Paper 23

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE, INC.,

Petitioner

v.

QUALCOMM INCORPORATED,

Patent Owner

Case IPR2018-01250

U.S. Patent No. 8,447,132

QUALCOMM INCORPORATED'S
PATENT OWNER RESPONSE

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Exhibit No.	Description
2001	1250 Expert Declaration of Dr. John Villasenor
2002	Curriculum Vitae of Dr. John Villasenor
2003	omitted
2004	Transcript of March 28, 2019 Deposition of Alan Bovik, Ph.D.

I. INTRODUCTION

Petitioner alleges that the only challenged independent claim, claim 1, is anticipated by Needham. But, by Petitioner's own admissions and those of its Expert, Needham fails to disclose a correction being "matched" to the determined physical object, and that matched correction applied to two regions of the image in two different amounts. Petitioner's secondary reference, Nonaka, fails to remedy this deficiency. Both references simply fail to disclose the level of detail by which claim 1's image correction technique is defined. Further, POSITA would not have been motivated to combine the disparate systems of Needham and Nonaka to maximize Needham's dynamic range. Needham's technique already maximized dynamic range. Furthermore, Nonaka's system operates on a specific architecture requiring a reference image that is not available in Needham's system. At least for these reasons, as described in more detail below, the claims of the '132 Patent should be found patentable.

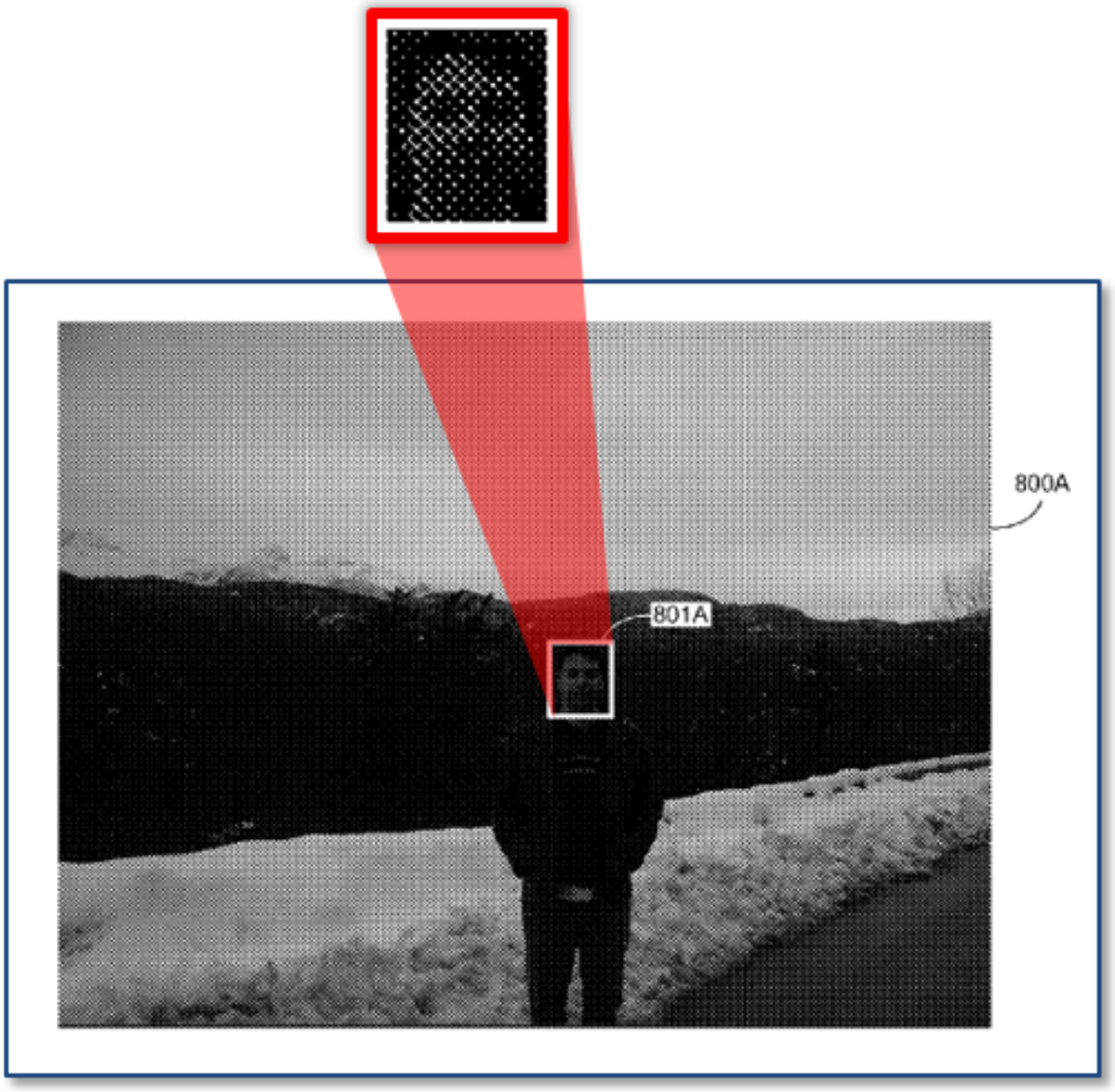
II. OVERVIEW OF U.S. PATENT NO. 8,447,132 (the '132 Patent)

The '132 Patent is generally directed to image enhancement techniques based on content in the image.

The '132 Patent explains certain shortcomings in prior digital camera technologies. For example, "[d]etail visible to the human eye tends to be lost in dark and bright portions of an image due to the limited dynamic range of the image

sensor and/or the display device." APPLE-1001 at 1:20-23. For example, lower image quality of these digital photos can result in an image in which a person's face is darkened because of a bright region elsewhere in the image. *See id*. at 1:28-35.

Figure 8A (annotated below) shows an example of this problem. "Specifically, FIG. 8A shows an example of an image 800A with no dynamic range correction applied. As can be seen, the face area 801A in image 800A is hardly recognizable; it is too dark, in contrast to the sky and the snow bank in the background." *Id.* at 9:56-60. The limited dynamic range of the image sensor results in a loss of detail in the user's face when preventing the saturation of white from the snow in the image. *Id.* at 1:19-39.



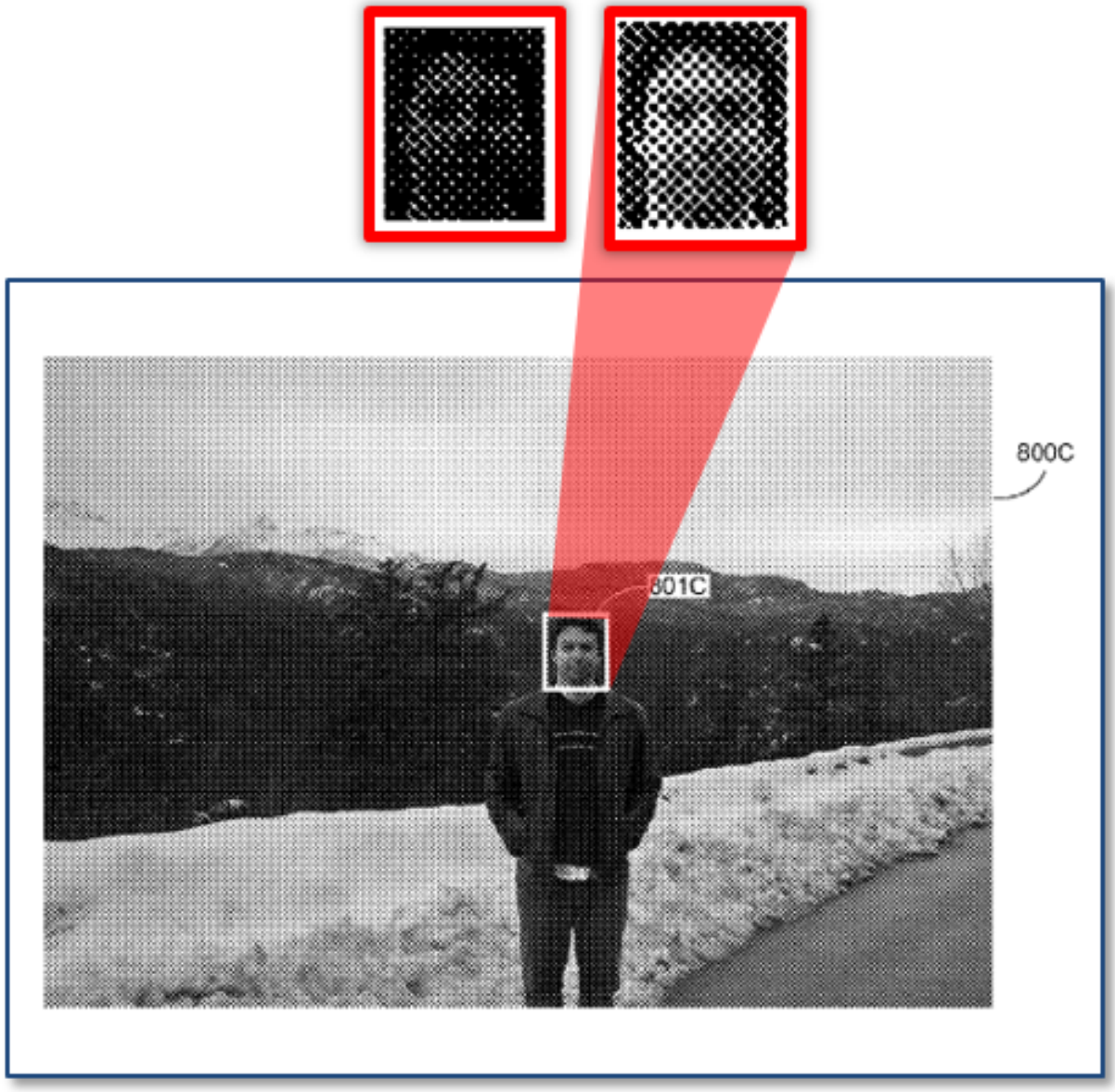
Id. at Fig. 8A (annotated)

As a solution, the ’132 Patent describes: analyzing image content to identify portions of the image, for examplephysical object(s), determining a correction to apply to an identified portion that is matched to an identified physical object, and applying different amounts of correction to corresponding portions of the image. *See id.* at Cl. 1.

For example, the '132 Patent describes "making a determination that a first portion of digital image data represents a physical object of a predetermined type, determining an amount of a parameter such as gain to apply to the first portion of the digital image data, based on the determination that the first portion of the digital image data represents a physical object of the predetermined type, and applying the determined amount of the parameter to the first portion of the digital image data." *Id*. at 2:53-60. "The amount of the parameter applied to the first portion may be a different amount than that applied to the image as a whole (or at least to those parts of the image data that do not represent a physical object of the predetermined type)." *Id*. at 2:60-64. Examples of such enhancements include dynamic range correction, gain adjustment, contrast enhancement, color manipulation, sharpness adjustment, and noise reduction. *Id*. at 3:59-64. For instance, an enhancement may include dynamic range correction may be applied to a physical object (e.g., a face) in a dark photograph. *See id.* at 2:44-50.

One approach includes identifying a face in the image, determining a correction to apply to the image, and applying different amounts of the correction to the face and another image. *Id*. at 2:15-17. With a face identified, the face can "be made bright and visible without causing loss of information in the bright areas of the image (saturation)" by applying a first amount of correction to the face and a different amount of correction to another portion of the image. *See id*. Figure 8C

(annotated below) shows this facial correction performed on the image of Figure 8A.



Id. at Fig. 8C (annotated).

As explained in the specification:

> FIG. 8C shows an example of the same image after dynamic range correction is selectively applied based on knowledge of the content of the image (i.e., based on the presence and location of the face area 801C in this example), according to the technique introduced here. As can be seen, the face area 801C in image 800C is much brighter than in the previous two images.

Id. at 10:15-21. The correction to another portion of the image is performed by applying a different amount of correction to the background. *See id.* at 6:34-44. For example, a different gain value is used to apply the same correction that was applied to the face to a background region of the image, resulting in an increase in detail in that background region. This improvement in the background is also seen in comparing Figure 8A to Figure 8C shown below:

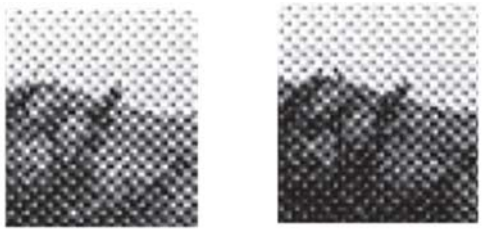


Fig. 8C **Fig. 8A**

The dynamic range correction of the '132 Patent described above is claimed in one particular application recited in claim 1. Claim 1 recites that a correction

applied to a particular region of the image is determined by matching the correction of the object of a particular type detected in the image. That "matched" correction is then applied in two different amounts to two different portions of the image. That is, the claim recites that a correction matched to an object on the image is applied to the portion of the image containing the object, and that correction is also applied to another portion of the image.

III. OVERVIEW OF THE GROUNDS OF REJECTION

The Institution Decision instituted *inter partes* review on three grounds:

(1A) claims 1 and 5-7 of the '132 Patent as allegedly anticipated or obvious in view of Needham alone and/or Needham in view of Nonaka;

(1B) claim 8 as allegedly obvious in view of Needham in view of Dvir and/or Needham in view of Nonaka and Dvir;

(1C) claim 13 as allegedly obvious in view of Needham in view of Gallagher and/or Needham in view of Nonaka and Gallagher.

Thus, all asserted Grounds rely on Needham alone or Needham and Nonaka.

IV. CLAIM CONSTRUCTION

A. "physical object of a predetermined type" (Claim 1)

Petitioner seeks to construe "physical object of a predetermined type" as "something of a predetermined type which exists in the real (physical) world and which can be visually recognized as such by a human being when depicted in a digital image, and which excludes virtual or abstract objects and concepts such as

pixels, data, and image characteristics and parameters." Pet. at 14-15. Patent Owner disputes that this term requires any construction apart from its plain meaning. Further, the construction of this term has no impact on the actions of these proceedings.

B. "gain" (Claim 7)

The ordinary meaning of "gain" as understood by a POSITA in view of the '132 Patent is "an attribute that relates to brightening or darkening a region of an image." Villasenor Decl. ¶107. This is consistent with the '132 Patent, which uses the term "gain" in the context of increasing or decreasing the intensity of colors, such as to "increase the intensity of darker portions of an image." APPLE-1001 at 2:14-17, 5:15-24, 5:54-60; Villasenor Decl. ¶107.

C. "gain map" (Claim 13)

The ordinary meaning of a "gain map" as understood by a POSITA in view of the '132 Patent is "a representation of a plurality of gain values corresponding to different locations of an image." Villasenor Decl. ¶107. This is consistent with the '132 Patent which describes a gain map: "gain map, i.e., a two-dimensional map of gain coefficients to be applied to input pixel intensity values." APPLE-1001 at 3:10-12; Villasenor Decl. ¶107. As defined above, a "gain" is a "an attribute that relates to brightening or darkening a region of an image."

V. LEVEL OF ORDINARY SKILL IN THE ART AT THE TIME OF THE '132 PATENT

The level of ordinary skill in the art as of December 9, 2009, the priority date of the '132 Patent, is a Bachelor of Science degree in electrical engineering, computer science, or a related discipline, and 2-3 years of experience in image processing. Villasenor Decl. ¶30. Although this definition differs from that proposed by petitioner, the difference would not change the actions of this proceeding. Villasenor Decl. ¶¶31-32.

VI. NEEDHAM DOES NOT ANTICIPATE CLAIM 1

Ground 1A alleges claim 1 of the '132 Patent is anticipated by Needham. For the reasons explained below, Needham does not anticipate any of claims 1 and 5-7, because the prior art's disclosure does not describe the correction technique recited in claim 1.

Independent claim 1 recites:

[1p] A method comprising:

[1a] determining whether a first portion of digital image data represents a physical object of a predetermined type;

[1b] determining a correction to apply to the first portion of the digital image data, based on a determination that the first portion of the digital image data represents a physical object of the predetermined type, wherein the determined correction is matched to the predetermined type;

[1c] applying the determined correction to the first portion of the digital image data to enhance a visual characteristic of the first portion of the digital image data, by applying a first amount of the correction to the first portion of the digital image data; and

[1d] applying a second amount of the correction to a second portion of the digital image data, wherein the first amount differs from the second amount, and wherein the first amount corresponds to a physical object of the predetermined type.

APPLE-1001 at Cl. 1. As recited in claim 1, an image is corrected by applying different amounts (e.g., the claimed "first amount" and "second amount") of gain of the same correction to two different portions of the input image in steps [1c] and [1d]. That same correction that is applied to two different portions has to be "matched" to the type of the physical object in the image according to step [1b]. The '132 Patent describes examples of the different correction amounts as including different gain curves, such as shown in figure 7, that map input pixel intensities to output pixel intensities. *Id.* at 3:12-27, 5:52-60. The correction applied in the first and second amounts is "matched to the predetermined type" of physical object determined in the first portion of the image at step [1a]. For example, the '132 Patent describes that a lookup table provides gain values for use with a particular detected object type, and additional lookup tables can provide gain values for other object types. *Id.* at 5:65-67, 6:22-25.

A. Needham Describes An Image Correction Framework With Multiple Distinct Approaches to Correcting Images

Needham describes "an automated feature-based image correction mechanism" for "performing one or more correction operations." *Id.* at [0029]. The correction is performed on an image for "adjusting, enhancing, and in any other way modifying the image and/or image feature characteristics whether for technical or aesthetic purposes." *Id.* at [0017]. The corrections are performed on, for example, an image acquired from a camera after storing the image in memory in a technique referred to as post-processing. *Id.* at [0016] Villasenor Decl. ¶69. During the automated correction, "[i]mage feature types to be detected and the associated weights (if any) are specified." APPLE-1001 at [1016]; Villasenor Decl. ¶33. Then, "feature descriptions are [] used to correct [] the input image" with "correction operation(s) . . . performed on either individual features or on the entire input image." *Id.* One correction of interest to Needham is backlight control. For example, Needham discloses that "maximizing the intensity dynamic range (i.e., enhance the contrast) may be performed on a human face image feature and a different correction operation that increases the brightness may be applied to the image feature that represents the sky." *Id.* at [0020].

Needham describes different embodiments for applying corrections to the images. Weights are used when corrections are applied to individual image features, unlike when the same correction is applied across the entire image. For

example, Needham discloses in one embodiment that "[w]hen a correction operation is applied to the entire input image, the statistical properties of the detected features may be used to determine how the overall correction may be performed." *Id.* at [0027]. However, in another embodiment, "[w]hen a correction operation is applied to an individual image feature, the correction performed on the image feature may be based on both the specified correction parameter(s) 240 as well as the feature weight 230." *Id.* at [0027]. That is, feature weights are used when correction operations are specified at a feature level such that different corrections are applied to different features. But, Needham discloses no matching of these different corrections to the different types of features. This lack of matching is demonstrated in two ways in Needham. First, Needham discloses multiple objects of the same type receiving different corrections. *See id.* at [0032] ("The operational parameter(s) may also specify that different occurrences of the same image feature type (e.g., different human faces) in an image receive a differing correction operation."). Additionally, corrections would be applied regardless of whether any particular object type or even whether any object was detected as confirmed by Petitioner's expert Dr. Bovik. Ex. 2004 at 112:3-16.

The lack of matching is a result of the lack of specificity for any particular correction technique applied by Needham, because Needham focuses on providing a generic framework for correcting images. The Petition relies extensively on

Needham's paragraph [0022]. *See, e.g.,* Pet. at 18, 21, 25, 26. Needham provides an example in paragraph [0022] that when maximizing intensity dynamic range for "both human faces and buildings and a human face feature has a higher weight than a building feature, the intensity dynamic range used for correcting human faces in an image may be larger (corresponding to higher contrast) than that used for correcting buildings in an image." *Id.* at [0022] Villasenor Decl. ¶33. Needham describes applying corrections to the image features that cause "the human faces [to] be corrected so that they become more visible than buildings." *Id.* Needham describes in paragraph 22 a goal for the dynamic range correction, but does not disclose in this example the actual corrections being applied to the face and the building to obtain the indicated visibility. This lack of specificity in Needham's disclosure is fatal to the Petitioner's allegation that the specific image processing technique of claim 1 is anticipated by Needham, because there is no disclosure that different amounts of the same correction matched to one of the objects in the image are applied to different portions of the image.

B. Needham Does Not Disclose "Determining A Correction To Apply . . . [That] Is Matched To The Predetermined Type" of Physical Object, "Applying A First Amount Of *The [Matched] Correction* To The First Portion," And "Applying A Second Amount Of *The [Matched] Correction* To A Second Portion" (Claim 1)

1. When Needham applies a correction to different objects, that correction is not matched to a predetermined type of object

Needham fails to disclose that a correction is determined that is ***matched*** to the "predetermined type" of physical object detected on the image as required by Claim 1. Villasenor Decl. ¶51. The Petition alleges this matching in the petition by inserting the word "matching" in its allegation without providing explanation or support. The petition alleges that Needham discloses "determining the correction parameter and the feature weight corresponding to (i.e., matched to) the detected image feature." Pet. at 14. The Petition concludes from this that "the determined correction is matched to the predetermined type." *Id.* This is the only reference to any correction being "matched" in the Petitioner's discussion of claim limitation [1b] and it is only a conclusory statement with no cited support from Needham. *See id*.

In addition to Petitioner failing to address this aspect of the claims, Needham fails provide disclosure regarding matching of a correction to a predetermined type of physical object. For example, Needham merely discloses that an image feature can have a defined correction parameter and feature weight, not that any correction is *matched* to the particular image feature type in a predetermined manner.

Villasenor Decl. ¶51. That correction parameters are specified for each feature is insufficient to demonstrate that the correction parameters are "matched" to a particular object type. *Id*. Needham does not describe the cause-effect relationship that a determined type of physical object results in the particular correction that is applied to the objects of that type in the image. *Id.* To be "matched," a particular correction must be applied to a particular physical object because it is that particular type. In fact, Petitioner's expert admitted that Needham does not disclose this element when Dr. Bovik stated that the corrections would be applied regardless of whether any object (e.g., a building) was detected:

> Q. In paragraph 22, Needham doesn't say that it's applying an intensity dynamic range correction to the face and the building because there's a face in the image; does it?
>
> A. I don't think that Needham is saying that the example that begins with "for instance" in paragraph 22 requires that the input image have faces in it. They may or may not.
>
> Q. And in paragraph 22, Needham doesn't say that it's applying an intensity dynamic range correction to the face and the building because there's a building in the image; does it?
>
> A. I think the algorithm would be applied whether or not there's a building in the image.

Ex. 2004 at 112:3-16. Dr. Bovik further recited that corrections would be applied regardless of whether a face was detected: "Q. Would that algorithm also be applied whether or not there's a face in the image? A. I already said that. Yeah."

Ex. 2004 at 112:18-20. If Needham's correction happens even in the absence of an object, then that correction is not matched to the object.

Other portions of Needham cited by the Petition (e.g., Needham's paragraphs [0019]-[0020], [0026]-[0027], [0031], [0035]) are likewise insufficient to disclose element [1b] because these portions describe generically defining corrections for image features, but never state that a particular image feature receives a *particular* correction such that a correction is "matched" to the detected object type as required by claim 1. Villasenor Decl. ¶51. At least for this reason, the foregoing disclosure of Needham does not anticipate independent claim 1.

Needham's paragraphs [0019]-[0020] describe that "correction operations may also be defined for each image feature" such that "contrast and brightness may be corrected for a specific image feature such as a human face." However, this example is only stating that a particular face in the image receives certain corrections, not that the faces in the image are applied this particular correction because the object is a face such that they are "matched." Villasenor Decl. ¶51. Needham's paragraph [0026] describes that "based on the feature description 260, the feature-based correction unit 270 performs one or more specified correction operations according to the correction parameter(s) 240." However, there is no disclosure that the correction parameter(s) 240 are matched to a particular feature type. Villasenor Decl. ¶51. Needham's paragraph [0027] describes that "the

statistical properties of the detected features may be used to determine how the overall correction may be performed." However, this is too vague to indicate that the overall correction is matched to a detected feature as in claim 1 because in one example scenario the detected features may include two features (e.g., a building and a face). In that scenario, the overall correction is determined from the combined statistical properties of the building and the face, and the overall correction is not matched to either the building or the face, and thus paragraph [0027] does not describe matching feature types to corrections. Villasenor Decl. ¶51. Needham's paragraph [0031] describes generally the construct of a correction parameter, but not that the correction parameter is matched to any particular feature type. Villasenor Decl. ¶51. Needham's paragraph [0035] describes generically applying correction operations on various image features, but not that a particular image feature type receives a particular correction because that image feature is recognized as a particular type of image feature. Villasenor Decl. ¶51. Thus, each of Petitioner's citations in Needham fail to disclose the "matched" aspect recited in claim 1.

In addition to matching a correction to an object type, claim 1 requires, and Needham fails to disclose, that the matched correction is applied to two portions of the image in different amounts.

As described in more detail below regarding Needham's weights, the crux of Petition's argument is centered on Needham's paragraph [0022]. But paragraph [0022] provides no more clarity regarding how the particular corrections are determined and applied for image features, and certainly not determining two different amounts of a particular correction selected based on a physical object type matching that particular correction exists.

2. When Needham matches a correction to an object in an image, Needham does not also apply a different amount of **that same** *correction to a second portion of the image*

The Petition alleges that Needham's application of weights to image features are the first and second amounts of correction. *See* Pet. at 15 ("applying weights to control correction parameters are . . . applying different amounts of the correction"). However, Needham teaches that the weights are not the corrections therein and also does not describe how the weights control the amount of correction to apply to a feature in an image. Villasenor Decl. ¶¶39-50. For example, Petitioner has failed to identify anything in Needham showing application of the same correction using two different weights to two portions of an image wherein *that particular correction* is "matched" to the physical object type of one such portion of the image. Thus, Needham's disclosure of these weights is not sufficient to demonstrate applying a "first amount of the correction" and a "second amount of the [same] correction" as required by Claim 1. *See Spansion,*

Inc. v. Int'l Trade Comm'n, 629 F.3d 1331, 1356 (Fed. Cir. 2010) (anticipation exists "when the four corners of [that] . . . document describe every element of the claimed invention, either expressly or inherently, such that a [POSITA] could practice the invention without undue experimentation.").

Petitioner asserts that the "weights" of Needham are the different correction amounts of independent claim 1 (Pet. at 16), but the weights themselves are not corrections, and the Petition fails to connect these weights to the particular correction required by claim 1. Villasenor Decl. ¶¶40-50. The Petition cites from Needham that:

> Different image features may also be considered with different importance. For example, human faces may be considered as more important than buildings in the input image 110. To accomplish this for example, **weights may be assigned to different image features** to specify their relative importance. Such weights may be used to control the correction parameter(s) during the correction. For instance, **if the correction operation of maximizing intensity dynamic range is applied to both human faces and buildings and a human face feature has a higher weight than a building feature, the intensity dynamic range used for correcting human faces in an image may be larger (corresponding to higher contrast) than that used for correcting buildings in an image**. In this way, the human faces may be corrected so that they become more visible than buildings.

Pet. at 15-16 (quoting APPLE-1004 at [0022]) (emphasis original). Thus, Petitioner attempts to equate "applying ***a weight*** assigned to human face features" with "***a first amount of the correction*** corresponding to the physical object of the predetermined type when correcting the dynamic range of a human face" and to equate "***applying a lower weight*** assigned to building features" with "***a second, different amount of the correction*** when correcting the dynamic range of buildings." Pet. at 16 (emphasis added). But, the weights in Needham are not corrections made to the image and thus do not necessarily result in the different amounts of the same matched correction recited in claim 1. Villasenor Decl. ¶¶40-41.

Needham instead describes that the weights therein "indicate[] the relative importance of specified image features." APPLE-1004 at [0024]; Villasenor Decl. ¶49. Accordingly, Needham expressly teaches that feature weights 230 (described as "indicat[ing] the relative importance of specified image feature types") are distinct from correction parameters 240 (described as "defin[ing] the correction operation(s) and the operational parameter(s) used during the correction operations"). APPLE-1004 at [0024]. A POSITA would not understand varying levels of importance, or "weights," assigned to image features to be corrections that may be applied to the different image features. Villasenor Decl. ¶¶40-45. In fact, Petitioner's expert Dr. Bovik when asked about the meaning of "correction"

around the time of the filing of the '132 Patent suggested that "[i]f I say 'image correction' to a colleague, they'll say, 'Correcting what?'" Ex. 2004 at 18:5-6. Dr. Bovik's testimony implies that a "correction" indicates fixing an error in the digital representation of a scene. The dynamic range correction example of the '132 Patent that corrects a digital signal representation that is deficient due to limited image sensor dynamic range is such a correction that fixes an error on the sensor's digital representation. Needham's "weights" are instead "preferences" for objects and do not indicate a manner for fixing an error in the image, but instead indicate a user's preference for elements in an image. Villasenor Decl. ¶¶41-44.

Further, Needham does not describe sufficient detail in the system description, or the solitary example at paragraph 22 cited by Petitioner, to demonstrate that Needham necessarily results in the weights creating different amounts of the same matched correction to be applied to an image as required to anticipate claim 1. Villasenor Decl. ¶¶41-49. Needham's system is multi-variable, and weights are simply one of the variables. *See* APPLE-1004 at Fig. 2.; Villasenor Decl. ¶45. It is the "correction parameter(s) 240 [in Figure 2, that] defines the correction operation(s) and the operational parameter(s) used during the correction operation(s)." APPLE-1004 at [0024]. Needham (e.g., paragraph [0022]) fails to, for example, explicitly define that the same operation is performed in two different amounts on two different portions. *See id.* Paragraph 22 describes

that a higher contrast is applied to change the intensity dynamic range of the face portion, but fails to specify that a contrast correction is necessarily applied to the building portion of the image. APPLE-1004 at [0022]. Instead, Needham's paragraph 22 is ambiguous about what correction is applied to the building to adjust the intensity dynamic range of the building. *See id.*; Villasenor Decl. ¶45.

The Petition fails to meet its burden in establishing that Needham squarely discloses this element within the four corners of the document because the Petition does not describe "applying the determined correction . . . by applying a first amount of the correction to the first portion . . . and applying a second amount of the correction to a second portion" for a feature based on Needham's weights. *In re Schreiber,* 128 F.3d 1473, 1477 (Fed. Cir. 1997) ("To anticipate a claim, a prior art reference must disclose every limitation of the claimed invention, either explicitly or inherently."); *Richardson v. Suzuki Motor Co*., 868 F.2d 1226, 1236 (Fed. Cir. 1989) ("The identical invention must be shown in as complete detail as is contained in the . . . claim."). The Petitioner bears the "burden of proving a proposition of unpatentability." *In re Magnum Oil Tools Int'l Ltd.*, 829 F.3d 1364, 1375 (Fed. Cir. 2016). This burden entails presenting a *prima facie* case in its Petition. *Intelligent Bio-Systems, Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1369 (Fed. Cir. 2016) (stating that "[i]t is of the utmost importance" that the invalidity challenge be identified "with particularity" in the petition); 35 U.S.C.

§ 312(a)(3). Petitioner has not shown anticipation for this element because Needham lacks an explicit description describing the same "complete detail as is contained" in Claim 1, and the Petition does not attempt to establish inherency of the recited limitation. *See Richardson*, 868 F.2d at 1236. Indeed, Needham does not disclose two different amounts of the same correction being applied to different portions of an image for the same reasons described above. Needham fails to describe with any specificity how the correction parameters are used by the correction unit to correct the image. Villasenor Decl. ¶¶41-50; *see* APPLE-1004 at [0024], [0026]-[0027], and [0031]. Further, as described above, the corrections being adjusted by weights are not "***the*** correction" that was "***matched***" to "the predetermined type" of objected determined to exist in the image. *See* Section VI(B)(1) *supra*.

VII. NEEDHAM AND NONAKA DO NOT RENDER OBVIOUS CLAIM 1

A. The Needham-Nonaka Combination Does Not Render Obvious Independent Claim 1

For the reasons explained above, Needham does not disclose "determining a correction to apply . . . [that] is matched to the predetermined type" of physical object and "applying a first amount of *the [matched] correction* to the first portion" and "applying a second amount of *the [matched] correction* to a second portion," as required by independent claim 1. *See* Sections VI(A)-(B), *supra*. The Petition attempts to use Nonaka's disclosure to remedy these deficiencies. In

particular, the Petition asserts for claim element [1b] that Nonaka's corrections are only applied to faces and thus that the corrections are matched to the faces (Pet. at 14) and regarding [1c-1d] that Nonaka teaches the application of two different gain values as the different first and second corrections applied to an image (Pet at 17). As described in more detail below, Nonaka's corrections are not matched to the detected object type because Nonaka applies corrections regardless of whether the determined object is found in the image. Thus, the Needham-Nonaka combination fails to disclose or suggest all elements of claim 1. Further, a POSITA would not be motivated to combine Needham and Nonaka, even if the combination disclosed all of claim 1's elements.

B. Nonaka Is a Two-Part Processing System of a Different Architecture with Different Goals than the System of Needham

Nonaka describes a two-path processing system with different corrections on a monitored image and a photographed image for a camera. *See* APPLE-1005 at [0009]; Villasenor Decl. ¶¶34-67. During operation of the camera, "an acquired image signal is corrected or modified so as to raise luminance of the signal, or brightness of the image represented by the signal, in accordance with the luminance of each region, a correction amount of the image signal for use as a photographed image is smaller than that of an image signal for use as a monitor image." *Id.* at [0008]. The two different signal processing paths result in "an image for monitoring to be displayed in the display section" and a "photographed

image." *Id.* at [0009]. These two different processing paths produce different results: "a correction amount of the luminance of an actually photographed image to be smaller than that of an image for monitoring to be displayed in the display section." *Id.* The "monitored image" and the "photographed image" are processed in parallel and each in real-time, such that "a user can shoot the image while seeing [the monitored image]." *Id.* at [0027].

Nonaka "includes an optimization processing section 5b." *Id.* at [0029]. That "optimization processing section 5b performs the processing for improving the visibility of the image during both of the display of the image for monitoring and the actual photographing." *Id.* at [0046]. Nonaka's system identifies faces in dark regions of a photo and controls backlight to change the brightness of the face and landscape. *See id.* at Fig. 8. The backlight control is not only implemented when a dark face is detected, but the brightening is also applied in order to detect the face. *See id.* at [0042]. For example, "in a case where the main subject is positioned at a dark part of the screen of the backlight scene or the like, the image is blackened . . . . In this state, the face detecting section 11 cannot detect the face. In such a backlit scene, to detect the face, the optimization processing section 5b . . . perform[s] processing and control so as to brighten the dark part." *Id.*

C. Nonaka Does Not Disclose Or Suggest Matching A Correction To A Detected Predetermined Type Of Physical Object In An Image

The Petition alleges that the detection of a face results in the application or non-application of a correction, and thus concludes that Nonaka's correction is matched to the object. Pet. at 14. However, this is not matching of the correction and object type. Matching of the claim described above is a cause-effect relationship that if an object is a particular type then a correction of a particular type is applied. *See* Section VI(B)(1), *supra*. Nonaka describes that the correction (applied by "optimization processing section 5b") is still applied when a face is not detected, such as "when the face detecting section 11 cannot detect the face . . . to detect the face, the optimization processing section 5*b* and the exposure control section 12*a* perform processing and control so as to brighten the dark part." APPLE-1005 at [0042]. Apple's expert Dr. Bovik confirms that the optimization processing section's correction is being performed regardless of whether a face is detected. Ex. 2004 at 152:22-153:1. Dr. Bovik also confirms that paragraph [0042] described here and paragraph [0058] cited in the Petition are just "describing different scenarios where the processing happens differently for good reasons." Ex. 2004 at 156:3-5. Thus, even though the Petition's cited portions of Nonaka (e.g., paragraphs [0029], [0033], [0050], [0058], [0064], Fig. 1) may disclose applying optimizations to a face, Nonaka cannot be interpreted such that Nonaka's optimization processing is matched to the object type "face." If the

brightening is performed regardless of whether the face is detected, then that brightening cannot be matched to the detection of a face object type.

D. A POSITA Would Not Have Been Motivated To Combine Needham and Nonaka

The Petition asserts that "a POSITA would have recognized that the predictable modification to Needham, as suggested by Nonaka, would include Needham's system using gain as a correction parameter for dynamic range correction and applying different amounts of gain to different image features." Pet. at 17. However, the Petition fails to establish that a POSITA would have been motivated to combine the teachings of Nonaka with that of Needham. Villasenor Decl. ¶¶59-76.

Obviousness cannot be established upon the mere assertion that a particular modification was possible or even that the modification would predictably work and there would be a reasonable expectation of achieving what is claimed, but instead "requires consideration of whether, in light of factors such as 'design incentives and other market forces,' the hypothetical skilled artisan would recognize the potential benefits and pursue the variation." *Belden Inc. v. Berk-Tek LLC*, 805 F.3d 1064, 1075 (Fed. Cir. 2016) (citing *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007)). Moreover, outside of Petitioner's generic, hindsight-biased reasons to combine the features of Needham and Nonaka, Petitioner has not "identif[ied] a reason that would have prompted a person of ordinary skill in the

relevant field to combine the elements in the way the claimed new invention does." *KSR*, 550 U.S. at 418. Petitioner's generic reasons to combine the references and fit them together to obtain the invention recited in claim 1 do not provide any particular reason for why to particularly fit Nonaka's dynamic range correction techniques into Needham's dynamic range correction techniques.

Accordingly, *prima facie* obviousness under 35 U.S.C. § 103 has not been established with respect to claim 1. When combining references, a "factfinder must further consider the factual questions of whether a person of ordinary skill in the art would be motivated to combine those references." *Dome Patent L.P. v. Lee*, 799 F.3d 1372, 1380 (Fed. Cir. 2015). A person of ordinary skill in the art would not be motivated to combine these references because Needham already maximizes the dynamic range rendering moot any advantage in applying additional dynamic range correction.

1. A POSITA would not have been motivated to combine Needham and Nonaka to maximize dynamic range because Needham already solves that problem

A POSITA would not have combined the disclosures of Needham and Nonaka, because Nonaka's dynamic range correction technique would not improve Needham's already maximized dynamic range correction. Villasenor Decl. ¶77. Nonaka describes a dynamic range correction technique. *See* APPLE-1005 at [0008] ("acquired image signal is corrected . . . so as to raise luminance of the

signal . . . in accordance with the luminance of each region"). Needham already provides dynamic range correction, thus there is no reason for a POSITA to modify Needham's dynamic range correction (DRC) with Nonaka's DRC. In fact, Needham's algorithm already maximizes the dynamic range. *See* APPLE-1004 at [0019] ("a correction operate that maximizes the intensity dynamic range may be defined as the correction operation"); Villasenor Decl. ¶77. With the dynamic range of the image already maximized, a POSITA would not have been motivated to modify Needham to further improve dynamic range. Villasenor Decl. ¶77. With no anticipated benefit to dynamic range achieved by modifying Needham with Nonaka, there would be no motivation to implement additional processing that may have a negative impact on the system design as described further below.

2. POSITA would not have been motivated to combine Needham's and Nonaka's distinct processing paths

Nonaka's backlight control technique is applicable to a different processing path than that used in Needham. Villasenor Decl. ¶¶65-74. Nonaka aims to address the potential benefit of making different modifications to the image signal that is to be shown on a display, as opposed to the image signal that will be recorded in the capture process. Villasenor Decl. ¶66. This "monitor image" of Nonaka is the displayed image signal and is the signal being processed by Nonaka, rather than the captured image being processed in Needham. APPLE-1005 at [0008]; Villasenor Decl. ¶¶65-66; Ex. 2004 at 135:23-25 ("Nonaka is describing a

[way] of, you know, doing image correction which uses an ancillary image."). Because there are two images being processed, Nonaka's processing system is a two-path system, applying different corrections to the monitor image and the recorded image. In contrast, Needham's processing system is a single processing path. Needham at figure 2; Villasenor Decl. ¶¶71-72. A POSITA would not seek to modify Needham's single-path image processing based on the disclosure of a two-path processing system in Nonaka because a POSITA would recognize the solutions of Needham and Nonaka to be two alternate solutions, not complimentary solutions, to the same problem of backlight control. Villasenor Decl. ¶¶68, 72-76.

3. Design incentives would have discouraged a POSITA from combining Needham and Nonaka

Although the Petition lists design incentives as reasons to combine Needham and Nonaka, the design incentives, when considered in their totality, lead a POSITA away from combining the references. Villasenor Decl. ¶¶69-77. A finding of obviousness under Section 103 "requires consideration of whether, in light of factors such as 'design incentives and other market forces,' the hypothetical skilled artisan would recognize the potential benefits and pursue the variation." *Belden*, 805 F.3d at 1075 (citing *KSR*, 550 U.S. at 417). Petitioner's alleged design incentives are centered on Needham's disclosure that "its system may include a camera, and Nonaka describes a camera and a method of controlling

a camera." Pet. at 9. However, this abstracts the disclosure of Needham to such a general level that a POSITA would be able to combine any two digital image processing references as long as both mention a "camera." Villasenor Decl. ¶¶70-71. Petitioner's expert likewise improperly argues that "[a] POSITA would have been prompted to combine the features of Nonaka with the teachings [of] Needham because they both relate to digital image processing, and specifically to dynamic range correction of digital image data." APPLE-1003 at [0029]. A POSITA would recognize more specifically that Needham is directed to post-processing techniques for processing images after capture by a camera. Villasenor Decl. ¶¶71-72. In contrast, Nonaka is directed to an architecture aimed at enabling differential processing for two copies of an image signal at the time of image capture. Villasenor Decl. ¶¶66-67. These two techniques require different implementations in a digital image processing system, and thus a POSITA would not have combined these references. Villasenor Decl. ¶¶68-73.

Further, Petitioner has not provided any rationale that its proposed combination would have any success. Further, negative side-effects, such as the oversaturation resulting from a combination of Needham and Nonaka as described below, shows that a POSITA would have no expectation of success in combining the references as suggested by Petitioner. *See* Section VII(E), *infra*. "One must have a motivation to combine accompanied by a reasonable expectation of

achieving what is claimed in the patent-at-issue." *Intelligent Bio-Systems*, 821 F.3d at 1367.

E. No Expectation of success Combining Needham with Nonaka

A POSITA would not combine Needham and Nonaka because a POSITA would not understand how to combine Needham with Nonaka in a manner to provide a reasonable expectation of success. Villasenor Decl. ¶75. The Petition does not describe how the weights of Needham, which Petitioner alleges are correction values, would be modified in view of the gain values of Nonaka to arrive at gain values that would enhance the image. *See* Pet at 16-17. If Nonaka's gain values are applied as Needham's weights it would be unclear how the dynamic range of the image would be impacted, particularly in view of Needham having already maximized the dynamic range. Villasenor Decl. ¶¶74-77. If Nonaka's gains are indiscriminately applied to Needham's correction, the resulting image could be oversaturated, which may result in a reduction of dynamic range (the opposite of the desired outcome of the '132 Patent). Villasenor Decl. ¶¶74-76.

A POSITA would not combine Nonaka with Needham because Needham is directed to post-processing of images whereas Nonaka is directed to a system for combined processing of a monitored-image and a photographed-image. *See* APPLE-1005 at [0033] ("the optimization processing section 5b subjects the image to correction processing such as the amplification of the luminance for each region

or the contrast emphasis in order to improve the visibility of the subject during the display of the image for monitoring"). These two architectures are incompatible. Nonaka's architecture includes separate paths for monitored images and photographed images, whereas Needham's architecture is a single path for post-processing of photographed images. Villasenor Decl. ¶66. In particular, Nonaka is directed to using a different amount of correction for a captured image than for a monitored image. *Id.* In order to accomplish this, Nonaka includes complex hardware and control paths, such that these two different types of corrections can be implemented at the appropriate times and places. *Id.* A POSITA would not expect success from combining the corrections and architectures of these two different dynamic range correction systems. Villasenor Decl. ¶¶65-76.

Nonaka's image optimization processing is intended to brighten dark regions that contain faces, but Nonaka's system cannot detect that a face exists without first brightening the image. APPLE-1005 at [0042]. In contrast, Needham's correction operations are only applied when objects are detected. APPLE-1004 at [0022]. Nonaka's gains are dependent on the scene already brightened enough to identify the face. That pre-brightening does not exist in Needham, and thus Nonaka's gains may not be useable values in Needham's system. Villasenor Decl. ¶¶74-75. In fact, improper gain values could even result in excessive gain leading to saturation of the image and loss of detail in the image. Villasenor Decl. ¶¶74-75.

The Petition incorrectly alleges when making the combination that "Nonaka's system does not perform optimization processing when no face is detected." Pet. at 14 (citing APPLE-1004 at [0058]). Nonaka describes in paragraph 58 that in "a scene . . . without any person . . . the optimization processing section 5b does not perform optimization processing." APPLE-1004 at [0058]. However, Nonaka describes more of the system elsewhere in its disclosure. Nonaka describes in paragraph 42 that in order "to detect the face, the optimization processing section 5b . . . perform[s] processing and control so as to brighten the dark part." APPLE-1004 at [0042]. That is, some correction is required in order to even perform the face detection to determine whether further correction is required. *Id.* That correction is applied to the monitored image prior to the full correction that is applied to the photographed image, such that the monitored image is used as an ancillary image during processing. *See* Ex. 2004 at 137:23-24 ("What's displayed on the monitor is rarely, if ever, the exact same as the image that is – would be captured because it goes through a series of processing steps prior to display."); Ex. 2004 at 142:5-11 ("So in paragraph 42, it says, 'The face detection section extracts the characteristic point from information . . . so that's information . . . meaning the image for monitoring."); Ex. 2004 at 151:4-5 ("paragraph 42 is being discussed. It refers to the image for monitoring"). Without such preliminary brightening, Nonaka's system may not detect faces and

would not operate as expected in an image that included a face in a dark region. Villasenor Decl. ¶74; Ex. 2004 at 170:7-14 ("[I]f the blackened image of paragraph 42 were run through the steps of paragraph 58, Nonaka wouldn't be able to detect the face; would it? . . . I don't know what's going to happen."). Needham does not include such a preliminary brightening in order to detect objects. Villasenor Decl. ¶74. This unpredictable behavior results from different fundamentals underlying the architectures of Needham and Nonaka would lead a person of ordinary skill from combining the two references. Villasenor Decl. ¶¶74-76.

There can be no motivation to combine where there is no factual basis for finding that the proposed combination "would have had a reasonable expectation of success." *See Dome*, 799 F.3d at 1380 ("If all elements of a claim are found in the prior art . . . the factfinder must further consider the factual questions of whether a person of ordinary skill in the art would be motivated to combine those references, and whether in making that combination, a person of ordinary skill would have had a reasonable expectation of success."). Petitioner has made no allegations regarding how its proposed modification would work or that it could work except a bald-faced assertion that it would yield predictable results.

F. Petitioner's Combination of Needham and Nonaka is Merely Hindsight Combination to Arrive at the '132 Patent

Petitioner identifies "enabling both the person and landscape portions of an image to be more easily distinguished and perceived" as a problem to be solved in

Needham. Pet. at 9. But, as the Federal Circuit has held, "merely identif[ying] a problem that [a reference] sought to solve" is not enough, because "knowledge of a problem and motivation to solve it are entirely different from motivation to combine particular references." *Metalcraft of Mayville, Inc. v. The Toro Co.*, 848 F.3d 1358, 1367 (Fed. Cir. 2017) (citation omitted). Obviousness cannot be established upon the assertion that a particular modification was possible or even that the modification would predictably work and there would be a reasonable expectation of achieving what is claimed, but instead "requires consideration of whether, in light of factors such as 'design incentives and other market forces,' the hypothetical skilled artisan would recognize the potential benefits and pursue the variation." *Belden*, 805 F.3d at 1075 (citing *KSR*, 550 U.S. at 417). Beyond merely identifying the problem of needing enhanced dynamic range, Petitioner must also provide "explanation as to how or why" Needham and Nonaka "would be combined to arrive at the claimed invention;" otherwise, "we are left with only hindsight bias that *KSR* warns against." *Id.* (citing *KSR*, 550 U.S. at 421).

Petitioner's identified problem and solution are merely repeating the disclosure of the '132 Patent reframed as motivation to combine, and is thus nothing more than hindsight analysis. Compare APPLE-1001 at 2:15-17 ("face can be made bright and visible") with Pet. at 9 ("enabling both the person and landscape portions of an image to be more easily distinguished"). Needham and

Nonaka each individually address the identified problem, and thus the rationale to combine them is nothing more than Petitioner using hindsight bias to reconstruct the solution of the '132 Patent from references that a POSITA would not be motivated to combine. Without this hindsight bias, Petitioner has no reason to combine the references and thus cannot establish obviousness based on Needham and Nonaka. *See Malico, Inc. v. Cooler Master USA Inc.*, 594 F. App'x 621, 628 (Fed. Cir. 2014) ("[T]he raw ability to [modify a prior art reference] without any reason to do so does not establish obviousness.") (citing *KSR*, 550 U.S. at 418); *Polaris Indus., Inc. v. Arctic Cat, Inc.*, 882 F.3d 1056, 1068 (Fed. Cir. 2018) (finding error where "the Board focused on what a skilled artisan would have been *able* to do, rather than what a skilled artisan would have been *motivated* to do at the time of the invention.") (emphases in original).

VIII. CLAIMS 5-6 ARE PATENTABLE AT LEAST BY VIRTUE OF THEIR DEPENDENCY FROM CLAIM 1

Claims 5 and 6 are neither anticipated by Needham nor rendered obvious by Needham in view of Nonaka for the reasons that neither Needham nor Needham and Nonaka anticipate or render obvious claim 1. *See* Sections IV(A)-(B), *infra*.

IX. THE CITED PRIOR ART DOES NOT DISCLOSE "DETERMINING A DIFFERENT AMOUNT OF GAIN TO APPLY TO THE SECOND PORTION THAN AN AMOUNT OF GAIN DETERMINED FOR THE FIRST PORTION" (CLAIM 7)

Dependent claim 7 recites:

[7p] A method as recited in claim 1, further comprising:

[7a] determining that the second portion of the digital image data does not represent a physical object of the predetermined type; and

[7b] ***determining a different amount of gain to apply to the second portion than an amount of gain determined for the first portion***.

APPLE-1001 at Cl. 7 (emphasis added).

A. Needham Does Not Disclose Determining "a Different Amount of Gain" to First and Second Portions

Needham does not disclose determining "a different amount of gain" to apply to first and second portions of an image for the same reasons that Needham does not disclose "applying the determined correction . . . by applying a first amount of the correction to the first portion . . . and applying a second amount of the correction to a second portion" as recited in claim 1 for the reasons described above with respect to claim 1. Claim 7 adds that the step of determination of the different amounts of correction is determining different amounts of ***gain***. Just as Needham does not disclose determining different amounts of correction (because weights are not corrections), Needham does not disclose determining different

amounts of gain (because weights are not gains). Villasenor Decl. ¶60. Needham merely discloses weighting different features and does not explicitly describe applying different amounts of gain to different portions of the same image. In fact, the Petition admits that "Needham and the Needham-Nonaka combination provide a system for dynamic range correction of an image, but does not explain in detail any particular technique for determining the amount of gain to apply." Pet. at 25. Thus, Needham does not anticipate claim 7.

B. Nonaka Does Not Resolve the Deficiencies of Needham

A POSITA would not have combined Needham with Nonaka for the reasons described above. *See* Sections VII(D)-(F), *infra*. Thus, Nonaka cannot cure the deficiencies of Needham because there was no motivation to combine Needham with Nonaka, even if Nonaka discloses the limitation of claim 7.

X. CLAIM 8 IS PATENTABLE OVER NEEDHAM AND DVIR, OR OVER NEEDHAM, DVIR, AND NONAKA

Dependent claim 8 recites:

> A method as recited in claim 7, wherein determining the amount of gain to apply to the first portion of the digital image data comprises: determining the amount of gain to apply to the first portion of the digital image data ***so as to maintain local contrast of the first portion of the digital image data***.

APPLE-1001 at Cl. 8 (emphasis added).

A. Neither Needham nor Dvir Discloses or Suggests Determining a Gain Amount "to Maintain Local Contrast of the First Portion"

Dvir describes image processing with "multiple nonlinear edge preserving filters, and nonlinear pixel point operations," and in which "multiple low-pass filters are used, being applied to surrounding neighborhoods of the current pixel of narrow and of wide extent." APPLE-1007 at Abstract; Villasenor Decl. ¶85. Dvir employs the nonlinear edge preserving filters in an attempt to "achieve superior image quality as compared to previous image dynamic range compensation approaches, while preserving edge detail." *Id.* at [0005]; Villasenor Decl. ¶35. Dvir notes that its approach "differs from the prior art in the ***use of*** a cascade of ***widening*** scales, or ***neighborhoods***, in determining the dynamic range modification to be performed." *Id* (emphasis added). The neighborhoods are the "current pixel in conjunction with a plurality of signals derived from one or more successively widening neighborhoods" of nearby pixels. *Id.*

Dvir fails to disclose selecting a gain that maintains local contrast of the first portion of the image. The Petition alleges that Dvir "describes a dynamic range compensation (DRC) unit that includes cascaded two-dimensional low-pass filters" and "discloses that the number of cascaded stages of the filters can be adaptively selected depending on the image content to control local contrast of the image." Pet. at 27. However, such allegations are insufficient to establish a *prima facie* case of obviousness. As described above regarding claim 7, Needham does not

disclose determining gains. Dvir likewise does not disclose determining gains, let alone determining gains that maintain a local contrast as required by claim 8. The Petition does not provide an explanation for how the "local contrast" control in Dvir at paragraph [0033] is a determination of gain required by the claim language of "determining the amount of gain" in claim 8. *See* Pet. at 26-27; Villasenor Decl. ¶95. Instead, The disclosure in Dvir of low pass filters (indicated by "LPF" in paragraph [0033]), other than conveying that the filters would act to reduce or eliminate certain higher spatial frequencies, does not convey anything specific about gain, or a relationship between determining a gain and maintaining local contrast. APPLE-1007 at [0033]; Villasenor Decl. ¶96. Furthermore, the disclosure in Dvir that "the local contrast may be controlled" refers to the local contrast at the output of the processing. APPLE-1007 at [0033]. By contrast, to "maintain" local contrast requires specific consideration of the contrast before the processing as well as affirmative steps to ensure a similar output contrast—something that is not discussed in Dvir. Villasenor Decl. ¶96. Additionally, a POSITA would not have combined Needham with Dvir as described below.

B. A POSITA Would Not Have Combined Needham with Dvir

A POSITA would have had no motivation to combine Dvir with Needham. Dvir describes the use of "multiple nonlinear edge preserving filters" for processing images. Villasenor Decl. ¶¶84-101. The Petition alleges that

combining Dvir with Needham or Needham-Nonaka with Dvir "further improves" Needham. Pet. at 24. However, the Petition fails to account for the reengineering necessary to modify Needham to include the filters of Dvir. Villasenor Decl. ¶85. For example, Dvir's filters would add complexity to the hardware and/or software implementing Needham's processing and the parameters needed to implement those filters. Villasenor Decl. ¶¶85-86. The Petition does not account for any of the trade-offs reflected by the additional complexity or the challenges in making successful modifications to Needham. *See* Pet. at 24-26. In fact, edge-preserving filters, such as those in Dvir, can result in degradation to the image being processed with the filters because of the difficulties in localizing edges in the image. Villasenor Decl. ¶86. The unintended degradation of images that occurs when implementing edge-preserving filters is made more likely by the challenge of identifying suitable parameters for operating the edge-preserving filters. *Id.* The complexity of implementing the edge-preserving filters in Needham's techniques and the challenges in properly selecting parameters are design incentives that would lead a POSITA away from combining Dvir's edge-preserving filters with Needham. Villasenor Decl. ¶87. Furthermore, the Petition provides no explanation of how the edge-preserving filters would operate in combination with Needham's weights to determine a gain value for correcting the image. Needham does not disclose how gains are determined. Pet. at 25 ("Needham and the

Needham-Nonaka Combination . . . does not explain in detail any particular technique for determining the amount of gain to apply"). Petitioner does not provide an explanation for how Needham determines gains. Without an explanation as to how Needham determines gains, Petitioner cannot demonstrate that a modification of Needham would be operable, would result in predictable results, or would result in maintaining local contrast as required by claim 8. Villasenor Decl. ¶¶88-98.

Further, Dvir has no awareness of objects within the image and thus applies its filters indiscriminately of the locations of objects. Villasenor Decl. ¶¶99-100. Dvir's filters are "applied to surrounding neighborhoods of the current pixel of narrow and of wide extent." APPLE-1007 at [0006]. The surrounding neighborhood pixels may be part of a same object that the current pixel belongs to, or a different object. Villasenor Decl. ¶¶99-100. Applying a filter that calculates values for a current pixel based on neighboring pixels even if those neighboring pixels are part of a different object would lead a POSITA away from mixing the techniques of Dvir with object-based image processing such as Needham. *Id.* This is because indiscriminately applying filters to an image portion separate from the object content of an image portion could degrade the quality of the object or obtain a different effect on the object than that intended when a correction is applied only to the object. *Id.*

C. Nonaka Does Not Fill the Gaps in Needham and Dvir

As described above, neither Needham nor Dvir discloses the use of a "gain" in the manner recited in claim 8 "to maintain local contrast of the first portion." The Petition does not allege that Nonaka discloses or suggests the use of a gain in such a manner. Neither does Nonaka resolve this deficiency. Villasenor Decl. ¶101. Thus, the combination of Needham-Nonaka-Dvir also does not present a *prima face* case of obviousness for claim 8.

XI. CLAIM 13 IS PATENTABLE OVER NEEDHAM AND GALLAGHER, OR OVER NEEDHAM, GALLAGHER, AND NONAKA

Dependent claim 13 recites:

> A method as recited in claim 7, wherein determining the amount of gain to apply to the first portion of the digital image data comprises:
>
> ***modifying a gain map based on the determination that the first portion of the digital image data represents a physical object of the predetermined type***; and
>
> wherein applying the determined amount of gain to apply to the first portion of the digital image data comprises obtaining the amount of gain to apply to the first portion of the digital image data from the gain map.

APPLE-1001 at Cl. 13 (emphasis added).

A. Neither Needham nor Gallagher Discloses or Suggests "Applying The Determined Amount Of Gain To Apply To The First Portion Of The Digital Image Data Comprises Obtaining The Amount Of Gain To Apply To The First Portion Of The Digital Image Data From The Gain Map"

Gallagher describes a "method for sharpening a digital image without amplifying noise." APPLE-1006 at Title; Villasenor Decl. ¶36. The sharpening is performed based "on both the material content of the image and the amount of noise in the image." *Id.* at 2:21-40. Gallagher describes a "gain map generator 2" that "create[s] a map indicating the gain of the sharpening operation." APPLE-1006 at 6:25-27. That "gain map is a control signal used to determine the level of sharpening to apply on a pixel-by-pixel basis." *Id.* at 6:30-31. The sharpening is performed when "[t]he image i(x,y) and the final gain map $\beta_n(x,y)$ are passed to the image sharpener for sharpening the image according to the final gain map $\beta_n(x,y)$." *Id.* at 8:22-24. That image sharpener "applies a sharpening algorithm to the image, utilizing the sharpening parameter(s) in order to produce an enhanced output image having improved sharpness without producing objectionable sharpness artifacts." *Id.* at 8:25-29.

Petitioner makes no argument that Needham discloses the use of a "gain map," and relies on only Gallagher to remedy this deficiency. Pet. at 31-32. However Gallagher's "gain map" is not used for "applying the determined amount of gain to apply to the first portion of the digital image data." Villasenor Decl.

¶¶106-111. Claim 13 depends from claim 7, which recites "determining a different amount of gain to apply to the second portion than an amount of gain determined for the first portion." In the context of the '132 patent, a POSITA would understand the "gain" is related to the brightening or darkening of a region of an image. Villasenor Decl. ¶107. Thus, a "gain map" is a representation of gain values corresponding to various points in an image. Villasenor Decl. ¶107. In contrast to the gain map of claim 13, Gallagher discloses a "gain map" "used to determine the level of sharpening to apply on a pixel-by-pixel basis." APPLE-1006 at 6:26-31; Villasenor Decl. ¶¶108-110. Sharpening is an operation that enhances edge visibility, which is a separate aspect from the brightening or darkening of a region containing the edge. Villasenor Decl. ¶109. Because Gallagher's gain map is not used for controlling the brightening or darkening of a region of an image, Gallagher does not remedy Needham's deficiency in disclosing or suggesting the use of a gain map. Without a gain map for controlling brightness disclosed or suggested in Needham or Gallagher, the combination also cannot disclose or suggest "modifying a gain map based on the determination that the first portion of the digital image data represents a physical object of the predetermined type."

B. POSITA would not have combined Needham and Gallagher

Petitioner improperly alleges that a POSITA would combine Needham with Gallagher simply because they both "relate to digital image processing." Pet. at 30. However, based on such a generic rationale a POSITA would be motivated to combine any of thousands of references. A POSITA would not be motivated to combine references simply based on the references being analogous art. *See KSR*, 550 U.S. at 418 (requiring "a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does"). Petitioner adds that "design incentives would have prompted a POSITA to look to Gallagher to improve Needham and/or the Needham-Nonaka combination." Pet. at 30. However, Petitioner has not taken into consideration design incentives that would lead a POSITA away from combining Gallagher with Needham and/or Needham-Nonaka. Villasenor Decl. ¶¶101-103. For example, the goals of Gallagher are sharpening an image rather than feature-based enhancement of dynamic range contrast as in Needham. Villasenor Decl. ¶¶103, 108. There is no incentive to adapt a technique used for sharpening an entire image for use in enhancing dynamic range contrast of portions of an image. Villasenor Decl. ¶¶103-104. When considered as a whole, these design considerations weigh against combining Needham with Gallagher.

C. Nonaka does not resolve the deficiencies of Needham and Gallagher

As described above, neither Needham nor Gallagher disclose the use of a "gain map" in the manner recited in claim 13. Nonaka also does not disclose or suggest the use of such a gain map. Thus, the combination of Needham-Nonaka with Gallagher also fails to present a *prima face* case of obviousness for claim 13, just as the combination of Needham with Gallagher does not present a *prima face* case of obviousness for claim 13.

XII. CONCLUSION

For the foregoing reasons, the grounds of rejection presented by Petitioner should be denied.

Dated: May 23, 2019

Respectfully submitted,

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Lead Counsel for Patent Owner

CERTIFICATE OF WORD COUNT

Pursuant to 37 C.F.R. § 42.24(a)(i), the undersigned certifies that this Paper—exclusive of the table of contents, table of authorities, certificate of service, and this certificate of word count—includes 10,644 words. The undersigned has relied upon the word count feature provided by Microsoft Word.

/Eagle H. Robinson/
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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. § 42.6(e), the undersigned certifies that on May 23, 2019, complete copies of Qualcomm Incorporated's Patent Owner Response and Exhibits 2001-2002 and 2004 were served on Lead and Back-up Counsel for Petitioner via email (by consent) to:

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