UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

UNIFIED PATENTS, LLC,

Petitioner,

v.

DigiMedia Tech, LLC,

Patent Owner.

Case IPR2022-01182
Patent 6,473,532

PETITIONER'S REPLY TO PATENT OWNER'S RESPONSE

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I. Introduction

In its Response, Patent Owner seeks to avoid the prior art of record by proposing unsupported and overly complex claim constructions for the following three terms: "*details*," "*spatially and temporally separating . . . details of said frames*," and "*subclass.*" But neither Petitioner nor Patent Owner identified any claim terms requiring construction prior to institution, and the Board's Institution Decision found that "no aspects of the challenged claims require explicit constructions." Institution Decision, 8.

As established below, Patent Owner's claim constructions are contrary to the intrinsic record and unsupported by the extrinsic record. Furthermore, Patent Owner's only argument on the merits against the single ground in this case is that the cited references do not teach Patent Owner's proposed claim constructions. Patent Owner does not argue that the proposed obviousness combination is improper or otherwise deficient. Thus, if the Board is not persuaded by Patent Owner's proposed claim constructions, it need look no further into Patent Owner's arguments. And finally, even if Patent Owner's improper claim constructions are applied, the cited combination still renders the challenged claims obvious.

II. Patent Owner's Claim Construction Positions Are Not Supported by the Record

A. The record does not support Patent Owner's assertion that the "*details*" are elements of an image composed of pixels that have high frequency content.

The term "*details*" appears in every step of method claim 6. In the Petition, Petitioner established based on the intrinsic evidence of the '532 patent that "*details*" at least encompass a pixel or a group of pixels that is detectable or distinguishable by the human visual system. *See* Petition ("Pet."), 7-8, 29. Moreover, Petitioner's expert, Dr. Karam, testified that the '532 patent specification "describes '*details*' as pixels or groups of pixels that are related based on human visual perception," and can be processed and characterized by a computer. Declaration of Dr. Lina Karam, Ex. 1002 ("Karam"), ¶¶ 30-32. Importantly, Patent Owner never disputes Dr. Karam's testimony here as to the term "*details*," and Patent Owner does not provide any countervailing expert testimony of its own. *See* Patent Owner's Response ("POR"), Paper 10, 6-11. Furthermore, Patent Owner elected not to cross-examine Dr. Karam's testimony on this point or any issue raised in her Declaration; thus, Dr. Karam's testimony stands unrebutted.

Patent Owner argues that Petitioner's interpretation of "*details*" is too broad, asserting that this term should be construed as "elements of an image composed of

pixels that have high frequency content." Patent Owner's Response ("POR"), Paper 10, 6. But Patent Owner's construction is not supported by the record.

1. "elements of an image"

Patent Owner argues that "*details*" should mean "**elements of an image** composed of pixels that have a high frequency content," but it offers no citations in the intrinsic record to the use of the word "element" in the '532 patent. *See* POR, 6-7. Specifically, Patent Owner does not cite to a single use of the term "element" in the '532 patent specification nor does it attempt to explain what constitutes an "element." *Id*. In fact, there is no description in the '532 patent specification of the "*details*" being "elements of an image," but rather—in support of Petitioner's understanding—the claims and specification do expressly describe "*details*" as "pixels or groups of pixels." *See* Ex. 1001 ("'532 patent"), 5:28-33. For example, claim 8 recites the step of "*estimating parameters of said details*" includes generating certain "***per-pixel***" parameters. *Id*., 13:1-32. Claim 11 recites "*wherein said step of classifying includes the steps of comparing multiple spatial high frequency levels of* ***a pixel*** *against its associated visual perception threshold and processing said comparison results to associate said* ***pixel*** *with one of said subclasses*." *Id*., 14:12-16. As another example, the '532 patent specification states that "[t]he present invention separates the **details** of a frame into two different

types, those that can only be detected (for which only one bit will suffice to describe each of their **pixels**) and those which can be distinguished (for which at least three bits are needed to describe the intensity of each of their **pixels**)." *Id*., 5:28-33. Furthermore, in discussing the "*details*," the '532 patent refers to them as groups of pixels: "filters HPF-R1 and HPF-C1 retain only very **small details in the frame (of 1-4 pixels in size)** while filter HPF-R3 retains much **larger details (of up to 11 pixels)**." *Id*., 6:66-7:2 (emphasis added). This contradicts Patent Owner's assertion that the "*details*" are limited to "a horizontal edge, vertical edge, single small detail, very small vertical edge, and very small single detail." POR, 7. This disclosure in the '532 patent also moots Patent Owner's argument that "there would not be a size component to the determination of ['details'] . . . because all pixels are the same size (e.g., 1 pixel)," *id*., as the groups of pixels may have different numbers of pixels and therefore correspond to different dimensions. And, significantly, Patent Owner concedes that "the '532 patent discloses that 'details' are composed of **multiple pixels**." *Id*.

Moreover, Patent Owner's **only** attempt to overcome the lack of intrinsic evidence to support its "elements of an image" construction is with citations to two extrinsic evidence exhibits. But both exhibits, Exhibit 2001 (Merriam-Webster's

Dictionary) and Exhibit 2003 (College Course Notes)[1], are after the '532 patent's claimed priority date, and are unsupported by any expert testimony. POR, 11. Patent Owner fails to offer any explanation of how these post-priority date materials would be relevant to the understanding of an ordinary artisan as of the priority date of the '532 patent. *Eisai Co. Ltd. v. Dr. Reddy's Labs., Ltd.*, 533 F.3d 1353, 1359 (Fed. Cir. 2008) ("[T]he obviousness inquiry must rely on evidence available 'at the time' of the invention."). Thus, as set forth in Petitioner's Objection to Exhibits, Exs. 2001 and 2003 should not be given any weight. S*ee* Petitioner's Objection to Exhibits, Paper 11, 2-4; *Unified Patents, LLC f/k/a Unified Patents Inc. v. DivX, LLC et al.*, IPR2019-01379, Paper 52 (Feb. 8, 2021), 56-57 (finding that the Patent Owner's exhibits "refer to video coding techniques that were developed many years after the priority date of the [challenged] '651 patent" and "the timing of these exhibits diminishes the persuasive weight they might otherwise be accorded"). In fact, Exs. 2001 and 2003

[1] Patent Owner asserts that it cites Exhibit 2003 "as an example of the technique for illustrative purpose only, not as evidence of the skill in the art at the time of the invention." POR, n. 2. Regardless of whether the POR's exhibits are considered as extrinsic evidence, they do not support Patent Owner's constructions.

are irrelevant to the understanding of the meaning of "*details*" as used in the '532 patent. As to Ex. 2001, Patent Owner cites its definition about "the small elements of an image corresponding to those of the subject strong lighting to achieve clarity of *detail*." Ex. 2001, 1; POR, 11. But nowhere does the '532 patent limit the claimed "*details*" to small elements or strong lighting. As to Ex. 2003, Patent Owner asserts Figure 14 shows "the small elements of an image." POR, 11. But, again, the '532 claims do not limit the "*details*" to small elements of an image. '532 patent, 12:51-63. Thus, Exs. 2001 and 2003 do not support Patent Owner's proposed construction.

2. "high frequency content"

Patent Owner also argues that "*details*" should be limited to "high frequency content." POR, 6. Patent Owner relies on the following statement in the specification: "details which the human eye distinguishes are ones of high contrast and ones whose details have small dimensions. Areas of high contrast are areas with a lot of high frequency content." *Id*., (citing '532 patent, 6:27-30). But the '532 patent specification also made it clear that there are two kinds of "*details*"—"[t]he present invention separates the **details** of a frame into two different types, those **that can only be detected** (for which only one bit will suffice to describe each of **their pixels**) and those **which can be distinguished** (for which at least

three bits are needed to describe the intensity of each of **their pixels**)." '532 patent, 5:28-33; Pet., 7. Patent Owner's proposed "high frequency content" is limited to distinguishable pixels, and excludes the detectable pixels all together. *See* POR, 6. This is incorrect.

Indeed, the '532 patent specification discloses that the "*details*" are not just high frequency content by describing that low pass filters are used to analyze or separate the details. '532 patent, 9:61-65 ("The low pass filters (LPF) are associated with the high pass filters used in analyzer 50. . . . The low pass filters thus pass that which their associated high pass filters ignore."). Table 3 also lists the types of low pass filters used for each subclass of details. *See id*., Table 3. As disclosed in the '532 patent, the content filtered by the low pass filters has lower frequency than the content filtered by the associated high pass filters. *Id*.

TABLE 3

	Low Pass Filters						
Subclass	R1	R2	R3	C1	C2	D-R	D-C
1	0	0	1	0	1	0	0
2	0	0	1	1	0	0	0
3	0	0	1	0	0	0	1
4	0	1	0	0	1	0	0
5	0	1	0	1	0	0	0
6	0	1	0	0	0	0	1
7	1	0	0	0	1	0	0
8	1	0	0	1	0	0	0
9	1	0	0	0	0	0	1
10	0	0	0	0	1	1	0
11	0	0	0	1	0	1	0
12	0	0	0	0	0	1	1

Id., Table 3 (color annotation added). Thus, the '532 patent specification makes it clear that the claimed "*details*" are not limited to the alleged high frequency content.

Moreover, Patent Owner's attorney arguments about the high frequency content, unsupported by any expert testimony or other evidence, are legally and factually incorrect. Patent Owner's proposed construction makes a fatal error because it leaves uncertain and ambiguous what constitutes the alleged "high frequency." "High" is relative to "low." Patent Owner has not explained how high is the alleged "high frequency." Such uncertainty renders Patent Owner's claim construction inoperable. *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898, 910 (2014) (the claims and their constructions must "inform those skilled in the art about the scope of the invention with reasonable certainty").

Patent Owner asserts that "all pixels . . . are classified as either detected or distinguished." POR, 8-9. This is contrary to the '532 patent specification, which states that "there are large swaths of the image (in the background) which have no details in them." '532 patent, 5:24-25. Thus, some of the pixels of the image (some of the background pixels) do not constitute the claimed "*details*." *See id*. Patent Owner's own categorization of the pixels establishes that some pixels are not detected or distinguished. Namely, Patent Owner argues that all pixels can be

placed into three categories: (1) "areas without details," (2) "pixels that form part of details that are only detected," and (3) "pixels that form part of details that are distinguished." POR, 8. The first category of pixels, (1) "areas without details," are the pixels that are not detectable or distinguishable by the human visual system. Accordingly, Petitioner's understanding of "*details*" as "a pixel or a group of pixels that is detectable or distinguishable by the human visual system" comports with the disclosures of the '532 patent specification.

Patent Owner also asserts that because "[t]he identification of 'details' and determination of whether pixels are detected or distinguished are separate operations." *Id*., 9. Patent Owner argues that "Petitioner's proffered definition is overly broad and conflates the identification of details and determination of whether pixels are detected or distinguished." *Id*. This assertion inaccurately characterizes the Petition's explanation about how the "*details*" are processed in the prior art. Practically, the "*details*" must be processed by processing the pixels constituting the details. Karam, ¶¶ 30, 72, 73. Patent Owner fails to offer any explanation about how the "*details*" are processed as processing other than pixels. Moreover, Patent Owner's attack on Petition's interpretation of the claimed "*details*" as encompassing a pixel or group of pixels that is detectable or

distinguishable by the human visual system is undermined by its own notion that a subclass of details is an area with pixels related to the same detail. POR, 18-20.

Finally, the entire dispute created by Patent Owner regarding the meaning of "*details*" is a red herring. Patent Owner's statement that the details are "composed of pixels" is no different from Petitioner's interpretation that the details can be comprised of one or more pixels. *Compare* Pet., 29 ("'details' in the '532 patent claims at least encompasses a pixel or a group of pixels that is detectable or distinguishable by the human visual system"), *with* POR, 7 ("'details' are composed of multiple pixels"). Thus, the only thing that Patent Owner seems to disagree with is that it believes the "*details*" must be limited to high frequency content of the image. But, as discussed above, such limitation is unfounded and not supported by any evidence. Moreover, as discussed below, the cited prior art teaches processing both low and high frequency content.

Furthermore, Patent Owner repeatedly alleges that "*details*" are not "pixels." POR, 10. But, as discussed above, Petitioner did not propose a claim construction that simply equates "*details*" to any pixels. And Patent Owner fails to explain how its distinction between "*details*" and "pixels" makes any difference to the prior art obviousness analysis. Notably, Patent Owner's purported construction has no meaningful impact on the prior art analysis because, during image processing, the

details are processed through processing the pixels constituting the details. If the prior art teaches the same way of processing the pixels as the '532 patent, then it teaches the same way of processing the "*details*" as the '532 patent. As discussed below, even under Patent Owner's definition of the "*details*," the prior art of record still teaches the claim limitations.

B. The record does not support Patent Owner's assertion that the "*spatially and temporally separating . . . details*" must be performed on a per frame basis.

Patent Owner argues that that the parties' proposed claim constructions for the claim phrase "*separating and temporally separating and analyzing details of said frames*" are as follows:

DigiMedia's Construction	Unified's Construction
set apart, isolate, or divide into parts the spatial details from the frame and to set apart, isolate, or divide into parts the temporal details from the frame relative to an earlier frame	analysis to describe spatial and temporal characteristics of pixels on a per pixel basis

POR, 11 (color annotation added). Patent Owner's text box reproduced above is misleading, as Petitioner did not provide a proposed construction for the "*separating*" claim phrase. In fact, Patent Owner concedes that "**Petitioner does not set out an explicit interpretation** for 'spatially and temporally separating and analyzing details of said frames.'" *Id*., 17. Notwithstanding the lack of a proposed

construction by Petitioner, Patent Owner argues that Petitioner's "construction" is flawed because it requires separating on a per pixel basis. *Id*.

1. The '532 patent discloses "*spatially and temporally separating . . . details*" on a per pixel basis.

Patent Owner fails to identify any disclosure in the '532 patent specification where separating is not conducted on a per pixel basis. In fact, the Patent Owner Response quotes five different examples of separating on a per pixel basis. *Id*., 16. Furthermore, Patent Owner's citations allegedly showing separating on a per-frame basis (*id*., 17) are consistent with the notion of per-pixel separating because any per-frame separating must be done by processing individual pixels. Patent Owner has not provided any evidence to show this is not the case in the '532 patent. As described in the '532 patent, image filtering, whether it is applied to an entire frame or a local area of the frame, must be performed by applying the filters to individual pixel values. *See* Karam, ¶¶ 81, 85. As explained by Dr. Karam, spatial filtering is performed by applying mathematical operators, e.g., matrixes, "to a pixel surrounded by a region." Karam, ¶ 81 (citing *Wu*); *see also id*., ¶ 85 ("A POSA would have understood that the highpass operators, such as Gk(I, j), and weighted lowpass operator, such as B(I, j), all in the form of matrices, are spatial filters that analyze how one pixel relates to another.") (citing *Jayant* and *Wu*). The '532 patent also explains that the separating includes "spatially filter[ing] each

pixel of the frame"). '532 patent, 6:3-12. Therefore, the alleged per-frame separating still needs to be performed at the pixel level. As established in the Petition, this is taught by the cited prior art. Ex. 1006 ("*Gu")*, 11:29-36 ("ild(x, y, n) denotes the average interframe luminance difference between the n th and (n−1) th **frame**") (emphasis added); *id*., 11:36-44 ("to calculate the spatio-temporal JND profile for **each frame** in a video sequence") (emphasis added); Pet., 32-38; Karam, ¶¶ 80-84. Accordingly, *Gu* teaches both the per-frame and the per-pixel separating. *See id*. Patent Owner's alleged distinction is meaningless to the inquiry of this IPR.

Patent Owner alleges that the Petition avoids explicit construction of the "*separating*" because its prior art mapping of this term causes inconsistency to its earlier interpretation of "*pixels*" as encompassing a pixel or a group of pixels. POR, 17-18. This allegation is incorrect because Petitioner's mapping of the "*separating*" to performing spatial and temporal filtering of the pixel(s) is not only consistent with its usage of "*pixels*," but also matches the '532 patent's usage. *Compare* Pet., 38 ("*Gu* teaches that mg(x,y) and bg(x,y) filter the pixel information in each video frame with respect to its visual characteristics 'in the spatial domain,' while ild(x,y,n) filters the pixel information in each video frame with respect to its visual characteristics 'due to motion'"), *with* '532 patent, claim 7 ("*wherein said*

step of separating and analyzing also includes the step of spatial high pass filtering of small dimension details and temporal filtering for detail motion analysis").

2. The extrinsic evidence relied upon by Patent Owner is irrelevant.

Unable to find any intrinsic evidence to support its construction, Patent Owner turns to extrinsic evidence, Exhibits 2002-2004. POR, 12-15. But, as discussed in Section II.A, these exhibits were created after the '532 patent's claimed priority date. Patent Owner failed to identify how the post-priority date documents would have been relevant and known to an ordinary artisan as of the '532 patent priority date. Accordingly, Exhibits 2002-2004 should not be given any weight. S*ee* Petitioner's Objection to Exhibits, Paper 11, 2-4; *Unified Patents*, IPR2019-01379, Paper 52, 56-57. Moreover, these exhibits do not support Patent Owner's construction. For example, contrary to Patent Owner's assertion that the separated "*details*" are limited to high frequency content, Exhibit 2003 discloses that lowpass filters can be applied to the images to separate the low-frequency content from the images. *Compare* Ex. 2003, Figures 12 and 13 (lowpass filtering, not cited by the POR), *with id.*, Figure 14 (highpass filtering, cited by the POR). Moreover, Exhibit 2004 discloses a technique for extracting local image features by using "a calculation which makes it conceivable to recognize and depict **neighborhood feature** of a[n] image." Ex. 2004, 1188 (emphasis added). This is

contrary to Patent Owner's notion that "*separating*" must be performed on a per frame basis. Additionally, the exhibits' teaching actually supports Petitioner's mapping of "*separating*." For example, the definition of "separate" in Exhibit 2002 (Merriam-Webster's Dictionary dated 2023)—"1a: to set . . . apart . . . 5a: to isolate from a mixture . . . b: to divide into constituent parts"—is consistent with the *Gu*'s teaching of filtering the image content in the spatial domain and temporal domain separately, so as to extract different kinds of information from the original images. *Gu*, 9:50-11:55; Pet., 36. And the examples in Exhibit 2004 that Patent Owner alleges "illustrate the different *spatial* and *temporal* separations of frames that can be performed . . . ," POR, 15, are actually consistent with the *Gu*'s teaching of filtering the image content in the spatial domain and temporal domain separately. *Gu*, 9:50-11:55; Pet., 36.

C. Patent Owner's accusation about Petitioner's interpretation of "*subclass*" is unfounded.

Patent Owner argues that the parties' proposed constructions for "*subclass*" are contradictory. POR, 18. Yet, similar to the claim phrase discussed in the previous section, Patent Owner concedes that "Petitioner does not set out an explicit interpretation for 'subclass.'" *Id.*, 19. In fact, Petitioner did not propose a claim construction for the term "*subclass*." Regardless, Patent Owner asserts that "Petitioner's arguments imply an interpretation of 'subclass' to include a

characteristic of a macroblock as containing: (1) 'small, random details' or (2) 'large, connected details,'" and, "[t]herefore, according to Petitioner's interpretation, the thing to be classified is a macroblock." *Id*., 19-20. As explained below, Petitioner does not propose that the thing to be classified is a macroblock.

First, Patent Owner mischaracterizes the way the Petition mapped the prior art to the claimed "*subclass*." Specifically, it asserts that the Petition equated a macroblock to a subclass of details. *Id*., 20. This is incorrect. The Petition stated:

> As understood by a POSA, if all the sub-blocks in a particular macroblock likely have connected surviving pixels (i.e., details), the **surviving pixels (i.e., details) in the macroblock** likely form large, connected details (annotated in the orange boxes); otherwise, the **surviving pixels (i.e., details) in the macroblock** are small, random details (annotated in the orange boxes).

Pet., 58 (emphases added); *see also* Karam, ¶¶ 105-14. Accordingly, the Petition is clear that the surviving pixels in a macroblock are classified into different subclasses—large, connected details and small, random details. *See* Pet., 58. The Petition did not argue the entire macroblock constitutes a subclass. Thus, Patent Owner's accusation is unfounded.

Second, even if Patent Owner's construction of the "*subclass*" is adopted, the Petition has demonstrated that the cited prior art teaches it. *See id*. The Petition cited *Chiu*'s disclosure that skipping encoding the macroblocks containing the

small, random details can "enhance[] perceptual preprocessing by taking advantage of **the inability of the HVS to distinguish** the randomness of pixel locations in the difference frame in order to skip more macroblocks." *Id*. (quoting Ex. 1005 ("*Chiu"*), 12:7-11) (emphasis added); Karam, ¶ 105-114. Thus, according to *Chiu*, the pixels relating to the small, random details are not distinguishable from each other. As Dr. Karam opined, this disclosure is the same as the '532 patent's teaching that "a pixel that is not significantly present in the filtered frames belongs to a large detail or one that is 'only detected but not distinguished.'" Karam, ¶ 106. Accordingly, the cited prior art teaches Patent Owner's construction.

III. *Chiu* in View of *Gu* and the Knowledge of a POSA Renders Obvious Claims 6 and 16

Patent Owner makes only the following two arguments against the sole ground in this case, Ground 1: (1) *Chiu* in view of *Gu* and the knowledge of a POSA does not teach Patent Owner's proposed construction for "*details*" and "*spatially and temporally separating and analyzing details of said frames*," and (2) *Chiu* in view of *Gu* and the knowledge of a POSA does not teach Patent Owner's proposed construction of "*subclasses.*" Accordingly, if the Board does not agree with Patent Owner's proposed claims constructions, it need not consider the arguments against Ground 1. Regardless, even if Patent Owner's claim constructions are adopted, the proposed combination of *Chiu* in view of *Gu* and the

knowledge of a POSA still teaches them. Furthermore, Patent Owner does not dispute that one of skill in the art would have found it obvious to combine *Chiu* with *Gu* and the knowledge of a POSA, nor does it dispute the provided rationales for the combining them. Accordingly, *Chiu* in view of *Gu* and the knowledge of a POSA renders obvious the challenged claims.

A. *Chiu* in view of *Gu* and the Knowledge of a POSA teaches "*spatially and temporally separating . . . details of said frames*" by disclosing applying spatial and temporal filters to the pixel values of a frame.

Patent Owner argues that the cited prior art does not disclose the "*separating*" step under its proffered construction—"setting apart, isolating, or dividing into parts the spatial elements of an image composed of pixels that have high frequency content of frames and setting apart, isolating, or dividing into parts the temporal elements of an image composed of pixels that have high frequency content of frames relative to an earlier frame." POR, 22. Even if this overly narrow and unsupported claim construction were correct, which it is not, the proposed combination of *Chiu* in view of *Gu* and the knowledge of a POSA teaches the proposed limitations.

As detailed in the Petition, *Gu* teaches the claimed "spatially and temporally separating . . . details of said frames" by disclosing transforming the pixel information in each video frame n into:

- mg(x,y): spatial texture characteristics due to local luminance changes;
- bg(x,y): spatial average background luminance;
- ild(x,y,n): temporal characteristics due to motion or due to temporal intensity changes.

Pet. 36 (citing *Gu*, 9:50-11:55; *Karam*, ¶¶ 79-82). Thus, *Gu* teaches the claimed "spatially and temporally separating . . . details of said frames" by disclosing calculating, respectively, mg(x,y) (which involves spatial highpass filtering) and bg(x,y) (which involves spatial lowpass filtering) in the spatial domain and ild(x,y,n) (which involves creating a difference frame) in the temporal domain. Pet. 36 (*Karam*, ¶¶ 80-84). Dr. Karam testified that "[a] POSA would have understood these functions to be forms of separating details because they relate neighboring pixels to one another, both within the frame to which they belong and between frames." *Karam*, ¶ 84. This testimony from Dr. Karam is unrebutted by Patent Owner.

The disclosure of this processing in *Gu* is very similar to the processing disclosed in the '532 patent. Accordingly, *Gu* teaches Patent Owner's proposed construction of "setting apart, isolating, or dividing into parts" both spatially and temporally. Moreover, *Gu* teaches the use of high-pass filters. *See* Pet., 36 ("*Gu* further teaches that mg(x,y) is computed using four directional high-pass filters.");

Karam, ¶ 81. Dr. Karam testified that "A POSA would have understood the $G_k(I,j)$ operators to be highpass filters because they measure the spatial nonuniformity." *Karam*, ¶ 81. Notably, Patent Owner fails to offer any testimony to rebut Dr. Karam and offers only unsupported attorney argument.

Patent Owner further argues that "Petitioner takes the position that the thing that is being separated is the calculation of mg(x,y), bg(x,y), and ild(x,y,n) on a pixel-by-pixel basis." POR, 24. However, Patent Owner cites to similar disclosure of analysis in the '532 patent as an example of the "*separating*" step. *See id*., 21. Specifically, Patent Owner cites the following disclosure in the '532 patent: "**spatial temporal analyzer 50** generates a plurality of filtered frames from the current frame, each filtered through a different high pass filter (HPF)." *Id*. (citing '532 patent, 6:31-34). As noted in the Petition, the '532 patent discloses an example of this analysis as follows: "For example, **a filter implementing $\cos^{10}x$ takes 10 pixels around the pixel of interest**, five to one side and five to the other side of the pixel of interest." Pet., 35, (citing '532 patent, 6:51-54) (emphasis added). Thus, the '532 patent discloses that its spatial temporal analyzer 50 performs the "*separating*" step based on calculations and processing performed on pixels. *Id*. Like the '532 patent, *Gu* discloses similar processing is performed by

high-pass and low-pass filter operators, as detailed in the Petition. *See* Pet. 36-39 (citing *Gu*, 9:50-11:55).

Patent Owner also argues that it is wrong to view "the thing from which the 'details' . . . are 'separated' are *pixels* as opposed to *frames*." POR, 24. Yet, Patent Owner's position is contrary to disclosure from the '532 patent above that expressly discloses that the "*separating*" step is performed on pixels. *See* '532 patent, 6:51-54. Furthermore, as discussed in Section II.B, the filter, even if it is used to filter an entire frame, still needs to be applied at the pixel level. Thus, Patent Owner's emphasis on the distinction of per-frame filtering and per-pixel filtering is not persuasive because the claim does not exclude separating or filtering based on pixels.

Moreover, even if Patent Owner's unclaimed requirement of frame-based separating is adopted, the cited prior art still teaches it. *Gu*'s temporal filter is applied by comparing the difference between two different frames. *Gu*, 9:54-59, 11:29-36; Pet., 34-35. Here, the difference is a frame. *Gu* also suggests that the spatial filters mg(x,y) and bg(x,y) can be applied to the pixels in the entire frame by disclosing that these filters can be applied to the pixel information in each video frame with respect to in the spatial domain. *Gu*, 11:36-44; Pet., 38.

Patent Owner also asserts that "calculating characteristics of pixels based on neighboring pixels is not a disclosure of separating pixels from a frame—as claim 6 requires." POR, 23. This attorney argument is not supported by any evidence. On the contrary, Dr. Karam testified that the characteristics of neighboring pixels are correlated, thus the per frame analysis entails local analysis. Karam, ¶ 84 ("A POSA would have understood these functions to be forms of separating details because they relate neighboring pixels to one another, both within the frame to which they belong and between frames."). Patent Owner suggests that Dr. Karam's testimony shifts from analysis of local characteristics of pixels to the per frame analysis. POR, 27. However, Patent Owner fails to offer any testimony to rebut Dr. Karam. As Dr. Karam explains, "relat[ing] neighboring pixels to one another" means that the analysis will ultimately reach the entire frame. *See* Karam, ¶¶ 81-84.

Patent Owner further asserts that Petitioner is internally inconsistent with its interpretation of "*details*" because "Petitioner is reinterpreting 'details' to mean the calculation of mg(x,y), bg(x,y), and ild(x,y,n)," which is inconsistent with Petitioner's position that "'details' are 'a pixel or a group of pixels that is detectable or distinguishable by the human visual system.'" POR, 24. Patent Owner is incorrect because, as discussed above, the Petition mapped the separate

of mg(x,y), bg(x,y), and ild(x,y,n) to the act of "*separating*," rather than the "*details*." Pet., 35-40.

B. *Chiu* in view of *Gu* and the Knowledge of a POSA teaches "classifying said frame picture details into subclasses in accordance with said visual perception thresholds and said detail parameters" by disclosing the surviving pixels in macroblocks are classified into small, random details or large, connected details.

Patent Owner's prior art arguments regarding the "*subclasses*" is also unavailing. Particularly, Patent Owner argues that "[n]either *Chiu* nor *Gu* disclose or teach classifying the calculations of mg(x,y), bg(x,y), and ild(x,y,n) 'into *subclasses* in accordance with said visual perception thresholds,' as claimed. POR, 27. This assertion is misplaced because the Petition mapped *Gu*'s mg(x,y), bg(x,y), and ild(x,y,n) filters to the claimed "*spatially and temporally separating and analyzing*," not "*classifying said frame picture details*." *Compare* Pet., 32-45, *with id*., 51-59.

Like in other parts of the POR, Patent Owner continues to allege that the Petition's treatment of "*details*" is inconsistent with its earlier mapping for the same term. POR, 26-27. But, as explained in Section II.C, there is no such inconsistency. Moreover, Patent Owner agrees with Petitioner that the details are composed of pixels. *See* POR, 7. Thus, any processing of the details, whether it being "*separating*," "*analyzing*," or "*classifying*," can be performed on the pixels.

Accordingly, mapping the claimed "*subclasses*" to surviving pixels is consistent with the Petition's mapping of "*details*" elsewhere.

Patent Owner also alleges that "Petitioner has adopted the position that a subclass is a characteristic of a macroblock as containing small, random details (subclass 1) or large, connected details (subclass 2) as determined based on a number of surviving pixels following a comparison to a visual perception threshold." POR, 27. Patent Owner's argument is misplaced because, as discussed above, the Petition mapped *Chiu*'s surviving pixels, not the macroblocks or their characteristics, to the claimed "*subclass*." Pet. 51-59. This mapping is consistent with the "*subclass*" disclosed in the '532 patent. *Supra*, Section II.C. The Petition demonstrated that *Chiu* discloses that the surviving pixels in a macroblock are classified into small, random details or large, connected details, thereby disclosing the claimed "*classifying said frame picture details into subclasses*." *See* Pet., 58 (citing *Chiu*, 11:15-25).

C. *Chiu* in view of *Gu* and the Knowledge of a POSA renders obvious claim 16

The Patent Owner's Response does not provide any additional rebuttal to Petitioner's challenge to claim 16, other than merely relying on the same assertions made for claim 6. POR, 28-29. For the same reasons provided in the Petition, as

well as those stated in this Reply, claim 16 is obvious over *Chiu* in view of *Gu* and the knowledge of a POSA.

IV. Conclusion

For the reasons set forth above, and as outlined in the Petition, Petitioner has established that claims 6 and 16 are unpatentable. Petitioner respectfully requests that the Board cancel each challenged claim.

Dated: July 21, 2023

By: /Trenton A. Ward/
Trenton A. Ward, Lead Counsel
Reg No. 59,157
Counsel for Petitioner

CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. § 42.24(d), the undersigned hereby certifies that the foregoing PETITIONER'S REPLY TO PATENT OWNER'S RESPONSE contains 5,352 words, excluding the parts exempted under 37 C.F.R. § 42.24(c), as measured by the word-processing system used to prepare this paper.

Dated: July 21, 2023

By: / Trenton A. Ward /
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CERTIFICATE OF SERVICE

The undersigned hereby certifies that a copy of the foregoing PETITIONER'S REPLY TO PATENT OWNER'S RESPONSE was served electronically on July 21, 2023, on counsel of record for the Patent Owner as follows:

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