or all of the challenged claims." 37 C.F.R. § 42.108(b). Indeed, the Federal Circuit recognized our discretion in this regard when it stated that, "under [37 C.F.R. § 42.108], it is clear that the Board may choose to institute some grounds and not institute others as part of its comprehensive institution decision." *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1368 (Fed. Cir. 2016). Accordingly, faced with this record, we exercise our discretion and decline to institute review based on Petitioner's obviousness challenge to claims 1–4 over Hashima and Ueno. 37 C.F.R. § 42.108(a); *see also* 35 U.S.C. § 314(a) (giving the Director discretion on whether to institute review).

III. SUMMARY

We determine that Petitioner has demonstrated a reasonable likelihood of prevailing on its challenges to claims 1–4 on the '001 patent as set forth above. At this stage of the proceeding, we have not made a final determination as to the patentability of any of these challenged claims or the construction of any claim term.

IV. ORDER

It is, therefore,

ORDERED that, pursuant to 35 U.S.C. § 314(a), an *inter partes* review of the '001 patent is hereby instituted on the following grounds:

A. Obviousness of claims 1–4 over Gilbert and Hashima; and

B. Obviousness of claims 1–4 over Ueno and Gilbert;

FURTHER ORDERED that no other grounds are authorized for this *inter partes* review other than those specifically identified above; and

FURTHER ORDERED that pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial commencing on the entry date of this Decision.

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