

Apple Inc. (Petitioner)
v.
Qualcomm Incorporated (Patent Owner)
Petitioner Demonstratives

Case Nos. IPR2018-01250 and IPR2018-01251
U.S. Patent No. 8,447,132

Before Hon. Trevor M. Jefferson, Daniel J. Galligan, and Aaron W. Moore
Administrative Patent Judges

FISH.


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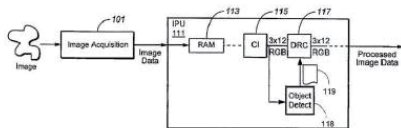
The '132 Patent

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'132 Patent Overview

	
US08447132B1	
(12) United States Patent Galil	(10) Patent No.: US 8,447,132 B1 (45) Date of Patent: May 21, 2013
<p>(54) DYNAMIC RANGE CORRECTION BASED ON IMAGE CONTENT</p> <p>(75) Inventor: Erez Galil, Mountain View, CA (US)</p> <p>(73) Assignee: CSR Technology, Inc., Sunnyvale, CA (US)</p> <p>(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 254 days.</p> <p>(21) Appl. No.: 12/961,400</p> <p>(22) Filed: Dec. 6, 2010</p> <p>Related U.S. Application Data</p> <p>(60) Provisional application No. 61/285,063, filed on Dec. 9, 2009.</p> <p>(51) Int. Cl. <i>G06K 9/40</i> (2006.01) <i>H04N 1/60</i> (2006.01)</p> <p>(52) U.S. Cl. USPC 382/274; 358/1.9</p> <p>(58) Field of Classification Search USPC 382/118, 243, 254, 264, 266, 274, 382/305, 312, 275, 348/207, 99, 241, 345; 358/1.9, 3.27, 518, 526; 345/617 See application file for complete search history.</p> <p>(56) References Cited</p> <p>U.S. PATENT DOCUMENTS</p> <p>4,466,018 A 8/1984 Sonoda et al. 5,012,333 A 4/1991 Lee et al. 6,788,822 B1 9/2004 Zhang et al. 6,807,299 B2 10/2004 Sobel 6,822,762 B2 11/2004 Mononey et al. 6,862,373 B2 3/2005 Enomoto 6,975,618 B1 12/2005 Ohta et al.</p>	

33 Claims, 13 Drawing Sheets



1

APPLE 1001

APPLE-1001 ('132 Patent).

- U.S. Patent No. 8,447,132 (the “’132 Patent” or “’132”) claims priority to Provisional Application No. 61/285,063, which was filed Dec. 9, 2009.
- The ’132 Patent’s claims are directed toward, e.g., “a technique for dynamic range correction of digital image data based on image content.”
- IPR2018-01250 challenges claims 1, 5-8, and 13 for being unpatentable under 35 U.S.C. § 102 and § 103.
- IPR2018-01251 challenges claims 1, 5-8, 11, and 14 for being unpatentable under 35 U.S.C. § 103.

APPLE-1001, 1:4-13; 1250 Pet. 1-2, 4-5; 1251 Pet. 2-3.

The '132 Patent

“According to the '132 patent, ‘[k]nown prior techniques of dynamic range correction do not take into consideration or use the content of an image.’”

1250 Pet. 4; 1251 Pet. 15.

image. Techniques for detecting faces and other arbitrary objects and patterns in an image are known in the art and are therefore not described in detail herein.

Hence, the technique introduced here includes a method and apparatus for dynamic range correction based on image content. Known prior techniques of dynamic range correction do not take into consideration or use the content of an image, at least to the extent such content has semantic significance (meaning) to a human viewer. For example, such methods do not consider or apply the principle that showing the details of certain types of objects depicted in an image often should have higher priority than the rest of the image. As a more specific example, in many instances showing the details of a person's face in the foreground of an image should be given higher priority than showing the details of a view in the background of the image. The technique introduced here considers and applies this principle in performing dynamic range correction.

APPLE-1001, 2:33-41; 1250 Pet. 3-4; 1251 Pet. 15.

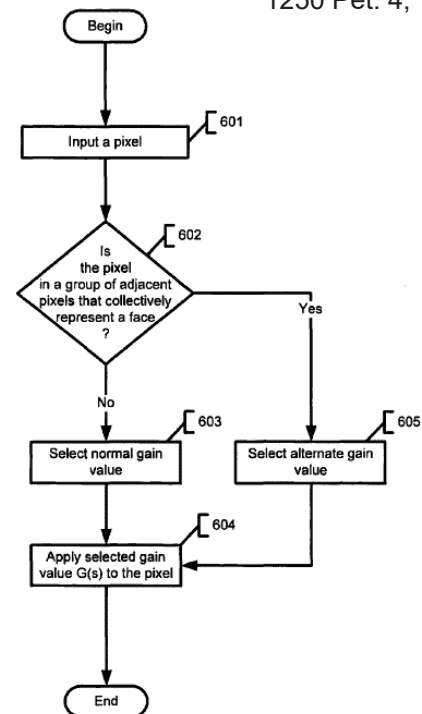


Fig. 6

APPLE-1001, FIG. 6; 1250 Pet., 5; 1251 Pet. 16-17.

Overview of the Grounds

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IPR2018-01250: Needham-based Grounds

Ground	'132 Patent Claims	Basis for Rejection
Ground 1A	1, 5-7	§102 and/or §103 – Needham alone and/or Needham in view of Nonaka
Ground 1B	8	§103 – Needham in view of Dvir and/or Needham in view of Nonaka and Dvir
Ground 1C	13	§103 – Needham in view of Gallagher and/or Needham in view of Nonaka and Gallagher

1250 Pet. 2

IPR2018-01251: Zhang-based Grounds

Ground	'132 Patent Claims	Basis for Rejection
Ground 2A	1, 6	§103 – Zhang in view of Konoplev
Ground 2B	5, 7, 8	§103 – Zhang in view of Konoplev and Nonaka
Ground 2C	11, 14	§103 – Zhang in view of Konoplev, Nonaka, and Gonzalez

1251 Pet. 2

Issue 1: Whether the prior art discloses
“the determined correction is matched to
the predetermined type” of claim 1

Claim 1: “the determined correction is matched to the predetermined type”

'132 Patent Claim 1

1. A method comprising:
determining whether a first portion of digital image data represents a physical object of a predetermined type;
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;
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
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, 11:33-37; 1250 Pet. 12; 1251 Pet. 24.

PO's Positions

The “determined correction is matched to the predetermined type” requires that:

- “Correction is *matched* to the particular image feature type in a predetermined manner.” 1250 POR 14.
 - “cause-effect relationship that a determined type of physical object results in a particular correction that is applied to the objects of that type.” 1250 POR 15, 26.
 - “a particular type of correction is predetermined or assigned to a particular image feature.” EX-2001, 51; POR 14-15.

Needham discloses “the determined correction is matched to the predetermined type”

Needham discloses a “cause-effect relationship that a determined type of physical object results in a particular correction that is applied to the objects of that type”:

- A feature description includes a feature type (i.e., a predetermined type of object).
- Examples of correction operations (i.e., types of correction) include increasing the brightness and enhancing the visual contrast.
- A correction operation (i.e., correction) is performed based on (i.e., is matched to) the feature description (which includes the feature type).

1250 Pet. 11-14; 1250 Reply 4-8.

detected instances of an image feature. In FIG. 6, a feature description 260 includes a feature type 610, a location descriptor 620, a shape descriptor 630, and statistical properties 640 of the image feature. An image feature corre- ...

Such descriptions may be used to determine where and how to apply one or more specified correction operations.

APPLE-1004, ¶ 30; 1250 Pet. 13-14; 1250 Reply 7.

types. The correction parameter(s) 240 defines the correction operation(s) and the operational parameter(s) used during the correction operation(s).

APPLE-1004, ¶ 24; 1250 Pet. 12.

correction to be performed. For example, a correction operation may be defined as increasing the brightness 730 (of either the entire image or an image feature or both, depending on the operation mode 705). A correction operation may also be defined as enhancing the visual contrast 740 (of either the entire image or an image feature or both, depending on the operation mode 705).

APPLE-1004, ¶ 31; 1250 Pet. 13; 1250 Reply 7.

mum intensity values) of the detected image feature. 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.

APPLE-1004, ¶ 26; 1250 Pet. 13-15; 1250 Reply 7.

Needham discloses “the determined correction is matched to the predetermined type”

Needham also discloses that “a particular type of correction is predetermined or assigned to a particular image feature”:

- A correction operation (e.g., maximizing dynamic range) defined on an image feature (e.g., detected human face) in an image.
- A correction operation defined for each image feature of multiple image features in a single image (e.g., maximizing dynamic range defined for a human face and increasing brightness defined for the sky).
- A corresponding correction operation is retrieved for each detected image feature.

1250 Pet. 11-14; 1250 Reply 4-8.

[0019] Correction operations may also be defined on individual image features. For example, a correction operation that maximizes the intensity dynamic range may be defined as the correction operation to be performed on the entire input image according to the contrast of detected human faces. Similar correction operations may also be applied only to the detected human faces.

APPLE-1004, ¶ 20; 1250 Pet. 13; 1250 Reply 6-8.

[0020] One or more types of correction operations may also be defined for each image feature. For example, both contrast and brightness may be corrected for a specific image feature such as a human face. Further, when one or more correction operations are applied to individual image features, different types of correction operations may be applied to different image features. For example, 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.

APPLE-1004, ¶ 20; 1250 Pet. 13; 1250 Reply 6-8.

[0035] If the correction operation(s) is to be performed on individual image features, the feature-based correction unit 270 may correct one feature at a time. For each detected image feature, the corresponding correction parameters are retrieved 860. The correction operation(s) is then performed 870 on each image feature according to specified weight and correction parameters. When all the image features are corrected 840, the corrected image is generated 850.

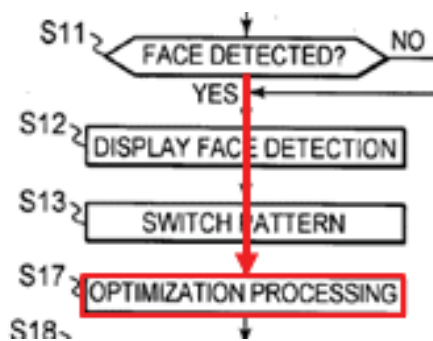
APPLE-1004, ¶ 35; 1250 Pet. 13; 1250 Reply 8. 12

Nonaka and Konoplev disclose “the determined correction is matched to the predetermined type”

Nonaka and Konoplev disclose a “cause-effect relationship that a determined type of physical object results in a particular correction that is applied to the objects of that type.”

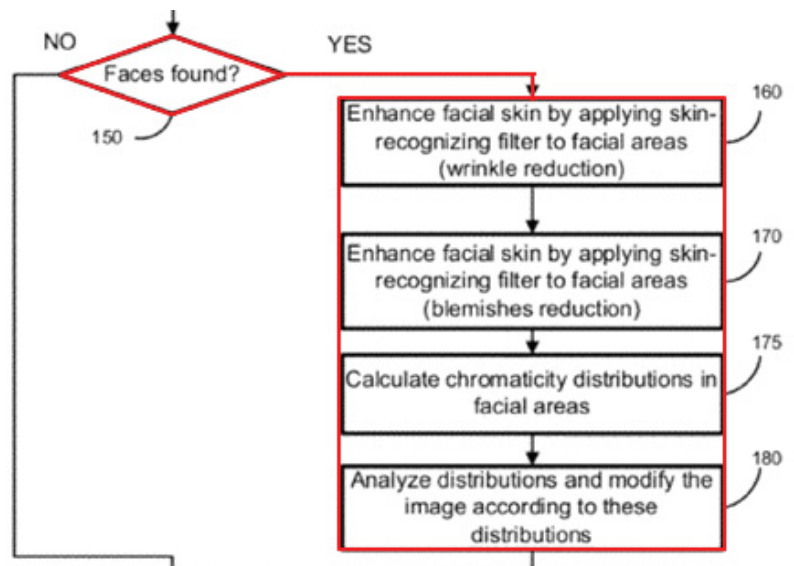
1250 Pet. 12, 14-15; 1250 Reply 12-13; 1251 Pet. 23-26; 1251 Reply 9-15.

Nonaka



APPLE-1022, ¶ 30;
APPLE-1005, Fig. 8;
1250 Reply 15-16;
1251 Reply 20.

Konoplev



APPLE-1022, ¶ 15;
APPLE-1009, Fig. 1;
1251 Reply 9-10

Issue 2: Whether the prior art discloses applying different amounts of the determined correction to different portions of the image as required by claim 1

Claim 1: applying different amounts of the determined correction to different portions

'132 Patent Claim 1

1. A method comprising:
determining whether a first portion of digital image data represents a physical object of a predetermined type;
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;
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
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, 11:33-37; 1250 Pet. 12; 1251 Pet. 26.

PO's Positions

- NO dispute as to claim meaning
- NO dispute that Nonaka discloses applying different amounts of the determined correction to different portions
- NO dispute that Zhang-Konoplev combination discloses applying different amounts of the determined correction to different portions
- ONLY challenge is to Needham's disclosure of this limitation and its combination with Nonaka
 - Needham describes distinct approaches
 - Needham disclosure is ambiguous

1250 POR 18-37; 1251 POR 27-52.

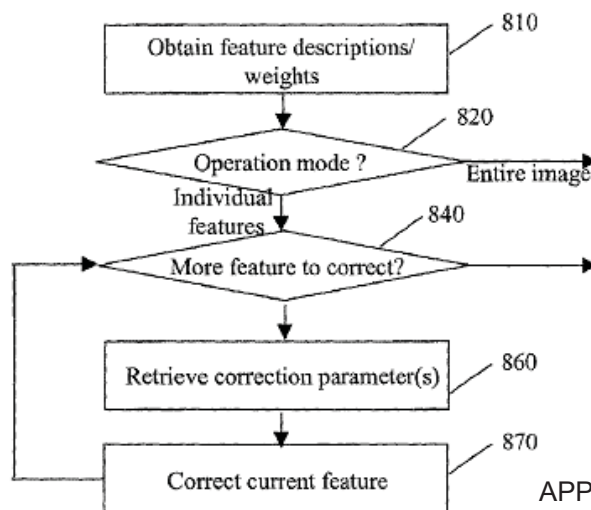
Needham discloses applying different amounts of the determined correction to different portions of the image

Rebuttal to:

“Needham describes an image correction framework with multiple, distinct approaches to correcting images ... and ‘[w]hen 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..’” 1250 PO Sur-reply 3; 1250 POR 11-13, 18-23.

[0035] If the correction operation(s) is to be performed on individual image features, the feature-based correction unit 270 may correct one feature at a time. For each detected image feature, the corresponding correction parameters are retrieved 860. The correction operation(s) is then performed 870 on each image feature according to specified weight and correction parameters. When all the image features are corrected 840, the corrected image is generated 850.

APPLE-1004, ¶ 35; 1250 Pet. 13; 1250 Reply 8.



APPLE-1004, FIG. 8; 1250 Pet. 10-11

[0022] 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.

APPLE-1004, ¶ 22; 1250 Pet. 15-16; 1250 Reply 8-10.

Needham discloses applying different amounts of the determined correction to different portions

Rebuttal to:

“Even if its multiple approaches were combined, the disclosures of Needham are, at best, ambiguous.” 1250 PO Sur-reply 13, 1250 POR 21-22.

Needham

[0022] 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.

APPLE-1004, ¶ 22; 1250 Pet. 15-16; 1250 Reply 8-10.

Dr. Bovik's Declaration

20. Based on my knowledge and experience in this field, Needham [0022]

discloses to a POSITA applying a correction of “maximizing intensity dynamic range” using a “larger” intensity dynamic range for human faces “(corresponding to higher contrast)” and applying the same correction of “maximizing intensity dynamic range” using a smaller intensity dynamic range (corresponding to lower contrast) for buildings in the same image. The “larger” intensity dynamic range used for human faces would correspond to a larger increase in the brightest value of the dynamic range, resulting in higher contrast for faces. The smaller intensity dynamic range used for buildings in the same image would correspond to a smaller increase in the brightest value of the dynamic range, resulting in smaller contrast for buildings. The correction would then maximize, i.e., use the full range of intensity values, within the larger intensity dynamic range determined for human faces when correcting human faces and maximize within the smaller intensity dynamic range determined for buildings when correcting buildings in the same image, i.e., apply two different amounts of the same type of correction, anticipating the claims of the '132 patent. Thus, Needham [0022] provides a clear and concrete

APPLE-1022, ¶ 20; 1250 Reply 9-10. 17

Needham discloses applying different amounts of the determined correction to different portions

**Rebuttal
to:**

“the amount of gain applied to two objects, even to reach two different dynamic intensity ranges, depends on the starting dynamic ranges of the respective objects ..., which is not given in Needham.” 1250 PO Sur-reply 15.

Needham “performs a correction operation (e.g., enhancing the brightness or contrast) on the detected image feature according to the feature description and an operational parameter (e.g., an intensity upper bound or dynamic range) that may be defined as a function of statistical properties of the detected image feature.” 1250 Pet. 7.

Needham

of one or more image features in the input image 110. As another example, to enhance the contrast 740 of an image feature, an intensity dynamic range 760 may be specified as an operational parameter so that the contrast in the detected image feature will be scaled to the specified dynamic range. Similarly, the specified dynamic range 760 may be defined as a function of statistical properties of one or more image features detected from the input image 110. The operational

APPLE-1004, ¶ 32; 1250 Pet. 7, 13.

Issue 3: Whether Konoplev is Prior Art

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Konoplev is supported and enabled by its provisional

Rebuttal to:

“The cited portions thus do not provide a written description of parameters necessary for wrinkle reduction.” 1251 POR, 23.

Konoplev claim elements 1(e) and 13(e)

(e) processing the converted image using wrinkle reducing parameters,

APPLE-1009, 10:29-30, 12:37-38; 1251 Pet. 5-6, 11-12.

Support in Konoplev Provisional

Then, parts of the image containing human faces are processed through the smoothing filter using a different set of filtering parameters for wrinkle removal.

APPLE-1012 [0027]; 1251 Pet. 5.

Face coordinates are acquired from a face detection module (or from a user). If faces are found in the image, the facial skin is enhanced by the skin-recognition filter applied to detected facial areas of the image. The filter uses wrinkle reducing parameters.

APPLE-1012 [0047]; 1251 Pet. 5-6.

Konoplev is supported and enabled by its provisional

**Rebuttal
to:**

“The cited portions thus do not provide a written description of parameters necessary for wrinkle reduction.” 1251 POR, 23.

Konoplev claim elements 1(e) and 13(e)

(e) processing the converted image using wrinkle reducing parameters,

APPLE-1009, 10:29-30, 12:37-38; 1251 Pet. 5-6, 11-12.

Support in Konoplev Provisional

The smoothing filter employed by the exemplary embodiment has a standard filtering function using a special filtering parameter “radius”. The filter performs filtering operations using a plurality of radii. The filtering operation is performed

APPLE-1012 [0035]; 1251 Pet. 6; 1251 Reply 6 (fn. 1).

FIG. 2 illustrates a flow chart of a skin recognition filtering, in accordance with the exemplary embodiment. Filtering parameters are received. The filtering parameters are: an initial radius, a final radius, an imperfection reduction mode (i.e., body imperfection reductions, wrinkle reductions, spots/blemishes reduction). The initial radius is applied to all pixels of the image. For each pixel, an imperfection type is recognized based on a color of the pixel and its surrounding area determined by the initial radius. If the imperfection is a light imperfection on a dark surrounding, the

APPLE-1012 [0049]; 1251 Pet. 6; 1251 Reply 5.

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Konoplev is supported and enabled by its provisional

**Rebuttal
to:**

*“The cited portions thus do not provide ... an enabling description of their use.”
1251 POR, 23.*

Konoplev claim elements 1(e) and 13(e)

(e) processing the converted image using wrinkle reducing parameters,

APPLE-1009, 10:29-30, 12:37-38; 1251 Pet. 5-6, 11-12.

Konoplev Provisional

If the imperfection is a dark imperfection on a light surrounding, the imperfection is reduced using special parameters for this type of the imperfection and for the imperfection reduction mode. Then, the radius is increased for each pixel and the same steps of recognition and reducing the imperfections are repeated.

APPLE-1012 [0050]; 1251 Pet. 6; 1251 Reply 6 (fn. 1).

The radius can be increased by an arbitrary value. However, an exponentially growing radius (i.e., $\text{radius} = \text{radius} * 1.195$) produces the most efficient visual results. The processing of the image pixels is stopped when the radius increases up to the maximum radius. At this point the filtered image is combined with an original

APPLE-1012 [0051]; 1251 Pet. 6; 1251 Reply 6 (fn. 1).

Konoplev is supported and enabled by its provisional

Rebuttal to:

"Petitioner's argument relies on sweeping conclusory statements that a POSITA would have understood how to remove wrinkles with a smoothing filter, yet fails to point to any evidence that a POSITA would understand what wrinkle reducing parameters are or processing with wrinkle reducing parameters would have entailed." 1251 PO Sur-reply, 5.

"a POSITA would clearly have possessed the knowledge to implement "processing the converted image using wrinkle reducing parameters," given the references cited by the Examiner and other references that are readily accessible." 1251 Reply 3-7.

Examiner stated that prior art references to Konoplev disclose "removing permanent imperfections such as ... wrinkles" and "retouching flaws in images which may consist of wrinkles," i.e., processing the converted image using wrinkle reducing parameters. APPLE-1024, 73-74. Recognizing that "processing the

1251 Reply 4.

The closest reference Simon et al (US 2004/0170337 A1) discloses detecting and locating faces and removing temporary imperfections such as blemishes and removing permanent imperfections such as moles or wrinkles to enhance the image.

APPLE-1024, 73; 1251 Reply 4.

Konoplev is supported and enabled by its provisional

Rebuttal to:

"Petitioner's argument relies on sweeping conclusory statements that a POSITA would have understood how to remove wrinkles with a smoothing filter, yet fails to point to any evidence that a POSITA would understand what wrinkle reducing parameters are or processing with wrinkle reducing parameters would have entailed." 1251 PO Sur-reply, 5.

"A POSITA would have had the knowledge to implement a smoothing filter using filtering parameters for wrinkle removal based on these prior art teachings" of Gonzalez.

3.5 Smoothing Spatial Filters

1251 Reply 3-7.

Smoothing filters are used for blurring and for noise reduction. Blurring is used in preprocessing tasks, such as removal of small details from an image prior to (large) object extraction, and bridging of small gaps in lines or curves. Noise reduction can be accomplished by blurring with a linear filter and also by nonlinear filtering.

3.5.1 Smoothing Linear Filters

The output (response) of a smoothing, linear spatial filter is simply the average of the pixels contained in the neighborhood of the filter mask. These filters sometimes are called *averaging filters*. As mentioned in the previous section, they also are referred to a *lowpass filters*.

The idea behind smoothing filters is straightforward. By replacing the value of every pixel in an image by the average of the intensity levels in the neighborhood defined by the filter mask, this process results in an image with reduced "sharp" transitions in intensities. Because random noise typically consists of sharp transitions in intensity levels, the most obvious application of smoothing is noise reduction. However, edges (which almost always are desir-

discussed in Section 2.4.3. A major use of averaging filters is in the reduction of "irrelevant" detail in an image. By "irrelevant" we mean pixel regions that are small with respect to the size of the filter mask. This latter application is illustrated later in this section.

With reference to Eq. (3.4-1), the general implementation for filtering an $M \times N$ image with a weighted averaging filter of size $m \times n$ (m and n odd) is given by the expression

$$g(x, y) = \frac{\sum_{s=-a}^a \sum_{t=-b}^b w(s, t) f(x + s, y + t)}{\sum_{s=-a}^a \sum_{t=-b}^b w(s, t)} \quad (3.5-1)$$

The parameters in this equation are as defined in Eq. (3.4-1). As before, it is understood that the complete filtered image is obtained by applying Eq. (3.5-1) for $x = 0, 1, 2, \dots, M - 1$ and $y = 0, 1, 2, \dots, N - 1$. The denominator in

APPLE-1010, 173; 1251 Reply 5.

APPLE-1010, 172; 1251 Reply 5.

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Issue 4: Motivations to Combine

Combinations of the Prior Art

Ground 1A: Needham and Nonaka

Ground 2A: Zhang and Konoplev

Ground 1B: Needham and Dvir

Ground 1C: Needham and Gallagher

Ground 2B: Zhang and Nonaka

Ground 2C: Zhang and Gonzalez

Combinations of the Prior Art

Ground 1A: **Needham and Nonaka**

Ground 2A: Zhang and Konoplev

Ground 1B: Needham and Dvir

Ground 1C: Needham and Gallagher

Ground 2B: Zhang and Nonaka

Ground 2C: Zhang and Gonzalez

Combination of Needham + Nonaka (Ground 1A)

**Rebuttal
to:**

“Nonaka’s dynamic range correction would not improve Needham’s already maximized dynamic range correction.” 1250 POR 28.

“Incorporation of Nonaka’s teachings improves Needham’s system by providing functionality for improving visibility of a person in a backlit scene.”

1250 Pet. 8-9, 1250 Reply 14.

Needham

[0022] 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.

APPLE-1004, ¶ 22; 1250 Pet. 15-16; 1250 Reply 8-10.

Dr. Bovik’s Declaration

62. Incorporation of Nonaka’s teachings improves Needham’s system by providing functionality for improving visibility of a person in a backlit scene.

APPLE-1005, [0003], [0005], [0008]-[0009], [0043]-[0044]. A POSITA would have been led by Nonaka to modify Needham to apply amplifying correction and contrast emphasis (i.e., dynamic range correction), enabling both the person and landscape portions of an image to be more easily distinguished and perceived. A POSITA would have recognized that the predictable combination of Needham and Nonaka would have included using gain as a correction parameter for dynamic range correction and applying different amounts of gain to different image features so that the more important image features become sufficiently visible. A POSITA

APPLE-1003, ¶ 62; 1250 Pet. 8-9.

Combination of Needham + Nonaka (Ground 1A)

Rebuttal
to:

"A POSITA would not expect success from combining the corrections and architectures of these two different dynamic range correction systems."
1250 POR 33.

Bodily incorporation is not a requirement for obviousness.

whole). Apple did not propose to combine "the corrections and architectures of these two different dynamic range correction systems" (POR, 33), but rather relied on Nonaka's teaching of not performing optimization processing when no face is detected in digital image data, using gain as a correction parameter for dynamic range correction of digital image data, and applying different amounts of gain to different portions of digital image data in a single image. Petition, 14-17.

1250 Reply 14-15.

1250 Reply 15; Petition, 14-17; APPLE-1003, ¶ 62; 1250 Pet. 17.

the card.³ However, [HN17](#) [↑] we have consistently held, as the Board recognized, that "[t]he test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art." [In re Keller, 642 F.2d 413, 425 \(CCPA 1981\)](#); see also [In re Mouttet, 686 F.3d 1322, 1333 \(Fed. Cir. 2012\)](#).

Ambrosio are basically irrelevant, the criterion being not whether the references could be physically combined but whether the claimed inventions are rendered obvious by the teachings of the prior art as a whole.

In re Etter, 756 F.2d 852, 859
(Fed. Cir. 1985) (en banc);
Reply 14-15.

MCM Portfolio LLC v. Hewlett-Packard Co.,
812 F.3d 1284, 1294 (Fed. Cir. 2015);
Reply 14-15.

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Combination of Needham + Nonaka (Ground 1A)

Rebuttal to:

“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.”

1250 POR 33.

“Nonaka does not require the gains to be dependent on ‘pre-brightening.’”

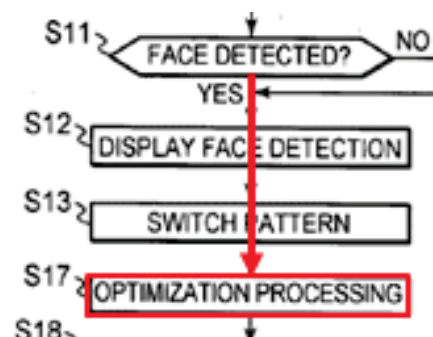
1250 Reply 15.

Nonaka’s gains are applicable to the processing path where no “emphasis processing” (step S17) is performed where the face is detected at step S11.

APPLE-1022, ¶30. Contrary to Qualcomm’s allegations (POR, 33), Nonaka does not require the gains to be dependent on “pre-brightening.” *Id.* Thus, Nonaka’s gains are useable values in Needham’s system, with the weights controlling the gains as taught by Needham and Nonaka. Petition, 16-17 (“Needham’s teachings of applying weights to control correction parameters” and Nonaka’s teachings of “using gain as a correction parameter”); POR, 32 (contrary to Qualcomm’s

1250 Reply 16; Petition 16-17.

Nonaka



APPLE-1022, ¶ 30;
APPLE-1005, Fig. 8;
1250 Reply 15-16;
1251 Reply 20.

Combinations of the Prior Art

Ground 1A: Needham and Nonaka

Ground 2A: Zhang and Konoplev

Ground 1B: Needham and Dvir

Ground 1C: Needham and Gallagher

Ground 2B: Zhang and Nonaka

Ground 2C: Zhang and Gonzalez

Combination of Zhang + Konoplev

Rebuttal to:

“a POSITA would conclude that it would be inappropriate to attempt to modify Zhang in light of the teachings of Konoplev” because “Zhang is directed to image capture” and “Konoplev is directed to postprocessing.” 1251 POR, 48-52.

Both Zhang and Konoplev disclose use in digital cameras (image capture) and mobile/cell phones (image capture and postprocessing).

1251 Reply 17-18.

Zhang

[0002] In recent years, digital image technologies advance rapidly, and various digital image capturing devices (such as CCD and CMOS) of electronic imaging devices (such as digital cameras, digital camcorders, notebook computers, mobile phones and webcams, etc) are introduced to the market. Not only the imaging quality becomes increasingly

APPLE-1008, [0002]; 1251 Reply 18-19.

Konoplev

Note that the exemplary embodiment can be implemented on a processor of a digital camera or a cell phone. These devices have sufficient memory and can perform calculations needed for implementing the image enhancement method.

APPLE-1009, 10:6-9; 1251 Reply 18.

Combination of Zhang + Konoplev

Rebuttal to:

“A POSITA reading Konoplev would understand the operations disclosed in Konoplev are computationally complex and suited to after-the-fact digital enhancements that would have been impractical and unnecessary to implement at the moment of capture.” 1251 POR, 51

“the computational complexity of Zhang ... is similar in computational complexity as Konoplev.”

1251 Reply 18-19.

Zhang

A focus enhancing method for a portrait in a digital image is applied to an electronic device capable of receiving or reading a digital image and executing a focus enhancing process with respect to a portrait in the digital image, wherein the focus enhancing process includes a foreground definition procedure for defining a head region and a body region of the portrait as a foreground of the digital image, a foreground and background segmentation procedure for cutting away an image other than the foreground from the digital image and defining the result as a background of the digital image, and a foreground and background blending procedure for blurring the background, feathering a transition region coupled to the foreground and the background, and blending the foreground, the transition region and the background to form a new digital image with a prominent portrait.

APPLE-1008, Abstract; 1251 Pet. 21.

Konoplev

A system, method and computer program product for correction and enhancement of digital images containing portraits or images of human faces by automatically detecting imperfections in an original facial image and correcting them in order to enhance the original image quality. The imperfections can be various skin blemishes, birth marks, pimples, freckles, wrinkles, etc. The facial images are detected and the imperfections are recognized. Then, the imperfections are automatically corrected by selecting a most suitable skin color using a histogram of distribution of color values on a face. A white balance and appropriate colors are set for an image. The corrected image is combined with the original image for preservations of details.

APPLE-1009, Abstract; 1251 Pet. 21.

Combinations of the Prior Art

Ground 1A: Needham and Nonaka

Ground 2A: Zhang and Konoplev

Ground 1B: Needham and Dvir

Ground 1C: Needham and Gallagher

Ground 2B: Zhang and Nonaka

Ground 2C: Zhang and Gonzalez

Combination of Needham + Dvir

**Rebuttal
to:**

"the purported 'reengineering necessary,' 'add[ed] complexity,' 'trade-offs,' and 'degradation to the image' would have led a POSITA away from combining Dvir's teachings with Needham." 1250 Reply 19 (citing 1250 POR 42-43).

NO Teaching Away

1250 Reply. 19-21.

Dr. Bovik's Declarations

36. I understand that Qualcomm argues the purported "reengineering necessary," "add[ed] complexity," "trade-offs," and "degradation to the image" "would lead a POSITA away from combining Dvir's edge-preserving filters with Needham." POR, 42-43. However, neither Qualcomm nor Dr. Villasenor point to any teachings of the references to establish clear discouragement of the combination of Dvir with Needham. Additionally, Dvir does not lack definiteness or certainty about the result of using a cascade of nonlinear edge preserving filters for dynamic range correction and gives more than mere general guidance. See generally APPLE-1007; APPLE-1003, ¶¶64-68.

APPLE-1022, ¶ 36; 1250 Reply. 19-20.

suitable biostable polymer, *Id.* col. 5 ll. 33-53. Although Tuch states that a "bioabsorbable polymer is probably more desirable," *Id.* col. 5 ll. 19, this statement, absent clear discouragement from use, does not compel a finding that Tuch teaches away from using VDF:HFP as a stent coating. See *Tyco Healthcare Grp. LP v. Ethicon Endo-Surgery, Inc.*, 774 F.3d 968, 977 (Fed. Cir. 2014) ("Yet simply because the curved blade configurations are not preferred embodiments does not result in the Davison patent teaching away from use of a curved blade, 'absent clear discouragement of that combination.'" (quoting *Santarus, Inc. v. Par Pharm., Inc.*, 694 F.3d 1344, 1356 (Fed. Cir. 2012))); see also *In re Applied Materials, Inc.*, 692 F.3d 1289, 1298 (Fed. Cir. 2012) (HNS) "A reference must be considered for everything that it teaches, not simply the described invention or a preferred embodiment.").

In re Ethicon, Inc., 844 F.3d 1344, 1351 (Fed. Cir. 2017); 1250 Reply 20.

quick change functionality disclosed by Caterpillar, "[a] given course of action often has simultaneous advantages and disadvantages, and this does not necessarily obviate motivation to combine." *Medichem, S.A. v. Rolabo, S.L.*, 437 F.3d 1157, 1165 (Fed. Cir. 2006) (citation omitted). As articulated by the PTAB, a

Allied Erecting & Dismantling Co. v. Genesis Attachments, LLC, 825 F.3d 1373, 1381 (Fed. Cir. 2016); 1250 Reply 20.

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Combinations of the Prior Art

Ground 1A:	Needham and Nonaka
Ground 2A:	Zhang and Konoplev
Ground 1B:	Needham and Dvir
Ground 1C:	Needham and Gallagher
Ground 2B:	Zhang and Nonaka
Ground 2C:	Zhang and Gonzalez

Combination of Needham + Gallagher

Rebuttal to:

“Gallagher discloses a ‘gain map’ ‘used to determine the level of sharpening to apply on a pixel-by-pixel basis,’” and “[b]ecause 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.” 1250 POR 46.

Bodily incorporation is not a requirement for obviousness.

1250 Reply. 21-24.

Etter, 756 F.2d at 859. Apple did not propose to modify Needham with

Gallagher’s gain map for determining the level of sharpening, but rather relied on Gallagher for its general teaching of generating a gain map that indicates an amount of correction to be applied to image pixels and using the gain map to correct the image. Petition, 29, 32; APPLE-1022, ¶39. As stated in the Petition, a

1250 Reply 22.

As repeatedly discussed above, “[t]he test for obviousness is ...” “what the combined teachings of the references would have suggested to those of ordinary skill in the art.” *MCM*, 812 F.3d at 1294; *In re Etter*, 756 F.2d at 859. And, in view of the Supreme Court’s guidance, referenced above (at 18), a POSITA would have known how to fit Gallagher’s teachings with Needham and/or Needham-Nonaka. See *KSR*, 550 U.S. at 421.

The second error of the Court of Appeals lay in its assumption that a person of ordinary skill attempting to solve a problem will be led only to those elements of prior art designed to solve the same problem. *Ibid.* The

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Asano pedal. *Ibid.* Common sense teaches, however, that familiar items may have obvious uses beyond their primary purposes, and in many cases a person of ordinary skill will be able to fit the teachings of multiple patents together like pieces of a puzzle. Regardless of

...

problem makes little sense. A person of ordinary skill is also a person of ordinary creativity, not an automaton.

KSR Int’l Co. v. Teleflex Inc., 550 U.S. 398, 421 (2007); 1250 Reply 23.

1250 Reply 23.

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Combination of Needham + Gallagher

Rebuttal to:

"Petitioner has not taken into consideration design incentives that would lead a POSITA away from combining Gallagher with Needham and/or Needham-Nonaka. ... For example, the goals of Gallagher are sharpening an image rather than feature-based enhancement of dynamic range contrast as in Needham. ... 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."
1250 POR 47.

NO Teaching Away 1250 Reply. 21-24.

POR, 47. Here again, neither Qualcomm nor Dr. Villaseñor point to any teachings of the references to establish clear discouragement of the combination of Gallagher with Needham. In addition, Gallagher does not lack definiteness or certainty about the result of using a gain map to correct an image and gives more than mere general guidance. *See generally* APPLE-1006; APPLE-1003, ¶¶75-79. As I stated in my original declaration and repeated here, a POSITA would have recognized that Gallagher's teachings of generating a gain map that indicates an amount of correction to be applied to image pixels and using the gain map to correct the image could have been combined with Needham's dynamic range correction to generate a gain map for dynamic range correction and use the gain map to correct the image. APPLE-1003, ¶¶80-81.

suitable biostable polymer, *Id.* col. 5 ll. 33-53. Although Tuch states that a "bioabsorbable polymer is probably more desirable," *Id.* col. 5 ll. 19, this statement, absent clear discouragement from use, does not compel a finding that Tuch teaches away from using VDF:HFP as a stent coating. *See Tyco Healthcare Grp. LP v. Ethicon Endo-Surgery, Inc.*, 774 F.3d 968, 977 (Fed. Cir. 2014) ("Yet simply because the curved blade configurations are not preferred embodiments does not result in the Davison patent teaching away from use of a curved blade, 'absent clear discouragement of that combination.'" (quoting *Santarus, Inc. v. Par Pharm., Inc.*, 694 F.3d 1344, 1356 (Fed. Cir. 2012))); *see also In re Applied Materials, Inc.*, 692 F.3d 1289, 1298 (Fed. Cir. 2012) (HNS[↑]) "A reference must be considered for everything that it teaches, not simply the described invention or a preferred embodiment.").

In re Ethicon, Inc.,

844 F.3d 1344, 1351 (Fed. Cir. 2017);

1250 Reply 23.

APPLE-1022, ¶ 40;
1250 Reply 23-24; Petition 29.

Combinations of the Prior Art

Ground 1A:	Needham and Nonaka
Ground 2A:	Zhang and Konoplev
Ground 1B:	Needham and Dvir
Ground 1C:	Needham and Gallagher
Ground 2B:	Zhang and Nonaka
Ground 2C:	Zhang and Gonzalez

Combination of Zhang + Nonaka

**Rebuttal
to:**

“Modification of Zhang’s disclosed invention to employ different amounts of contrast emphasis in both image regions, as allegedly disclosed by Nonaka, would fail to enhance focus of the portrait, which is the stated purpose of Zhang, because the background would not be blurred.” 1251 POR, 57.

“combining Zhang’s background blurring and Nonaka’s contrast emphasis would result in an image with a blurred background.”

1251 Reply 22-25.



1251 Reply 23-24.

Combination of Zhang + Nonaka

**Rebuttal
to:**

“a POSITA would not be led to modify the system of Zhang (or Zhang/Konoplev) to incorporate the additional processing path disclosed in Nonaka without undue experimentation.” 1251 POR, 62.

Bodily incorporation is not a requirement for obviousness.

1251 Reply 25-26.

(en banc) (same). Apple does not propose “modify[ing] the system of Zhang (or Zhang/Konoplev) to incorporate the additional processing path disclosed in Nonaka” (POR, 62), but rather relies on Nonaka’s use of gain as a correction parameter to correct digital image data, applying different amounts of gain to different portions of digital image data, while maintaining local contrast in a first portion of digital image data. Petition, 30-41; APPLE-1023, ¶31. Qualcomm does not allege that incorporating these teachings from Nonaka into Zhang would require undue experimentation.

1251 Reply 25-26.

the card.³ However, [HN17](#)^(↑) we have consistently held, as the Board recognized, that “[t]he test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art.” *In re Keller*, 642 F.2d 413, 425 (CCPA 1981); see also *In re Mouttet*, 686 F.3d 1322, 1333 (Fed. Cir. 2012).

MCM Portfolio LLC v. Hewlett-Packard Co.,
812 F.3d 1284, 1294 (Fed. Cir. 2015);
Reply 14-15.

Ambrosio are basically irrelevant, the criterion being not whether the references could be physically combined but whether the claimed inventions are rendered obvious by the teachings of the prior art as a whole.

In re Etter, 756 F.2d 852, 859
(Fed. Cir. 1985) (en banc);
Reply 14-15.

FISH.

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Combinations of the Prior Art

Ground 1A:	Needham and Nonaka
Ground 2A:	Zhang and Konoplev
Ground 1B:	Needham and Dvir
Ground 1C:	Needham and Gallagher
Ground 2B:	Zhang and Nonaka
Ground 2C:	Zhang and Gonzalez

Zhang-Konoplev-Nonaka-Gonzalez Combination

Rebuttal to:

“Petitioner Does Not Identify A Motivation to Add Gonzalez.” 1251 POR, 63.

Petition

can easily be seen. APPLE-1017, ¶69. Gonzalez’s teachings provide a POSITA with a more detailed discussion of digital image fundamentals and the processing techniques utilized by the Zhang-Konoplev-Nonaka combination. APPLE-1017, ¶85.

1251 Petition 43.

Second, design incentives would also have prompted a POSITA to look to Gonzalez to improve the Zhang-Konoplev-Nonaka combination. Given Gonzalez’s description above, it is a useful resource for a POSITA. APPLE-1017, ¶89. Gonzalez also describes different techniques that are available for contrast enhancement, smoothing, color balance, and object detection. APPLE-1010, 77-78, 98, 135, 162-164, 172-177, 248, 262-263, 287-507.

1251 Petition 44.

Dr. Bovik’s Declaration

POR, 63-64. As set forth in my original declaration and acknowledged by Qualcomm, the Gonzalez textbook describes image processing techniques. APPLE-1017, ¶¶73-83; POR, 63. A POSITA would have referred to a textbook containing “basic concepts and methodologies” and foundational knowledge for digital image processing. APPLE-1010, 13. Gonzalez’s teachings would have provided a POSITA with a more detailed discussion of digital image fundamentals and the processing techniques utilized by the Zhang-Konoplev-Nonaka combination, making Gonzalez a beneficial and useful resource for a POSITA. *Id.*, ¶¶85-89. A POSITA would have looked to Gonzalez for implementation details and insight for ways to improve the processing techniques discussed in Zhang, Konoplev, and Nonaka. *Id.*

APPLE-1023, ¶ 32; Reply 26.

Issue 5: Whether the prior art discloses applying different amounts of gain to different portions as required by claim 7

Claim 7: applying different amounts of gain to different portions

'132 Patent Claim 7

7. A method as recited in claim 1, further comprising:
determining that the second portion of the digital image data does not represent a physical object of the predetermined type; and
determining a different amount of gain to apply to the second portion than an amount of gain determined for the first portion.

APPLE-1001, 12:1-7; 1250 Pet. 21; 1251 Pet. 37-39.

PO's Positions

- NO dispute of Needham's disclosure of element [7a]
- NO dispute of Nonaka's disclosure of claim 7 but rather challenged Nonaka's disclosure of "matched" recited in claim 1
- ONLY challenged Needham's disclosure of element [7b] and its combination with Nonaka

1250 POR 38-39; 1251 POR 52-62

Issue 6: Whether the prior art discloses
“maintain local contrast” of claim 8

FISH.

Claim 8: “maintain local contrast”

'132 Patent Claim 8

8. 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, 12:8-14; 1250 Pet. 22-27.

PO's Positions

- Challenged Dvir's disclosure
 - Makes image detail generally more visible
 - No use of predetermined object types
- Challenged Konoplev's disclosure
 - Reduces local contrast in the face through removal of blemishes

1250 POR 39-41; 1251 POR 58-59.

Dvir discloses “maintain local contrast”

Rebuttal to:

“Dvir discloses making image detail generally more visible, while the ‘132 Patent discusses making object edge detail more visible to improve local contrast.”
1250 PO Sur-reply 22.

Dvir and the ‘132 patent disclose “a gain ... is applied on pixels in the digital image to change the pixel values, which can result in a change in pixel values in a first portion of the digital image.”

1250 Reply 16-17.

‘132 Patent

Embodiments described below employ a cascade of non-linear edge preserving filters, and nonlinear pixel point operations, to calculate pixel gain or other pixel characteristics (e.g., chromaticity) in order to make object edge detail more visible, i.e., to improve local contrast. Note, however, that

APPLE-1001, 3:28-32; 1250 Pet. 23; 1250 Reply 16-17.

Dvir

[0012] The methods presented below use a cascade of non-linear edge preserving filters, and nonlinear pixel point operations, to calculate the pixel gain or other pixel characteristics, such as chromaticity, that can be employed to make image detail more visible. It suggests a new non-linear combination

APPLE-1007, ¶ 12; 1250 Pet. 27; 1250 Reply 16-17.

Dvir discloses “maintain local contrast”

**Rebuttal
to:**

“Furthermore, the ‘132 Patent at 9:28-53 discusses use of predetermined object types, in addition to the spatial measurements disclosed in Dvir at [0033]-[0036].”
1250 PO Sur-reply 22.

Dvir and the ‘132 patent disclose “a gain ... is applied on pixels in the digital image to change the pixel values, which can result in a change in pixel values in a first portion of the digital image.”

1250 Reply 16-17.

‘132 Patent

The general embodiment of FIGS. 3 and 4 can include two or more cascaded stages. The particular number of active sections in the cascade can be adaptively selected using measurements from the whole image or from sub image block, so that a number sections ranging from one to all of the available sections are applied to the image. In the exemplary embodiments, each section contains a linear filter whose window support length increases with the section number; that is, again referring to FIG. 4, the LPF of section n+1 has larger support than LPF of section n. Since a narrow support filter can track changes more locally than a filter with wider support, the local contrast may be controlled by selectively using various sections in cascade.

APPLE-1001, 9:23-43; 1250 Pet. 23; 1250 Reply 16-17.

Dvir

[0033] The general embodiment of FIGS. 3 and 4 can include 2 or more cascaded stages. The particular number of active sections in the cascade can be adaptively selected using measurements from the whole image or from sub image block, so that a number sections ranging from one to all of the available sections are applied to the image. In the exemplary embodiments, each section contains a linear filter whose window support length increases with the section number; that is, again referring to FIG. 4, the LPF of section n+1 has larger support than LPF of section n. Since a narrow support filter can track changes more locally than a filter with wider support, the local contrast may be controlled by selectively using various sections in cascade.

APPLE-1007, ¶ 33; 1250 Pet. 27; 1250 Reply 16-17.

Dvir discloses “maintain local contrast”

Rebuttal to:

“Furthermore, the ‘132 Patent at 9:28-53 discusses use of predetermined object types, in addition to the spatial measurements disclosed in Dvir at [0033]-[0036].”
1250 PO Sur-reply 22.

Dvir and the ‘132 patent disclose “a gain ... is applied on pixels in the digital image to change the pixel values, which can result in a change in pixel values in a first portion of the digital image.”

1250 Reply 16-17.

‘132 Patent

In addition to detecting predetermined types of objects, various spatial measurements may also be used to characterize the image content. The location(s) of a predetermined type of object and/or these spatial measurements (which can be taken together with a user preference for the amount of local contrast needed) can be used to adaptively determine which and how many sections will be used. Examples of such spatial

APPLE-1001, 9:23-43; 1250 Pet. 23; 1250 Reply 16-17.

Dvir

[0034] Various spatial measurements may be used to characterize the image content. These measurements, which can be taken together with user preference for the amount of local contrast needed, can be used to adaptively determine which and how many sections will be used. Examples of such mea-

APPLE-1007, ¶ 33; 1250 Pet. 27; 1250 Reply 16-17.

Dvir discloses “maintain local contrast”

Dvir and the '132 patent disclose “a gain ... is applied on pixels in the digital image to change the pixel values, which can result in a change in pixel values in a first portion of the digital image.”

1250 Reply 16-17.

'132 Patent

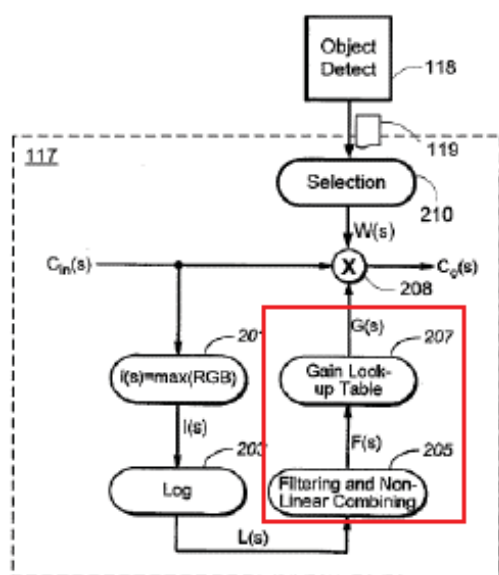


FIG. 2B

APPLE-1022, ¶ 44; APPLE-1001, FIG. 2B.

Dvir

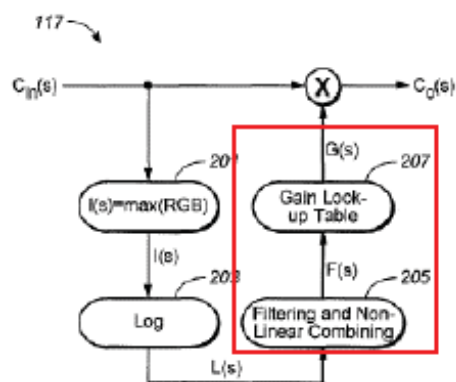


FIG. 2

APPLE-1022, ¶ 44; APPLE-1007, FIG. 2.

Konoplev discloses “maintain local contrast”

Rebuttal
to:

“Konoplev actually teaches reducing local contrast in the face through removal of blemishes.” 1251 POR, 59.

Removal of blemishes “does not reduce local contrast of the face as a whole.”

1251 Reply 21.

Dr. Bovik’s Declaration

POR, 59. I disagree. While Konoplev’s smoothing process reduces contrast among adjacent pixels (as I discuss below), it does not reduce local contrast of the face as a whole. Dr. Villasenor confirmed and I agree that contrast among adjacent pixels is not indicative of overall image contrast:

APPLE-1023, ¶ 26; 1251 Reply 21.

Dr. Villasenor

a whole. APPLE-1023, ¶26. Dr. Villasenor confirmed that contrast among adjacent pixels is not indicative of overall image contrast. APPLE-1021, 129:16-21. Indeed, Konoplev discloses that “the imperfections are corrected and the

1251 Reply 21.

A. Well, again, it depends on what contrast means, but -- but if contrast is -- is interpreted in the sense of, you know, between the edge pixel and the pixel adjacent to it, then you could use that term. That's not talking about overall image contrast.

APPLE-1021, 129:16-21; 1251 Reply 21.

Issue 7: Whether the prior art discloses “gain” and “gain map” of claim 13

Claim 13: “gain” and “gain map”

'132 Patent Claim 13

13. 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, 12:51-60; 1250 Pet. 31.

PO's Positions

- Proposed a construction of “gain” that is not the broadest reasonable construction
- Challenged Gallagher’s disclosure of “gain map” under PO’s construction
- Challenged the combination of Needham and Gallagher to disclose “gain map” under PO’s construction

1250 POR 8, 44-48; 1250 Reply 1-3.

Claim Construction: “gain” and “gain map”

PO’s Proposals

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.

1250 POR 8.

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.”

1250 POR 8.

Petitioner’s Reply

Contrary to Qualcomm’s position, Qualcomm’s construction is not “the broadest reasonable interpretation” because the construction improperly imports limitations. *In re Van Geuns*, 988 F.2d 1181, 1184 (Fed. Cir. 1993). A POSITA would not understand the ’132 patent’s use of “gain” as limited to only “brightening or darkening a region of an image.” APPLE-1022, ¶7.

1250 Reply 2.

Claim Construction: “gain” and “gain map”

Rebuttal to:

The disclosure at APPLE-1001, 3:59-64 “directly undermines Petitioner’s contention that ‘gain’ can refer to other types of correction, however, because those ‘other types of corrections or adjustment’ are other than gain.” 1250 PO Sur-reply 1.

Other types of correction can use gain as a parameter. 1250 Reply 1-3.

'132 Patent

Note that the content-based technique introduced here is not necessarily limited to determining a gain adjustment or to DRC. For example, **other types of corrections** or adjustments can be made based on image content as described herein, such as contrast enhancement, color manipulation, sharpness adjustment, noise reduction, skin smoothing, etc.

Apple-1001, 3:59-64; 1250 Reply 2.

Dr. Villasenor

Q. And those, just to be specific, were listed at column 3, lines 59 through 64 and include contrast enhancement, color manipulation, sharpness adjustment, noise reduction, skin smoothing, correct?

...

THE WITNESS:

That's what it says. The patent says **they are types of corrections.**

Apple-1021, 115:17-116:6; 1250 Reply 2.

Combination of Needham + Gallagher

Rebuttal to:

“Gallagher discloses a ‘gain map’ ‘used to determine the level of sharpening to apply on a pixel-by-pixel basis,’” and “[b]ecause 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.” 1250 POR 46.

Bodily incorporation is not a requirement for obviousness.

Etter, 756 F.2d at 859. Apple did not propose to modify Needham with Gallagher’s gain map for determining the level of sharpening, but rather relied on Gallagher for its general teaching of generating a gain map that indicates an amount of correction to be applied to image pixels and using the gain map to correct the image. Petition, 29, 32; APPLE-1022, ¶39. As stated in the Petition, a

1250 Reply 22.

As repeatedly discussed above, “[t]he test for obviousness is ...” “what the combined teachings of the references would have suggested to those of ordinary skill in the art.” *MCM*, 812 F.3d at 1294; *In re Etter*, 756 F.2d at 859. And, in view of the Supreme Court’s guidance, referenced above (at 18), a POSITA would have known how to fit Gallagher’s teachings with Needham and/or Needham-Nonaka. See *KSR*, 550 U.S. at 421.

1250 Reply 21-24.

The second error of the Court of Appeals lay in its assumption that a person of ordinary skill attempting to solve a problem will be led only to those elements of prior art designed to solve the same problem. *Ibid.* The

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Asano pedal. *Ibid.* Common sense teaches, however, that familiar items may have obvious uses beyond their primary purposes, and in many cases a person of ordinary skill will be able to fit the teachings of multiple patents together like pieces of a puzzle. Regardless of

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problem makes little sense. A person of ordinary skill is also a person of ordinary creativity, not an automaton.

KSR Int’l Co. v. Teleflex Inc., 550 U.S. 398, 421 (2007); 1250 Reply 23.

1250 Reply 23.

Gallagher renders obvious a gain map as recited in claim 13

**Rebuttal
to:**

“Gallagher discloses a ‘gain map’ ‘used to determine the level of sharpening to apply on a pixel-by-pixel basis,’” and “Gallagher’s gain map is not used for controlling the brightening or darkening of a region of an image.” 1250 POR 46.

PO does not focus sufficiently on the teachings of Gallagher.

Dr. Villasenor’s Deposition

1250 Reply 21-24.

Q. Well, I -- I changed to edges when we started talking about sharpness adjustment, so that's why I'm asking, in the context of sharpness adjustment, is -- and what you've just described about identifying edges and manipulating edges, is that pixel -- is that an adjustment of pixel intensity values?

A. Well, generally if you were going to enhance an edge, for example, you would have to change the pixel intensity value in order to achieve that goal. I mean, it depends on the

APPLE-1021, 130:5-15; 1250 Reply 21.

A. Well, I mean, almost -- almost -- most operations, almost any operation involves changing intensities. It's -- it's -- you know, increasing the brightness would be a different, you know, correction. It's described as a different correction operation than enhancing the contrast, but in both cases you would change pixel values.

APPLE-1021, 136:23-137:5; 1250 Reply 21.

I said, almost any -- any -- any manipulation of images could involve some change to the pixel values.

APPLE-1021, 137:12-14; 1250 Reply 21. 58

Issue 8: Whether the prior art discloses gain data structures as required by claims 11 and 14

Claims 11 and 14

'132 Patent Claim 11

11. 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:

selecting a value from a gain data structure according to whether the first portion of the digital image data represents a physical object of the predetermined type.

APPLE-1001, 12:33-38; 1251 Pet. 44.

'132 Patent Claim 14

14. 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:

selecting one of a plurality of data structures of gain values, from which to obtain a gain value, according to whether the first portion of the digital image data represents a physical object of the predetermined type.

APPLE-1001, 12:61-67; 1251 Pet. 47.

PO's Positions

- NO dispute that Zhang-Konoplev-Nonaka-Gonzalez's teachings satisfy the language of claims 11 and 14
- Challenged the combination of references based on infeasibility and poor image quality
- Moved to exclude Exhibit 1010, which includes excerpts of the Gonzalez textbook
 - Unauthenticated
 - Copyright date is inadmissible hearsay

1251 POR 62-68; 1251 Paper 37.

Zhang-Konoplev-Nonaka-Gonzalez Combination

**Rebuttal
to:**

“it would have been infeasible to precalculate and store the correspondingly large number of transformations” and “any reasonably storable subset would have resulted in impermissibly poor image quality.” 1251 POR, 65, 67.

“a gain can be obtained or calculated from a gain lookup table for contrast enhancement and color manipulation.” 1251 Reply 27-29.

Dr. Villasenor

indicated earlier, a POSITA would already know that a transformation of this type in image processing could be accomplished through a table lookup, so such a person

EX-2005, ¶ 123; Reply 27.

Q. And were there lookup tables for contrast enhancement?

MR. ROBINSON:

Objection, form.

THE WITNESS:

I think there were. In 2009, there were lookup tables for contrast enhancement, yes.

APPLE-1021, 119:16-23; 1251 Reply 27.

Q. And that is -- when you say “techniques like this,” it's, you know, a -- using the output of a lookup table and the use of a gain map to modify the hue, I believe, is -- is what you said, correct?

A. I think you could -- a person skilled in the art would understand that a hue could be modified by operations on pixels.

APPLE-1021, 127:3-10; 1251 Reply 27.

FISH.

“Evidence can be authenticated on the basis of the ‘appearance, contents, substance, internal patterns, or other distinctive characteristics of the item, taken together with all the circumstances.’” Fed. R. Evid. 901(b)(4).

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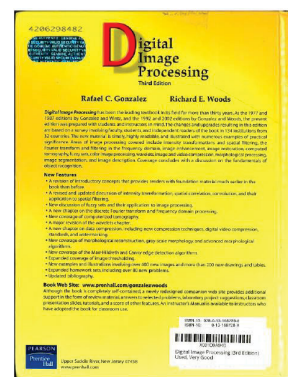
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[illegible]

We also agree with Patent Owner that the distinctive characteristics found on the title page, table of contents, and copyright page of Exhibit 2011 are sufficient to support a finding that the exhibit is what Patent Owner claims it to be. *See* Fed. R. Evid. 901(a), (b)(4). *See* Opp. 10–11; Ex. 2011, 1–9.⁴

Motorola Mobility, LLC, v. Intellectual Ventures I, LLC, CBM2015-00004, Paper 33 at 15 (PTAB Mar. 21, 2016); Paper 38. 2.

Hearsay Challenge to Gonzalez's Copyright Date

“Under Fed. R. Evid. 803(18) (Statements in Learned Treatises, Periodicals, or Pamphlets), the textbook qualifies as a learned treatise that qualifies as an exception to hearsay in this proceeding.”

1251 Paper 38, 1.

We agree with Patent Owner, that Exhibit 2011 contains excerpts from a textbook that qualifies as a learned treatise under Fed. R. Evid. 803(18), and, therefore, should not be excluded under Fed. R. Evid. 802. *See* Opp. 10.

Motorola Mobility, LLC, v. Intellectual Ventures I, LLC, CBM2015-00004, Paper 33 at 15 (PTAB Mar. 21, 2016); Paper 38, 2.

Petitioner provided the Library of Congress Catalog record (APPLE-1015) and the U.S. Copyright Office record (APPLE-1016) for the Gonzalez textbook.

1251 Pet. 2; 1251 Paper 38, 1.

Appendix

**Claim 1 – applying different amounts
of the determined correction to
different portions of the image**

FISH.

Nonaka discloses applying different amounts of correction

[0048] To solve the problem, the optimization processing section 5b first performs amplifying correction of the part of the landscape 30a with a gain 1 which is a predetermined correction amount, and raises the luminance of the landscape 30a from E_0 to E_1 . Furthermore, the optimization processing section 5b performs contrast emphasis processing of the landscape 30a, and raises the contrast from ΔE_0 to ΔE_1 .

[0049] On the other hand, even if F_0 of the person 30b is raised to F_1 with the gain 1, there is little possibility that F_1 becomes sufficiently higher than the noise level. That is, there is high possibility that the visibility cannot sufficiently be secured at this level. This is because the amount of the gain 1 is a correction amount for the landscape 30a, and the gain 1 cannot be set to a sufficiently large value. Since a certain degree of brightness is secured in the landscape 30a, a comparatively small gain to such an extent that the landscape 30a is not saturated is only obtained as the gain 1.

[0050] To solve the problem, the optimization processing section 5b performs the correction processing of the person 30b with a gain 2 as a correction value larger than that of the gain 1 to raise the luminance curve from F_0 to F_2 . Moreover, the optimization processing section 5b performs large contrast emphasis processing as compared with the landscape 30a to raise the contrast from ΔF_0 to ΔF_2 . In consequence, the visibility in the room sufficiently improves. Therefore, an image (FIG. 2A) providing the visibility close to that obtained by human eyes can finally be achieved.

APPLE-1005, ¶ 48-50; 1250 Pet. 16-17.

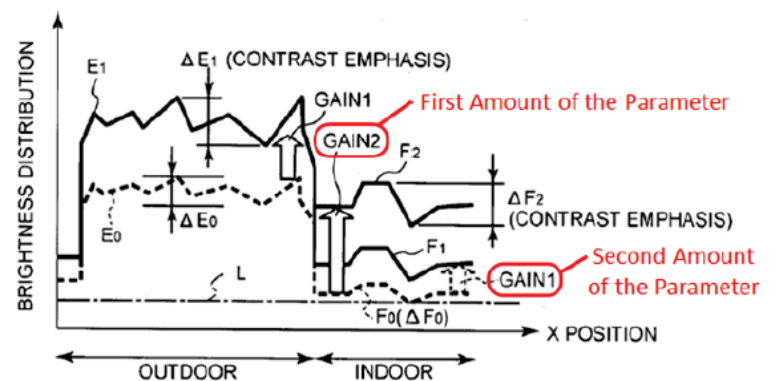


Fig. 4A (Nonaka)

APPLE-1003, ¶ 57; APPLE-1005, FIG. 4; 1250 Pet. 15-17.

Zhang-Konoplev discloses applying different amounts of correction

systems. As discussed above with respect to element [1b], Konoplev teaches applying the determined correction to the first portion of the digital image data (e.g., Konoplev's smoothing of the face and skin areas). APPLE-1009, 2:4-7, 3:37-45, 3:57-4:25, 6:20-30, 8:13-52; APPLE-1012, [0009], [0027], [0029]-[0033], [0047]-[0048], [0061]-[0063]. Including Zhang's disclosures discussed above regarding blurring the background, a POSITA would have recognized that the predictable modification to Zhang as suggested by Konoplev would include smoothing the detected face and skin areas and blurring the background. APPLE-1008, [0006], [0014], [0043], [0045]; APPLE-1009, 2:4-7, 3:37-45, 3:57-4:25, 6:20-30, 8:13-52; APPLE-1012, [0009], [0027], [0029]-[0033], [0047]-[0048], [0061]-[0063]; APPLE-1017, ¶60. A POSITA would have understood that Konoplev's skin smoothing and Zhang's background blurring are different amounts of the same type of correction, and that Konoplev's smoothing, being applied to only the face and skin areas, corresponds to the face and skin. APPLE-

1251 Pet. 28; APPLE-1017, ¶ 60.

Claim 5

Claim 5

5. A method as recited in claim 1, wherein applying the determined correction to the first portion of the digital image data comprises applying a first amount of a parameter to the first portion to enhance the visual characteristic, wherein the first amount of the parameter is different from a second amount of the parameter applied to a second portion of the digital image data, resulting in a first portion of a digital image that corresponds to the first portion of digital image data being brighter than if the second amount of the parameter were applied to both the first portion and the second portion of the digital image data.

APPLE-1001, 11:55-65; 1250 Pet. 18.

PO did not separately address Needham's disclosure of claim 5

Needham teaches applying a first amount (e.g., feature weight assigned to human face features) of a parameter (e.g., intensity dynamic range) to the first portion (e.g., a detected human face) to enhance the visual characteristic, where the first amount of the parameter is different from a second amount (e.g., feature weight assigned to building features) of the parameter applied to a second portion (e.g., the detected buildings) of the digital image data. APPLE-1004, [0019]-[0020], [0022], [0026]-[0027], [0029]-[0031], [0035], Figs. 2, 6. Needham discloses that “[i]n this way, the human faces may be corrected so that they become more visible than buildings.” *Id.*, [0022]. Thus, Needham teaches that applying different amounts of the parameter to different portions results in the first portion being more visible than the second portion.

1250 Pet. 18.

PO did not address Nonaka's disclosure of the language recited in claim 5

discussed above with respect to element [1c], Nonaka discloses that the optimization processing section 5b performs amplifying correction of the landscape portion of the image with a "gain 1," which raises the luminance of the landscape from E_0 to E_1 . APPLE-1005, [0048], Fig. 4A. *Because the "gain 1" cannot secure sufficient visibility of the person (including the face) in the backlit region without saturating the landscape, the optimization processing section 5b performs the correction processing of the person with a "gain 2," which is "a correction value larger than that of the gain 1," to raise the luminance of the person from F_0 to F_2 . Id., [0049]-[0050] (emphasis added), Fig. 4A. As shown in Nonaka's Fig. 4A reproduced and annotated below, applying gain 2 to the backlit region including the face (i.e., the first portion) results in the first portion being brighter than if gain 1 (i.e., the second amount of the parameter) were applied to both the first portion and the second portion of the digital image data. APPLE-1003, ¶57.*

1250 Pet. 19; 1251 Pet. 35-36.

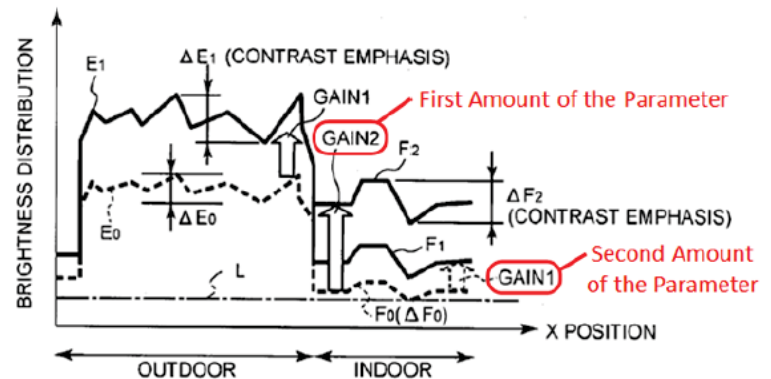


Fig. 4A (Nonaka)

APPLE-1003, ¶ 57; APPLE-1005, FIG. 4; 1250 Pet. 15-17; 1251 Pet. 35-36.

Claim 6

Claim 6

6. A method as recited in claim 1, wherein the predetermined type of physical object represents facial attributes.

APPLE-1001, 11:66-67; 1250 Pet. 20.

PO did not separately address Needham's and Nonaka's disclosure of claim 6

For the same reasons as discussed above with respect to elements [1a]-[1c],
Needham alone and/or Needham in view of Nonaka provides claim 6.
APPLE1003, ¶¶45-63. Needham discloses that “a specified image feature may
correspond to a human face.” APPLE-1004, [0017]. Nonaka also discloses
detecting whether or not a human face exists in image data thereby integrating
Needham's teaching of an image corresponding to a human face. APPLE-1005,
[0036], [0042], [0059], [0063], Figs. 1, 7A, 7B, 8 (step S10-S12).

1250 Pet. 20.

PO did not separately address Zhang's and Konoplev's disclosure of claim 6

For the same reasons as discussed above with respect to element [1a], the Zhang-Konoplev combination provides claim 6. APPLE1017, ¶¶45-62. Zhang describes a foreground definition procedure that uses face, face feature, and skin detection techniques to define head and body regions as a foreground of a digital image. APPLE-1008, Abstract, [0006]-[0008], [0014]-[0037], Figs. 1 and 2 (block 20), Fig. 4 (head region 40, body region 50). The head and body regions (i.e., the foreground) include a head edge region, a body edge region, a head transition region, and a body transition region. *Id.*, [0007]-[0009], [0027]-[0034], Fig. 4. Accordingly, Zhang's detected face and face features represent facial attributes. APPLE-1017, ¶46.

Konoplev describes correcting and enhancing digital images containing human faces. APPLE-1009, Abstract, 1:14-16, 1:60-2:9; APPLE-1012, [0001], [0007]-[0008]. Konoplev's system detects facial images and imperfections in the facial images. APPLE-1009, Abstract, 1:14-16, 1:60-2:4, 2:59-3:3, 3:57-58, 6:22-26; APPLE-1012, [0001], [0007]-[0008], [0024]-[0025], [0029], [0047]. Accordingly, Konoplev's detected facial areas and facial imperfections represent facial attributes. APPLE-1017, ¶53.

1251 Pet. 29.

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