

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GOOGLE LLC,

Petitioner,

v.

138 EAST LCD ADVANCEMENTS LIMITED,

Patent Owner.

Case No. IPR2024-00955

U.S. Patent No. 7,668,365

PETITION FOR *INTER PARTES* REVIEW

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LIST OF EXHIBITS

Exhibit	Description
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Ex. 1004	Curriculum Vitae of Kenneth A. Parulski
Ex. 1005	U.S. Patent Application Publication No. 2003/0108250 to Luo et al. (“Luo-250”)
Ex. 1006	Certified English Translation of Japanese Patent Publication No. JP2003-248825 to Hibi et al. (“Hibi”)
Ex. 1007	U.S. Patent No. 7,212,668 to Luo et al. (“Luo-668”)
Ex. 1008	U.S. Patent No. 5,659,357 to Miyano (“Miyano”)
Ex. 1009	U.S. Patent No. 7,358,994 to Yano
Ex. 1010	U.S. Patent No. 7,013,042 to Yamada
Ex. 1011	<i>Longitude Licensing Ltd. v. Google LLC</i> , No. 23-cv-03046-VC, Dkt. 46 (N.D. Cal. Oct. 27, 2023).
Ex. 1012	Certified English Translation of Japanese Patent Publication No. JP2001-160057 to Sato et al. (“Sato”)
Ex. 1013	<i>Longitude Licensing Ltd. v. Google LLC</i> , No. 23-cv-03046-VC, Dkt. 1 (N.D. Cal. Jun. 21, 2023).
Ex. 1014	<i>Longitude Licensing Ltd. v. Google LLC</i> , No. 23-cv-03046-VC, Dkt. 50 (N.D. Cal. Nov. 15, 2023).
Ex. 1015	<i>Longitude Licensing Ltd. v. Google LLC</i> , No. 23-cv-03046-VC, Dkt. 51 (N.D. Cal. Nov. 15, 2023).

Exhibit	Description
Ex. 1016	Bernd Heisele et al., <i>Face Detection in Still Gray Images</i> , MIT Artificial Intelligence Lab, A.I. Memo No. 1687, C.B.C.L Paper No. 187 (May 2000) (“Heisele”)
Ex. 1017	Kenneth A. Parulski et al., <i>A High-Performance Digital Color Video Camera</i> , SPIE Vol. 1448 Camera and Input Scanner Systems, pp. 45-57 (1991) (“Parulski 1991”)
Ex. 1018	Adobe Photoshop version 5.0 User Guide (1998) (“Photoshop 5.0”)
Ex. 1019	Ken Parulski and David Lewis, <i>Digital, Still-Optimized Architecture for Electronic Photography</i> , IS&T’s 47th Annual Conference, pp. 665-67 (1994) (“Parulski 1994”)
Ex. 1020	U.S. Patent No. 2,571,697 to Evans (“Evans”)
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Ex. 1022	U.S. Patent No. 6,301,440 to Bolle et al. (“Bolle”)
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I. PRECISE RELIEF REQUESTED

Google LLC (“Petitioner”), requests review under 35 U.S.C. § 311 of claims 1-33 (“challenged claims”) of U.S. Patent No. 7,668,365 (“’365 patent”) and cancellation of the challenged claims under pre-AIA 35 U.S.C. § 103 based on the following prior art references and unpatentability grounds:

Grounds	Claims	Basis (§)	Prior Art
1	1, 3, 5-19, 21-24, 26, 27, and 30-33	103	Luo-250
2	2, 20, 23, and 28	103	Luo-250 and Hibi
3	4	103	Luo-250 and Luo-668
4	24, 25, and 29	103	Luo-250 and Miyano

II. BACKGROUND

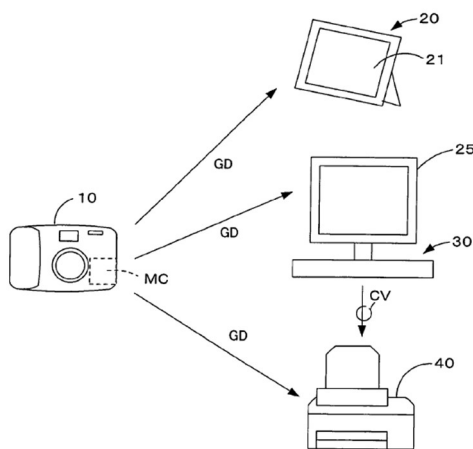
A. The ’365 Patent

The ’365 patent “relates to a technique that determines the main object characterizing an image” and “that adjusts the picture quality of the image data.” ’365 Patent, 1:8-10. According to the ’365 patent, because techniques for adjusting picture quality assume “that the main object characterizing the image has been correctly determined,” improperly determining the main object can “result in poor picture quality.” *Id.*, 1:20-24. The ’365 patent purportedly seeks “to properly

identify the main object characterizing an image” to “improve the picture quality of the main object.” *Id.*, 1:44-48.

The '365 patent describes an image processing system, below, including “a digital still camera 10 as an image data generating device” and an “image processing device,” such as a display device 20, a personal computer 30, and a color printer 40, for processing image data generated by the image data generating device. *Id.*, 6:3-52, 14:1-4.

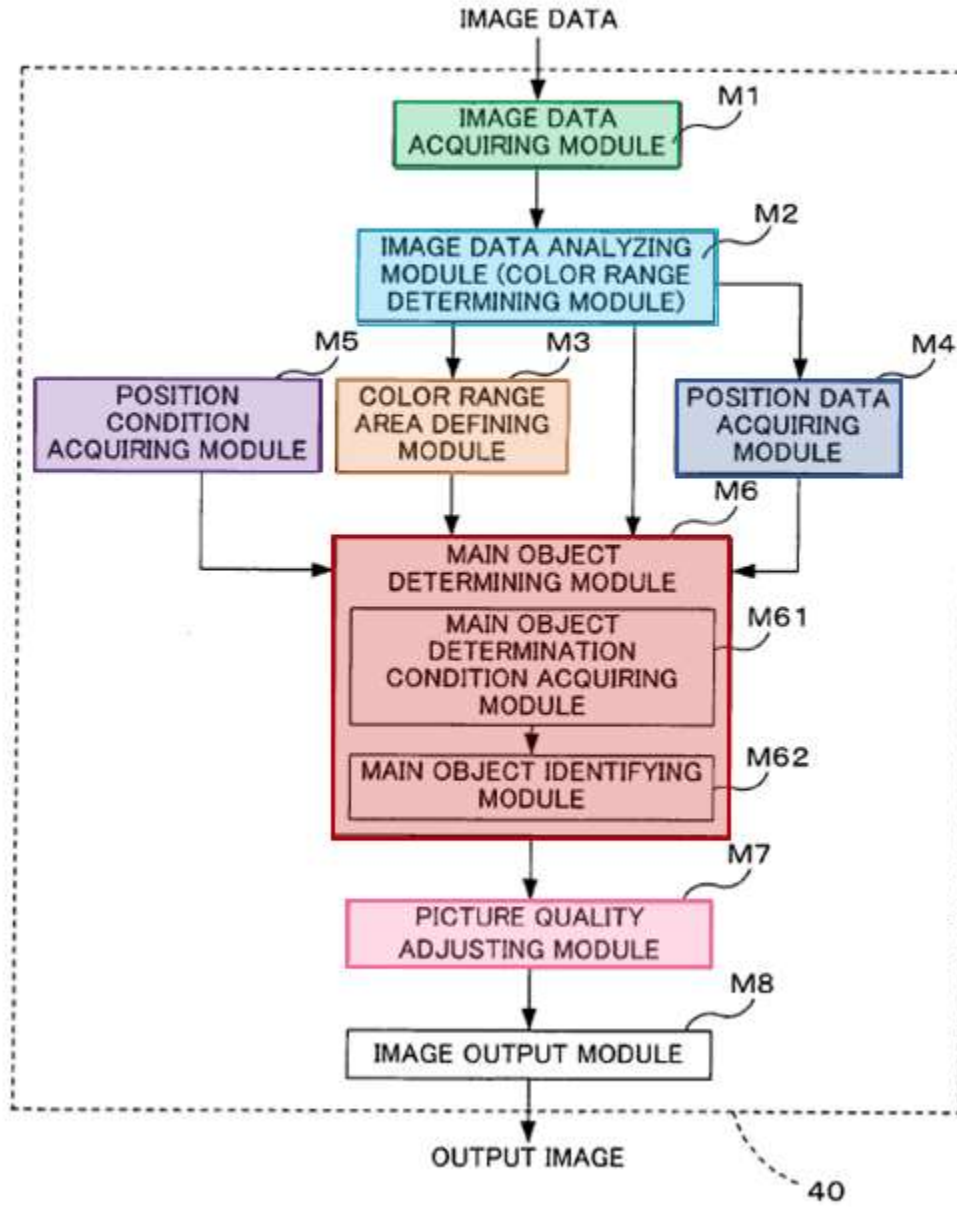
Fig.1



Id., Fig. 1.

Figure 3, below, depicts “a block diagram of the functional modules realized by” an image processing device in one embodiment. *Id.*, 7:26-29.

Fig.3



Id., Fig. 3 (annotated).

In this embodiment, the **image data acquiring module M1** acquires image data and sends it to the **image data analyzing module (color range determining module) M2**. *Id.*, 7:32-35. The image data analyzing module (color range determining module) M2 “splits the image data into a plurality of areas” and “determines the color range of the split areas.” *Id.*, 7:36-38. A “color range” is, e.g., a “color value” or “hue,” such as “flesh tones,” “green,” “sky blue,” or “red.” *Id.*, 9:4-6, 9:35-38. For example, as Figure 8 below illustrates, areas A4, A5, and A6 each exhibit a sky blue color range “S”. *Id.*, 10:23-28.

Fig.8

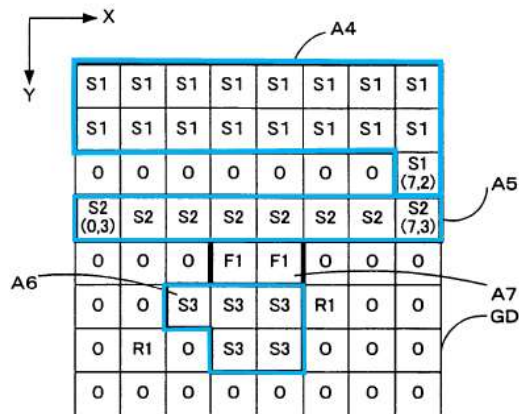
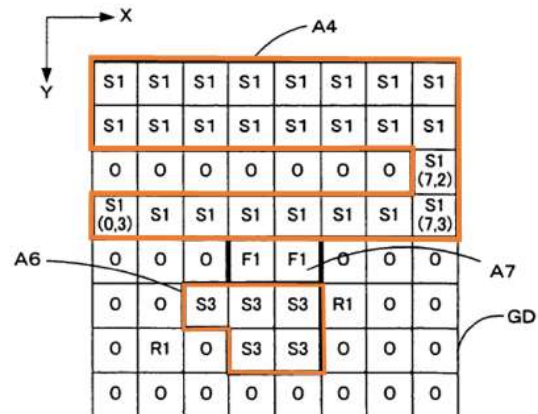


Fig.9



Id., Figures 8, 9 (annotated).

The **color range area defining module M3** then “forms color range areas by associating adjacent image data areas exhibiting the same color range using the determined color range data.” *Id.*, 7:41-44. Because areas A4 and A5 are adjacent and exhibit the same blue sky color range, color range area defining module M3

determines areas A4 and A5 are “the same color range area A4,” as shown in Figure 9. *Id.*, 10:28-36. Area A6, which is not adjacent to A4 or A5, is another color range area A6. Ex. 1003, ¶82.

The **position data acquiring module M4** “acquires position data ... for [the] color range areas.” *Id.*, 7:44-48. The position data is, e.g., “x-y coordinates” that are “assigned to the pixel data” that makes up the image. *Id.*, 8:51-54, 10:39-43. The **position condition acquiring module M5** “acquires position conditions stipulating where objects exhibiting specific color range to be present.” *Id.*, 7:48-50. The position conditions (also called “object-determining-conditions”) are “conditions used to determine whether or not the color range areas correspond to a certain object by means of the color range and position data for the color range areas.” *Id.*, 10:46-49. Figure 11 illustrates a table storing example position conditions. *Id.*, 10:49-51.

Fig.11

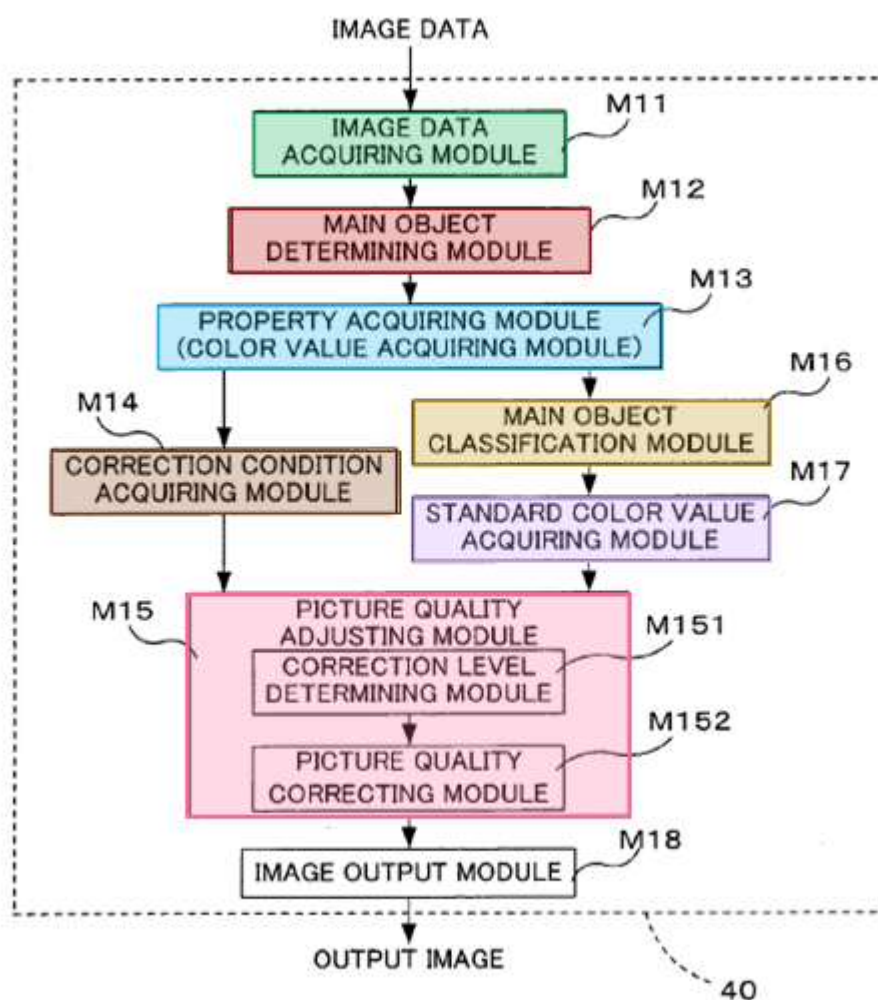
OBJECT	HUE	POSITION	
SKY	SKY BLUE/ RED	TOP OF IMAGE AND TOUCHING EDGES OF IMAGE	AREA(x,0), (0,y), (7,y) $0 \leq x \leq 7, 0 \leq y \leq 2$
VEGETATION	GREEN	BOTTOM OF IMAGE AND TOUCHING EDGES OF IMAGE	AREA(x,7), (0,y), (7,y) $0 \leq x \leq 7, 4 \leq y \leq 7$
PEOPLE	FLESH TONE	MIDDLE OF IMAGE	AREA(x,y) $2 \leq x \leq 5, 2 \leq y \leq 5$

Id., Figure 11.

“The **main object determining module M6** determines the main object corresponding to the color range areas using the color range and position data of the color range areas as well as the position conditions.” *Id.*, 7:51-54. For example, a color range area that (like color range area A4 in Figure 9) is “sky blue/red” and in the “top of image and touching edges of image,” as specified in Figure 11, is determined to be a “sky” object.” *Id.*, 10:59-11:11. Other position conditions are usable to identify “vegetation” and “people” main objects, as shown. *Id.* An image may contain more than one main object. *Id.*, 14:49-50, 17:46-50, Figure 14 (Step S270). Once a main object is determined, “[t]he **picture quality adjusting module M7** adjusts the picture quality of the main object[.]” *Id.* 7:66-8:3.

A “second embodiment” of the “functional modules realized by the control circuit 41” is illustrated in Figure 13. *Id.*, 14:30-34. The **image data acquiring module M11** acquires image data, and the **main object determining module M12** determines “main object image data” corresponding to one or more main object. *Id.*, 14:38-50.

Fig.13



Id., Figure 13 (annotated).

Then, the **property acquiring module (color value acquiring module) M13** “acquires the properties,” such as “statistical values and color values,” of the main object image data. *Id.*, 14:51-54. In some embodiments, the **correction condition acquiring module M14** “acquires correction conditions corresponding to the acquired properties.” *Id.*, 14:55-58. Alternatively, the **main object classification module M16** uses the acquired properties to “classify the main object in greater detail, such as clear sky, ordinary sky, and dark sky,” and the **standard color value acquiring module M17** “acquires standard color values corresponding to the classified main object.” *Id.*, 15:12-22.

In either embodiment of Figure 13, the **picture quality adjusting module M15** then “adjusts the picture quality” of each main object. *Id.*, 14:62-15:1. The correction level determining module M151 “determines the correction level,” e.g., “in a standardized way,” and the picture quality correcting module M152 then “applies the determined correction level to the main object image data.” *Id.*, 15:23-32.

B. Prosecution History

The examiner never issued a rejection but identified as “inventive features”: the “image data analyzing module”; the “position data acquiring module”; the

“main object determining module”; the “correction condition acquiring module”; and the “picture quality adjusting module.” Ex. 1002, 124.

III. OVERVIEW OF PRIOR ART

Luo-250, Hibi, Luo-668, and Miyano are all analogous art to the '365 patent because each is from the same field of endeavor: image processing. *Compare* '365 Patent, 1:44-48 *with* Luo-250, [0016]-[0017], Hibi, 1 (“[Problem]”, “[Means for Solving]”), Luo-668, 1:43-64, and Miyano, 1:60-2:11; Ex. 1003, ¶100; *Unwired Planet, LLC v. Google Inc.*, 841 F.3d 995, 1000-01 (Fed. Cir. 2016). Furthermore, Luo-250, Hibi, Luo-668, and Miyano are reasonably pertinent to “one of the particular problems dealt with by the inventor,” such as improving image quality. *Unwired*, 841 F.3d at 1000-01. *Compare* '365 Patent, 1:44-48 *with* Luo-250, [0016]-[0017], Hibi, 1 (“[Problem]”, “[Means for Solving]”), Luo-668, 1:43-64, and Miyano, 1:60-2:11; Ex. 1003, ¶100.

A. Luo-250

Luo-250, filed December 10, 2001 and published June 12, 2003, is prior art to the '365 patent at least under pre-AIA 35 U.S.C. § 102(a), (e). Luo-250 describes a system that detects “target” and “background” subject matter in an image, then “enhanc[es]” the image “based on the subject matter in the image.” Luo-250, Abstract, [0001].

As Figure 1 shows, after “[a] digital color image 10 is obtained,” “a subject matter detector is selected 20 from a collection of subject matter detectors 22[.]” *Id.*, [0030], [0032]. Each subject matter detector serves to “distinguish[] between target and background subject matters.” *Id.*, [0017]. When the selected subject matter detector is “applied 24 to the digital image,” a “subject matter belief map” results that “indicate[s] the belief that particular pixels or regions of pixels” in the image “belong to a given target subject matter.” *Id.*, [0032].

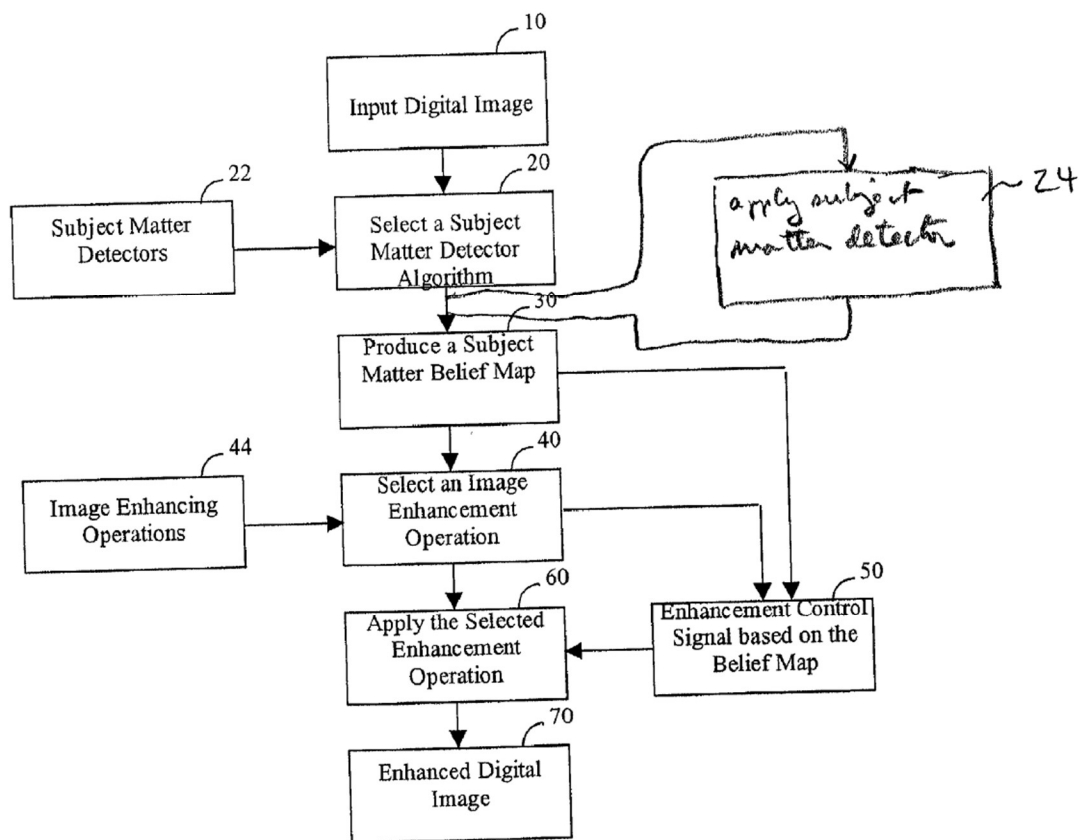


FIG. 1

Id., Figure 1.

Luo-250 illustrates various subject matter belief maps for the image in Figure 2, which is “a typical snapshot image containing a person (whose face is marked as skin region 100), foliage 101, cloud sky 102, clear blue sky 103, and lawn grass 104.” *Id.*, [0079]. Figure 5 is “a belief map generated by the subject matter detector when the target subject matter is grass,” where “the grass ha[s] a belief value of 100[,] ... the tree leaves hav[e] a belief value of 30,” and everything else has a belief value of 0. *Id.* The belief value reflects whether a pixel meets certain “unique characteristics” of the target subject matter, including a “specific location” that stipulates the position where the subject matter is to be present in the image. Luo-250, [0043], Figure 10. For lawn grass, the specific location is “near bottom of the image[] and in contact with image borders.” *Id.*

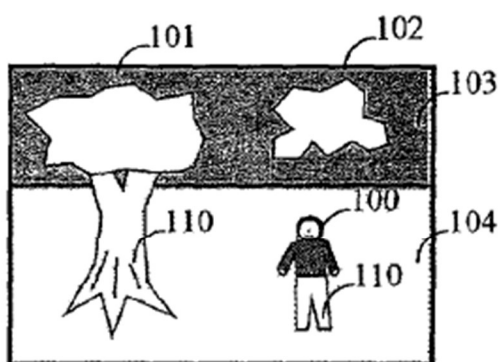


FIG. 2

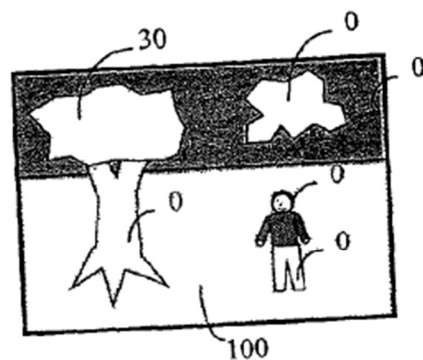


FIG. 5

Id., Figures 2, 5.

Next, “an image enhancement control signal 50” is generated and “applied 60 to the input digital image 10 to produce an enhanced image 70.” *Id.*, [0045]. For example, the enhancement “selectively modif[ies] the colors (color re-mapping) of certain target subject matters,” e.g., “the color of sky regions in an image can be modified to a pre-determined ‘preferred’ or ‘memory’ color of the sky.” *Id.*, [0049].

B. Hibi

Hibi, published September 5, 2003, is prior art to the ’365 patent at least under pre-AIA § 102(a). Hibi describes an “image processing device ... that can achieve a more preferable correction to an image.” Hibi, [Problem]. Hibi’s device “recognizes a plurality of objects from the entered images” and performs “correction ... for each object,” resulting in “correction processing that is more harmonious as a whole than when correction processing is performed on each object alone.” *Id.*, [0015], [0022], [0038]; [Effect of the Invention]. With Hibi’s “correction method,” “more detailed adjustments can be made by using object attributes,” such as the attribute “clear skies” or “sunset” for a “sky” object. *Id.*, [0043]-[0044], Figure 12.

C. Luo-668

Luo-668, filed August 18, 2000 and issued May 1, 2007, is prior art to the ’365 patent at least under pre-AIA § 102(e). Luo-668 teaches a system for

“processing images made up of pixels ... to emphasize the main subject of the image.” Luo-668, 1:7-9. According to Luo-668, “[i]n terms of location, the main subject tends to be located near the center instead of the periphery of the image[.]” Luo-668, 6:12-15.

D. Miyano

Miyano, filed February 1, 1996, and issued August 19, 1997 is prior art to the '365 patent at least under pre-AIA § 102(a), (b), and (e). Miyano teaches a method for “white balance adjusting.” Miyano, Abstract. According to Miyano, certain light sources cause “color failure” in images. Miyano, 1:38-52. For example, a “fluorescent lamp in a room” typically produces “[a] greenish image.” *Id.*, 1:38-40. “[I]n taking pictures of a sunset,” Miyano explains, “the sky itself is properly imaged,” but “subjects except the sky in the sunset” require white balance adjusting. *Id.*, 1:66-2:3. Miyano describes a method “for appropriately adjusting the white balance of an image of the subject irradiated by a plurality of light sources or by an unidentified light source,” such as a “sunset.” *Id.*, 2:8-11, 2:16-18.

IV. LEVEL OF ORDINARY SKILL IN THE ART

Based on the relevant factors, *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995), a person of ordinary skill in the art (“POSITA”) would have had a Bachelor’s degree or equivalent in electrical engineering, computer science, or a

related field, in addition to three years in research, design, or development in digital image processing. Ex. 1003, ¶68.

V. CLAIM CONSTRUCTION

No terms need to be construed under 37 C.F.R. § 42.100(b) to resolve unpatentability. *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (“[O]nly those [claim] terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy”). The plain meaning of each term should apply for the purpose of this IPR.¹

VI. THE CHALLENGED CLAIMS ARE UNPATENTABLE

Luo-250, alone or in combination with Hibi, Luo-668, and/or Miyano would have rendered obvious claims 1–33 of the ’365 patent.

¹ Petitioner reserves the right to argue that certain limitations in the challenged claims are indefinite and/or require construction to resolve controversies in other forums.

A. Ground 1: Luo-250 Would Have Rendered Obvious Claims 1, 3, 5-19, 21-24, 26, 27, and 30-33

1. Claim 1

- a. 1[p] An image processing device that determines the **main object** which characterizes an **image**, the image processing device comprising:**

Luo-250 teaches 1[p] because Luo-250 teaches a “device ... employed to store a computer program product” that determines “**target subject matter**” in an **image**. Ex. 1003, ¶101; Luo-250, Abstract, [0029], [0090]. A POSITA would have understood Luo-250’s **target subject matter** to be a “**main object** which characterizes an **image**” at least because the ’365 patent uses “main object” and “object characterizing the image” synonymously and states that an image may contain more than one main object. ’365 patent, 6:53-63, 14:38-50, 17:46-53, Figure 14 (Step S270); Ex. 1003, ¶101.

- b. 1[a] image data acquiring module that acquires **image data** that is data of the target **image** and that is composed of a plurality of pixel data;**

Luo-250 teaches 1[a] because Luo-250’s device acquires or “obtain[s]” a “digital color **image**” that is composed of “rows of pixels by ... columns of pixels.” Ex. 1003, ¶¶102-103; Luo-250, Abstract, [0031]-[0032]. The “digital color image ha[s] pixels of (red, green, blue) values” arranged in “x₀ rows and y₀ columns.” *Id.*, [0031]-[0032], [0036], [0042].

It would have been obvious to implement this acquiring step as an acquiring module that forms part of Luo-250's computer program product, or as a hardware acquiring module, since Luo-250 teaches that "those skilled in the art will readily recognize that the equivalent of such software may also be constructed in hardware". Ex. 1005, ¶¶ [0029], [0032], [0090]; Ex. 1003, ¶103; '365 Patent, 14:32-35.

A POSITA would have been motivated and found it obvious to do so at least because Luo-250 envisions the computer program product being implemented through any "physical device or media employed to store a computer program having instructions for controlling one or more computers to practice the method." Ex. 1005, ¶ [0090]; Ex. 1003, ¶103. Likewise, Luo-250 teaches that its method is "a method implemented as a software program," which commonly included "modules." Ex. 1005, ¶ [0029]; Ex. 1003, ¶103. Luo-250 discloses that "all software implementation" of its image processing method "is conventional and within the ordinary skill in such arts." Ex. 1005, ¶ [0029]. Accordingly, incorporating this acquiring step into the computer program product as an acquiring module would have been a combination of familiar elements according to known methods to yield predictable results. Ex. 1003, ¶103.

c. 1[b] **color range** determining module segmenting that segments *[sic]* the **image** data into a plurality of **pixel data groups** according to the plurality of areas into which the

image is split, analyzes the image data in terms of pixel data units, and determines the color range exhibited by the pixel data groups;

Luo-250 teaches segmenting the image data into a plurality of pixel data groups according to the plurality of areas into which the image is split because Luo-250's device segments the "digital color image" pixels into "regions of pixels" according to the plurality of pixels or pixel groups into which the image is split. Ex. 1003, ¶¶104-106; Luo-250, [0042]. A POSITA would have understood from Luo-250 that the plurality of pixels ("areas") into which the image is split may be single pixels (when Luo-250's image is a high resolution image) or pixel groups (when Luo-250's image is a low resolution image). Ex. 1003, ¶104; Luo-250, [0031]. Luo-250's regions of pixels are "segment[ed] ... according to" the pixels or pixel groups because each region of pixels is made up of one or more pixels or pixel groups in the image. *Id.*, [0031], [0062], [0069], [0072]. Thus, Luo-250 teaches segmenting the image data into a plurality of pixel data groups according to the plurality of areas into which the image is split because Luo-250's device segments the image data of its digital color image into a plurality of "spatially contiguous regions" according to the plurality of pixels or pixel groups into which the image is split.

Luo-250 also teaches that its device analyzes the image data in terms of pixel data units and determines the color range exhibited by the pixel data groups

because Luo-250's device analyzes the **image** in terms of pixels or pixel groups and determines the color exhibited by the **regions of pixels**. Ex. 1003, ¶105. Luo-250's device analyzes "each pixel in the input color digital image" to "designate[]" certain pixels as certain **colors**. Luo-250's device analyzes "each pixel in the input color digital **image**" to "designate[]" certain pixels as "a **skin-tone** pixel." *Id.*, [0034], [0038] ("Each pixel is designated as either **skin-tone** or **non skin-tone**."). By analyzing the pixels, Luo-250's device determines the **color** exhibited by the **regions of pixels**. By analyzing the pixels to designate each as "either skin-tone or non skin-tone," Luo-250's device determines "[r]egions of skin-tone colored pixels" in the image. *Id.*, [0035]-[0039]. Luo-250 teaches analyzing the pixels to designate **regions** of other **colored** pixels as well, such as regions of "sky, lawn, grass, snow, [or] water" colors. *Id.*, [0040]. Such "color classification" of pixels and "detecting" of certain "colored pixels" were known in the art. *Id.*, [0014]-[0015], [0037]-[0041], [0042]; Ex. 1003, ¶105.

It would have been obvious to implement this **color range** determining step as a **color range** determining module in Luo-250's computer program product, or in a hardware module, for at least the reasons in 1[a]. Ex. 1003, ¶106.

- d. 1[c] **color range area** defining module that defines **color range areas** by associating **pixel data groups** that exhibit the same **color range** and that are adjacent to each

other among pixel data groups exhibiting specific color range;

Luo-250 teaches 1[c] because Luo-250's device defines "candidate subject matter areas" by associating regions of pixels that exhibit the same color and that are adjacent to each other among pixel data groups exhibiting specific color range.

Ex. 1003, ¶¶107-109.

Once Luo-250's device determines the color exhibited by the regions of pixels, *supra* 1[b], regions of pixels that exhibit the same color and are "spatially contiguous" are "form[ed]" into "candidate subject matter regions" and "labeled." Luo-250, [0042], [0043]. Figure 5 illustrates a "belief map" showing the likelihood ("belief value") that certain candidate subject matter regions in the image are "lawn grass." Luo-250, [0023], [0079]. Spatially contiguous regions of green pixels along the bottom of the image together form a candidate subject matter region that is assigned a belief value of 100, while spatially contiguous regions of green pixels on the top left of the image form another candidate subject matter region that is assigned a belief value of 30. *Id.*, [0079]; Ex. 1003, ¶108. Luo-250 teaches defining candidate subject matter regions from spatially contiguous pixels of other colors as well. *Id.*, [0043] ("labeled as smooth blue sky regions," "labeled as smooth lawn grass regions"), [0079] (discussing subject matter regions of "green

foliage,” “cloud sky,” etc.). Such “color classification” of regions was known in the art. *Id.*, [0014]-[0015], [0037]-[0041].

It would have been obvious to implement this **color range area** defining step as a **color range area** defining module in Luo-250’s computer program product, or in a hardware module, for at least the reasons in 1[a]. Ex. 1003, ¶109.

e. 1[d] **position data** acquiring module that acquires **position data for the color range areas**; [and] **position condition** acquiring module that acquires **position conditions** stipulating the position where an object that corresponds to the specific **color range** to be present; and

Luo-250 teaches 1[d] because Luo-250’s device acquires a “**pixel position (x,y)**” for the **candidate subject matter areas** and acquires a “**specific location**” where an object that corresponds to the specific **colors** is to be present. Ex. 1003, ¶¶110-113.

Luo-250 teaches that its device acquires a “**pixel position (x,y)**” for the **candidate subject matter areas** because Luo-250’s image is “an image $i(x,y)$ having x_0 rows and y_0 columns” of pixels. Luo-250, [0031]. Each pixel thus has a “**pixel position (x,y)**” where “(x,y) denotes the x^{th} row and the y^{th} column of an image.” *Id.*, [0062], [0069], [0072]. As a POSITA would have recognized, Luo-250’s **candidate subject matter areas**, which are formed by associating spatially contiguous regions of pixels, would have **pixel positions** for each pixel in the **candidate subject matter area**. Ex. 1003, ¶111.

Luo-250 also teaches that its device acquires a “specific location” where an object that corresponds to the specific colors is to be present. Figure 10 “shows a method ... for detecting subject matter such as ... lawn grass” in which “subject matter regions are analyzed 1028 for unique characteristics.” Luo-250, [0043], Figure 10; Ex. 1003, ¶112. One such unique characteristic is a “specific location” that stipulates the position where subject matter regions of a particular color are to be present in the image, just as the claimed position conditions stipulate the position where an object that corresponds to the specific color range is to be present. *Id.* As Luo-250 explains: “In the case of lawn grass, the unique characteristics” include a “specific location,” namely, “near bottom of the images and in contact with image borders.” *Id.* Of the green subject matter areas in the image, “[o]nly those ... that exhibit th[is] unique characteristic”—the specific location—“are labeled as ... lawn grass regions.” *Id.*

It would have been obvious to implement these position data acquiring and position condition acquiring steps as a position data acquiring module and position condition acquiring module, respectively, that form part of Luo-250’s computer program product, or in hardware modules, for at least the reasons in 1[a]. Ex. 1003, ¶113.

f. 1[e] main object determining module that determines the main object corresponding to the color range areas

using the **color range** and the **position data of the color range areas** as well as the **position conditions**;

Luo-250 teaches 1[e] because Luo-250's device determines the **target subject matter** corresponding to the **candidate subject matter areas** using the **colors** and the **pixel position** of the **candidate subject matter areas** as well as the **specific location**. Ex. 1003, ¶¶114-116. Once Luo-250's device "form[s] spatially contiguous **candidate subject matter regions**" of pixels exhibiting the same **color**, the device "analyz[es] the **spatially contiguous regions** based on ... unique characteristics," including "**specific location**," to "determine the probability that a **region** belongs to the **subject matter**" and "generat[es] a map of detected **subject matter regions** and associated probability that the regions belong to the **subject matter**." Luo-250, [0042]-[0043]. "In the case of lawn grass," the device analyzes the spatially contiguous candidate subject matter regions (i.e., those having green pixels) based on the "specific location" for lawn grass, namely, "near bottom of the image and in contact with image borders." *Id.*, [0043]. "Only those" of the green candidate subject matter regions "that exhibit th[is] unique characteristic"—the specific location—"are labeled as ... lawn grass regions." *Id.*

Referring to the "typical snapshot image" of Figure 2, both foliage 101 and lawn grass 104 would be candidate subject matter regions because both are spatially contiguous regions of green pixels. Ex. 1003, ¶115. But only the

candidate subject matter region of lawn grass 104 would be determined to be the target subject matter lawn grass, because lawn grass 104 is in the specific location (the claimed “position condition”) “near [the] bottom” and “in contact with [the] borders.” *Id.* This is shown in the belief map of Figure 5, where only lawn grass 104 is assigned a belief value of 100, while foliage 101 with similar pixel colors has a belief value of only 30. *Id.*

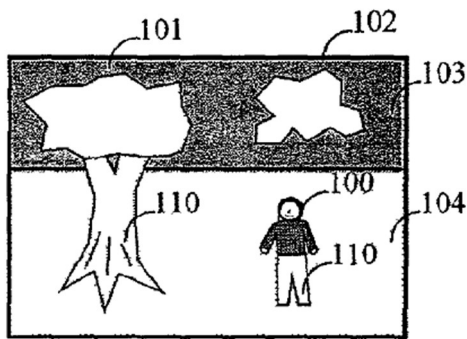


FIG. 2

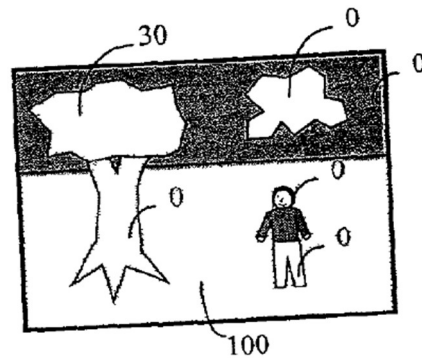


FIG. 5

Luo-250, Figures 2, 5.

It would have been obvious to implement the main object determining step as a main object determining module in Luo-250’s computer program product, or in a hardware module, for at least the reasons in 1[a]. Ex. 1003, ¶116.

g. 1[f] wherein each of the modules of the image processing device is executed by an integrated circuit.

Luo-250 teaches 1[f]. Luo-250 envisions its computer program product being implemented through “any ... physical device or media employed to store a

computer program having instructions for controlling one or more computers to practice the method” Luo-250 teaches. Luo-250, [0017], [0090]. Likewise, Luo-250 envisions implementing its method using “the equivalent of such software... constructed in hardware,” which a POSITA would have understood commonly includes integrated circuits. Luo-250, [0029]; Ex. 1003, ¶117; *see also* Ex. 1024, Abstract, Figure 1, 5:43-50. A POSITA would have understood that Luo-250’s disclosure of “the equivalent of” a computer program product storing instructions (e.g., in RAM or ROM) for carrying out its method “constructed in hardware” teaches modules of an image processing device executed by an integrated circuit. Luo-250, [0029], [0090]; Ex. 1003, ¶117.

To the extent Patent Owner contends otherwise, Luo-250 also would have rendered this obvious. Ex. 1003, ¶118. Computers employing integrated circuits to execute instructions—including integrated circuits implemented as modules—were well known. *Id.*; e.g., Ex. 1009, 2:36-43, 6:61-7:1 (disclosing a “PC” executing “an image process based on an application program installed” thereon using a CPU); Ex. 1010, 2:62-3:4 (disclosing a PC including a CPU executing “a program stored in a ROM 101 . . . using a RAM 103 . . . as a work memory”). A POSITA would have found it obvious to use an integrated circuit to execute Luo-250’s instructions to allow it to execute various computer programs, making the image processing device smaller, less power hungry, and less expensive. Ex. 1003, ¶118.

2. **Claim 3:** An image processing device according to claim 1, wherein the **main object** determining module determines that the **main object** is vegetation when the **color range area** exhibits a green **color range**, and the **location** of the **color range area** is a lower area in the image.

Luo-250 teaches this because Luo-250's **target subject matter** is determined to be lawn grass when the pixels of a **candidate subject matter region** are **green** and the **location** of the **candidate subject matter region** is "near bottom of the image[]." Luo-250, [0043]; Ex. 1003, ¶119; *see* 1[e].

3. **Claim 5**

a. 5[p] An image processing device that determines the **main object** which characterizes an **image**, the image processing device comprising:

See 1[p].

b. 5[a] **image** data acquiring module that acquires **image** data which is data of the target **image**;

See 1[a].

c. 5[b] **image** data analyzing module that segments the **image** data into a plurality of **areas** for analysis in terms of area units;

Luo-250 teaches 5[b] for the same reasons it teaches the "color range determining module" in 1[b]. Ex. 1003, ¶122; Figure 3 ("image data analyzing module (color range determining module)"). Luo-250's device segments the "digital color **image**" pixels into a plurality of "**regions**" of **pixels** that are analyzed

in terms of pixels (for a high resolution image) or pixel groups (for a low resolution image). Ex. 1003, ¶122.

d. 5[c] position data acquiring module that acquires position data of the areas of the image data; and

Luo-250 teaches 5[c] for the same reasons it teaches the “position data acquiring module” in 1[d]. Ex. 1003, ¶123. Luo-250 teaches acquiring position data of the areas of the image data because Luo-250’s device acquires a “pixel position (x,y)” for the “regions” of pixels in the image. Luo-250’s image is “an image $i(x,y)$ having x_0 rows and y_0 columns” of pixels. Luo-250, [0031]. For Luo-250’s high resolution image, the pixel position of a region of pixels is the pixel position of the pixels in the region. For Luo-250’s low resolution image, the pixel position of a region of pixels is the pixel position of the pixel groups in the region.

e. 5[d] main object determining module that determines the main object using the acquired position data and the results of analysis;

Luo-250 teaches a main object determining module that determines the main object using the acquired position data for the same reasons it teaches the “main object determining module” in 1[e]. Ex. 1003, ¶124. Luo-250’s device determines the target subject matter using the results of the analysis (that is, the analysis of the areas in terms of area units in 5[b]) because the device determines the target subject matter using the pixel position and the analysis of the regions of pixels,

which is done in terms of pixels (for a high resolution image) or pixel groups (for a low resolution image). Luo-250, [0035]-[0038], [0042], Figure 10.

f. 5[e] wherein each of the modules of the image processing device is executed by an integrated circuit.

See 1[f].

4. Claim 6: An image processing device according to claim 1, wherein the results of analysis include information on the color range of the areas of the image data, and the main object is determined with the use of object determining conditions stipulating the object by means of color range and location, and the position data of the areas of the image data and the color range data.

Luo-250 teaches claim 6. Ex. 1003, ¶¶126-127. The results of analysis² of the pixels or pixel groups in Luo-250 include information on the color of the candidate subject matter regions of the image because Luo-250's device analyzes "each pixel in the input color digital image" to "designate[]" the pixels of the candidate subject matter regions as certain colors. Luo-250, [0038]. In Luo-250, the target subject matter is determined with the use of object determining conditions—Luo-250's "unique characteristics"—that stipulate the target subject matter by means of color and location. Luo-250, [0042]. As one example, Luo-250 describes unique characteristics for the target subject matter "lawn grass" that

² The "analysis" in claim 6 is the analysis of the image data in terms of pixel data units" in 1[b].

include a pixel **color** of green and a location “near bottom of the images and in contact with image borders.” *Id.*, [0043]. Finally, the **target subject matter** is determined with the use of a **candidate subject matter region**’s **pixel position** and pixel **color**. Luo-250’s device “analyz[es] the spatially contiguous regions based on” the “unique characteristics of the subject matter to determine the probability that a region belongs to the subject matter” and “generat[es] a map of detected subject matter regions and associated probability that the regions belong to the subject matter.” Luo-250, [0042]. “Only those ... that exhibit these unique characteristics”—for lawn grass, a pixel color of green and the specific location—“are labeled as ... lawn grass regions.” *Id.*, [0043]; *see also* 1[e].

5. Claim 7: An image processing device according to claim 1, wherein the areas are composed of one pixel, and the plurality of **pixel data groups corresponding to the areas are composed of one pixel datum.**

Luo-250 teaches this. Ex. 1003, ¶128. As explained in 1[b], the “areas” in Luo-250 are the pixels (for a high resolution image) or pixel groups (for a low resolution image) into which the image is split, and the “**pixel data groups**” in Luo-250 that “correspond[] to the areas” are the **regions of pixels**. Luo-250, [0031]. Luo-250 teaches that the “areas are composed of one pixel,” and the “pixel data groups ... are composed of one pixel datum” because when a high resolution image is used in Luo-250, the “area” is a single pixel, and the corresponding **region**

of pixels is a single pixel datum. Luo-250, [0032] (analyzing “particular pixels” to determine if they “belong to a given target subject matter”), [0034], [0038] (“each pixel is designated as either skin-tone or non-skin tone”), [0043] (“each pixel is assigned ... a subject matter belief value in a color ... classification step”).

6. Claim 8: An image processing device according to claim 1, wherein the areas are composed of a plurality of pixels, and the plurality of pixel data groups corresponding to the areas are composed of a plurality of pixel data.

Luo-250 teaches this. Ex. 1003, ¶129. As explained in 1[b], the “areas” in Luo-250 are the pixels (for a high resolution image) or pixel groups (for a low resolution image) into which the image is split, and the “pixel data groups” in Luo-250 that “correspond[] to the areas” are the regions of pixels. Luo-250, [0031]. Luo-250 teaches that the “areas are composed of a plurality of pixels,” and the “pixel data groups ... are composed of a plurality of pixel data” because when a low resolution image is used in Luo-250, the “area” is a 4x4 group of pixels, and the corresponding region of pixels is a plurality of pixel data. Luo-250, [0032] (analyzing “particular pixels” to determine if they “belong to a given target subject matter”), [0034].

7. Claim 9: An image processing device according to claim 1, wherein the color range comprise [sic] at least hue as a parameter.

Luo-250 teaches this because, as used in Luo-250, “color” includes the “hue, lightness, or saturation of a color.” Ex. 1003, ¶130; Luo-250, [0049].

8. Claim 10

- a. 10[p] An image processing device that determines the **main object** which characterizes an **image**, the image processing device comprising:

See 1[p].

- b. 10[a] **image** data acquiring module that acquires **image** data which is data of the target **image** and which is composed of a plurality of pixel data;

See 1[a].

- c. 10[b] **image** data analyzing module that segments the **image** data into a plurality of **pixel data groups** according to the plurality of areas into which the **image** is split, and analyzes the **image** data in terms of pixel data units;

See 1[b]; '365 patent, Figure 3 (“image data analyzing module (color range determining module”). Ex. 1003, ¶133.

- d. 10[c] **position data** acquiring module that acquires **position data** for the **pixel data groups**; and

Luo-250 teaches 10[c] for the same reasons it teaches a “**position data** acquiring module that acquires **position data** of the **areas**” in 5[c]. Both the “**pixel data groups**” in 10[c] and the “**areas**” in 5[c] are taught by Luo-250’s “**regions**” of **pixels**, as explained in 1[b] and 5[b]. Ex. 1003, ¶134.

- e. 10[d] **main object** determining module that determines the **main object** using the acquired **position data** and results of analysis;

Luo-250 teaches 10[d] for the same reasons it teaches a “**main object** determining module that determines the **main object** ... using the acquired **position**

data and the results of analysis” in 5[d]. Ex. 1003, ¶125. The “results of analysis” in 10[d] is the “analysis ... in terms of pixel data units” in 10[b], while the “results of analysis” in 5[d] is the “analysis ... in terms of area units in 5[b],” but Luo-250’s pixels (for a high resolution image) and pixel groups (for a low resolution image) teach each of the “pixel data units” in 10[d] and the “area units” in 5[d]. See 5[b], 10[b]. As explained in 5[d], Luo-250 teaches determining the **target subject matter** using the acquired **pixel position** and the results of analyzing the pixels (for a high resolution image) and pixel groups (for a low resolution image). See also 1[b].

f. 10[e] wherein each of the modules of the image processing device is executed by an integrated circuit.

See 1[f].

9. Claim 11: An image processing device according to claim 10, wherein the results of analysis include **color range data exhibited by the **pixel data groups**, and the **main object** determining module comprises object identification condition acquiring module that acquires the **object determination conditions** that identifies objects by means of color range and location; and **main object** identifying module that identifies the **main object** using the **position data** and **color range** of the pixel data groups, and the acquired object identification conditions.**

Luo-250 teaches this. Ex. 1003, ¶¶137-140. The results of analysis in Luo-250 include **color range** data exhibited by the **pixel data groups** because by analyzing the pixels (for a high resolution image) or pixel groups (for a low

resolution image), Luo-250's device determines the color exhibited by the regions of pixels. See 1[b].

Luo-250 also teaches acquiring object determination conditions that identify objects by means of color range and location for the same reasons Luo-250 teaches “the use of object determining conditions stipulating the object by means of color range and location” in claim 6. Ex. 1003, ¶138.

Luo-250 teaches identifying the main object using the position data and color range of the pixel data groups, and the acquired object identification conditions, for the same reasons Luo-250 teaches that “the main object is determined with the use of [the] object determining conditions ..., and the position data ... and the color range data,” as explained for claim 6. Ex. 1003, ¶139.

It would have been obvious to implement these object identification condition acquiring and main object identifying steps as an object identification condition acquiring module and main object identifying module, respectively, that form part of Luo-250's computer program product, or in hardware modules, for at least the reasons in 1[a]. Ex. 1003, ¶140.

10. Claim 12: An image processing device according to claim 10, wherein the areas are composed of one pixel, and the plurality of pixel data groups corresponding to the areas are composed of one pixel datum.

See claim 7.

11. Claim 13: An image processing device according to claim 10, wherein the areas are composed of a plurality of pixels, and the plurality of **pixel data groups** corresponding to the areas are composed of a plurality of pixel data.

See claim 8.

12. Claim 14: An image processing device according to claim 10, wherein the **color range** includes at least hue as a parameter.

See claim 9.

13. Claim 15

a. 15[p] A method that determines the **main object** which characterizes an **image**, the method comprising:

Luo-250 teaches “a method” that determines the “**target subject matter**” which characterizes an **image**. Ex. 1003, ¶144, Luo-250, Abstract.

b. 15[a] acquiring **image** data which is data of the target **image** and which is composed of a plurality of pixel data;

See 1[a].

c. 15[b] segmenting the **image** data into a plurality of pixel data groups according to the plurality of areas into which the **image** is split, analyzing the **image** data in terms of pixel data units to obtain the **color range** exhibited by the pixel data groups;

See 1[b].

d. 15[c] defining **color range areas** by associating pixel data groups that exhibit the same **color range** among pixel data groups exhibiting specific **color range**;

See 1[c].

- e. 15[d] acquiring **position data** for the **color range areas**;

See 1[d].

- f. 15[e] acquiring **position conditions** stipulating the position where an object that corresponds to the specific **color range** to be present; and

See 1[d].

- g. 15[f] determining the **main object** that characterizes the **image** using the **color range** and **position data** of the acquired **color range areas** as well as the **position conditions**;

See 1[e].

- h. 15[g] wherein each of the operations of the method is executed by an integrated circuit.

See 1[f].

14. Claim 16

- a. 16[p] An image processing method that determines the **main object** which characterizes an **image**, the image processing method comprising:

See 1[p].

- b. 16[a] acquiring **image** data which is data of the target **image**;

See 1[a].

- c. 16[b] segmenting the **image** data into a plurality of **areas** for analysis in terms of area units;

See 5[b].

- d. 16[c] acquiring **position data** of the **areas** of the **image** data; and

See 5[c].

- e. 16[d] determining the **main object** using the acquired **position data** and the results of analysis;

See 5[d].

- f. 16[e] wherein each of the operations of the image processing method is executed by an integrated circuit.

See 1[f].

15. Claim 17

- a. 17[p] An image processing method that determines the **main object** which characterizes an **image**, the image processing method comprising:

See 1[p].

- b. 17[a] acquiring **image** data which is data of the target **image** and which is composed of a plurality of pixel data;

See 1[a].

- c. 17[b] segmenting the **image** data into a plurality of pixel data groups according to the plurality of areas into which the **image** is split, and analyzing the **image** data in terms of pixel data units;

See 1[b].

- d. 17[c] acquiring **position data** for the pixel data groups; and

See 10[c].

- e. 17[d] determining the **main object** using the acquired **position data** and results of analysis;

See 1[e], 5[d].

- f. 17[e] wherein each of the operations of the image processing method is executed by an integrated circuit.

See 1[f].

16. Claim 18

- a. 18[p] An image processing device comprising:

See 1[p].

- b. 18[a] **main object image** data determining module that determines the **main object image** data corresponding to the **main object** characterizing the **image**;

Luo-250 teaches 18[a] for the same reasons Luo-250 teaches a module that “determines the **main object** [which characterizes the **image**]” as explained for 1[p], 1[e]. Ex. 1003, ¶165.

- c. 18[b] **property** acquiring module that acquires the **properties** of the determined **main object image** data;

Luo-250 teaches 18[b] because Luo-250’s device acquires the property of **color** of the pixels (which together form the candidate subject matter area) in the **image** determined to be the **target subject matter**. Ex. 1003, ¶166. For example, the device identifies “**skin-tone colored** pixels” that make up “regions of **skin tone** colors.” Luo-250, [0034], [0036], [0039], [0079], Figure 3.

It would have been obvious to implement this property acquiring step as a property acquiring module in Luo-250's computer program product, or in a hardware module, for at least the reasons in 1[a]. Ex. 1003, ¶167.

d. 18[c] correction condition acquiring module that acquires correction conditions corresponding to the properties that have been acquired; and

Luo-250 teaches 18[c] because Luo-250's device acquires "preferred" or "memory" colors that correspond to the colors of the pixels that have been acquired. Luo-250, [0049], [0051]. Luo-250 describes a "pre-determined 'preferred' or 'memory' color of the sky; ... of the lawn grass (e.g., that of a golf course); ... [and] of the skin (e.g., tanned skin)." *Id.*, [0049]. These preferred colors are used for "color re-mapp[ing]," in which the color of the pixels of target subject matter are adjusted "in the direction of" these "preferred" colors. *Id.*, [0049].

It would have been obvious to implement this correction condition acquiring step as a correction condition acquiring module in Luo-250's computer program product, or in a hardware module, for at least the reasons in 1[a]. Ex. 1003, ¶169.

e. 18[d] picture quality adjusting module that adjusts the picture quality of the main object image data using the acquired correction conditions;

Luo-250 teaches 18[d] because Luo-250's device "improve[s] the image quality" by "color re-mapping" the pixels of the target subject matter in the image

using the “preferred” colors. Luo-250, [0002], [0016], [0049], [0051]. Ex. 1003, ¶¶170-171. Luo-250 explains: “the color of sky regions in an image can be modified to a pre-determined ‘preferred’ or ‘memory’ color of the sky; the color of grass regions in an image can be modified to a pre-determined ‘preferred’ or ‘memory’ color of the lawn grass (e.g., that of a golf course); the color of skin regions in an image can be modified in the direction of a pre-determined ‘preferred’ or ‘memory’ color of the skin (e.g., tanned skin).” *Id.*, [0049]. Such color re-mapping “can include modification of hue, lightness or saturation of a color.” *Id.*

It would have been obvious to implement this picture quality adjusting step as a picture quality adjusting module in Luo-250’s computer program product, or in a hardware module, for at least the reasons in 1[a]. Ex. 1003, ¶171.

f. 18[e] wherein each of the modules of the image processing device is executed by an integrated circuit.

See 1[f].

17. Claim 19: An image processing device according to claim 18, wherein the correction conditions are correction standard values corresponding to the acquired properties, and the picture quality adjusting module adjusts the picture quality of the main object image data so as to eliminate or reduce the difference between the acquired property values and the correction standard

values.

Luo-250 teaches that the **correction conditions** are correction standard values corresponding to the acquired **properties** because Luo-250's "**preferred**" **colors** are "predetermined," correspond to the **colors** of the pixels, and may be indicated by "values," such as "RGB values" or "Lst coordinates." Ex. 1003, ¶173; Luo-250, [0035], [0049]; *see also* 18[c]; '365 patent, 1:15-19. Luo-250 teaches **adjusting** the picture quality of the **main object image** data so as to eliminate or reduce the difference between the acquired **property** values and the correction standard values because Luo-250 teaches that a **color** of the **target subject matter** in the **image** can be "**modified to**" the **preferred color** (which eliminates the difference between the **color** and the **preferred color**) or can be "**modified in the direction of**" the **preferred color** (which reduces the difference between the **color** and the **preferred color**). *Id.*, [0049]. A POSITA would have understood that modifying the **color** (indicated by an RGB value) to or in the direction of the **preferred color** (indicated by an RGB value) is eliminating or reducing the difference between the color value and preferred or memory color value. Ex. 1003, ¶173.

18. Claim 21: An image processing device according to claim 18, wherein the **main object image data is determined by segmenting the **image** data into a plurality of **image data areas** and by using the **color range** data and **position data** of the **image****

data areas.

Luo-250 teaches this because the **target subject matter** of the **image** is determined (i) by segmenting the **image** into **candidate subject areas** and (ii) by using the **color** and **pixel position** of the **candidate subject areas**. Ex. 1003, ¶174; *see* 1[b], 1[e].

19. Claim 22: An image processing device according to claim 18, wherein the **color range has hue, saturation, and brightness parameters.**

Luo-250 teaches this because, as used in Luo-250, “**color**” includes the “hue, lightness, or saturation of a **color**.” Ex. 1003, ¶175; Luo-250, [0049]; *see* claim 9.

20. Claim 23

a. 23[p] An image processing device for improving the picture quality of the **main object characterizing an **image**, the image processing device comprising:**

Luo-250 teaches 23[p] because Luo-250’s device “determines the amount of **image** enhancement for each region in an **image** based on the **subject matter** content of the region.” Ex. 1003, ¶176; Luo-250, [0018]. Such enhancement “involves applying one or more operations to an image to improve the image quality.” *Id.*, [0002], [0045]-[0052].

b. 23[a] main object image data specifying module that specifies the **main object image data corresponding to the **main object**;**

Luo-250 teaches 23[a] for the same reasons Luo-250 teaches a module that “determines the **main object image** data corresponding to the **main object**” in 18[a]. Ex. 1003 ¶177.

c. 23[b] color value acquiring module that acquires the **color value of the specified **main object image** data;**

Luo-250 teaches 23[b] because Luo-250’s device acquires the **color values** for the pixels in the **image** that make up the **target subject matter**. Ex. 1003, ¶¶178-179. Luo-250’s device “assign[s] to each pixel a belief value as belonging to the **subject matter** region based on **color**[.]” Luo-250, [0042]-[0043]. Luo-250’s device analyzes “each pixel in the input color digital image” to “designat[e]” or “label[]” its color, e.g., “skin-tone colored,” “blue sky,” “green grass.” Luo-250, [0042]-[0043], [0035]-[0038], [0065]-[0066], Figure 9. Such “color classification” and “detecting” of certain “colored pixels” were known in the art. *Id.*, [0014]-[0015], [0037]-[0041]; Ex. 1003, ¶178.

It would have been obvious to implement this color value acquiring step as a color value acquiring module in Luo-250’s computer program product, or in a hardware module, for at least the reasons in 1[a]. Ex. 1003, ¶179.

d. 23[c] main object classifying module that **classifies the **main object** using the acquired **color values**;**

Luo-250 teaches 23[c] for the same reasons Luo-250 teaches a module that “determines the **main object** ... using the **color range**” in 1[e]. Ex. 1003, ¶180. Luo-250 describes **classifying** a subject matter region as a “**face** region” based on the “**skin tone colors**” of the pixels. Luo-250, [0034], [0038], [0042]-[0043],[0079]. The device also classifies the **target subject matter** based on a “texture” of the acquired **color** of the pixels—for example, **classifying** a subject matter region as “**lawn grass**” when the pixels have a **green color** and exhibit “a light and isotropic texture,” but **classifying** a subject matter region as “**foliage**” when the pixels have a **green color** but are “highly textured.” Luo-250, [0043], [0087].

e. 23[d] standard color value acquiring module that **acquires standard color values corresponding to the classified **main object**; and**

Luo-250 teaches 23[d] because Luo-250 teaches acquiring “**preferred**” or “**memory**” **colors** that correspond to the **target subject matter**. Ex. 1003, ¶181. Luo-250, [0049]. These preferred colors are used for “color re-mapp[ing],” in which the target subject matter is adjusted to be these “preferred” colors. *Id.*, [0049]. For example, “a pre-determined ‘preferred’ or ‘memory’ color” corresponding to “the

sky,” “lawn grass (e.g., that of a golf course),” or “skin (e.g., tanned skin)” may be used. *Id.*, [0049].

It would have been obvious to implement this standard color value acquiring step as a standard color value acquiring module in Luo-250’s computer program product, or in a hardware module, for at least the reasons in 1[a]. Ex. 1003, ¶182.

f. 23[e] picture quality adjusting module that **adjusts the picture quality of the **main object image** data using the acquired **color values** and **standard color values**;**

Luo-250 teaches 23[e] because Luo-250’s device “improve[s] the image quality” by “**color re-mapping**” the pixels of the **target subject matter** in the **image** using the “**preferred**” **colors**. Luo-250, [0002], [0016], [0049]; Ex. 1003, ¶183-184. Luo-250 explains, “the color of **sky** regions in an **image** can be **modified** to a pre-determined ‘**preferred**’ or ‘**memory**’ **color** of the **sky**; the color of **grass** regions in an **image** can be **modified** to a pre-determined ‘**preferred**’ or ‘**memory**’ **color** of the **lawn grass** (e.g., that of a golf course); the color of **skin** regions in an **image** can be **modified** in the direction of a pre-determined ‘**preferred**’ or ‘**memory**’ **color** of the **skin** (e.g., tanned skin).” *Id.*, [0049]. Such **color re-mapping** “can include **modification** of hue, lightness or saturation of a color.” *Id.*

It would have been obvious to implement this picture quality adjusting step as a picture quality adjusting module in Luo-250’s computer program product, or in a hardware module, for at least the reasons in 1[a]. Ex. 1003, ¶184.

g. 23[f] wherein each of the modules of the image processing device is executed by an integrated circuit.

See 1[f].

21. Claim 24: An image processing device according to claim 23, wherein the picture quality adjusting module comprises: correction level determining module that determines the level of correction so that the difference between the **color value and **standard color value** is eliminated or reduced; and picture quality correcting module for applying the correction level that has been determined to the **color value** in order to correct the picture quality of the **image** data in the **main object** area.**

Luo-250 teaches (i) determining a level of correction so that the difference between the **color value** and **standard color value** is eliminated or reduced; and (ii) applying the correction level that has been determined to the **color value** in order to correct the picture quality of the **image** data in the **main object** area.

Ex. 1003, ¶¶186-188. Luo-250 teaches that colors—like the acquired **color** of a pixel and a **preferred or memory color**—may be indicated by “values,” such as as “RGB color values” or “Lst” color values. Ex. 1003, ¶186; Luo-250, [0035], [0049], [0051]; *see also* 18[c]. Further, Luo-250 teaches that a **color** of the **target subject matter** in the **image** can be “re-mapped,” that is, “modified to” the **preferred color** (which eliminates the difference between the **color** and the **preferred color**) or can be “modified in the direction of” the **preferred color** (which reduces the difference between the **color** and the **preferred color**). *Id.*, [0049].

Thus, a POSITA would have understood Luo-250 to teach (i) determining a level of correction so that the difference between the **color's** RGB value and the **preferred color's** RGB value is eliminated or reduced; and (ii) applying the correction level that has been determined to the **color's** RGB value in order to correct the picture quality of the **image** data in the **target subject matter** area.

Ex. 1003, ¶187. A POSITA would have recognized that eliminating or reducing a difference between the color's RGB value and preferred color's RGB value would bring the color of the target subject matter in the image closer to the preferred color, thereby improving the picture quality of the image. *Id.* At a minimum, a POSITA would have recognized that using a “correction level” in this manner would have been an obvious way to implement Luo-250's teaching that the **colors** be “modified to” or “modified in the direction of” the **preferred colors**. *Id.*

It would have been obvious to implement these correction level determining and picture quality correcting steps as a correction level determining module and picture quality correcting module, respectively, that form part of Luo-250's computer program product for at least the reasons in 1[a]. Ex. 1003, ¶188.

22. Claim 26: An image processing device according to claim 24, further comprising **low correction image data for using the **color value** as reference to determine **low correction target data**, among the **image** data, which is targeted for correction with **low correction** levels at ore [sic] below the **correction level**; and **low correcting** module that corrects the **low correction** target image**

data by applying the low correction level to the color value.

Luo-250 teaches this. Ex. 1003, ¶¶189-194. As explained for claim 24, Luo-250 teaches color re-mapping, in which a correction level is determined and applied to the color value in order to correct the picture quality of the image data in the main object area. *Id.*

Such color re-mapping is one example of what Luo-250 calls “image enhancement operation[s].” Luo-250, [0076], [0080]. As Figure 1 below shows, after a particular image enhancement operation is selected (step 40), the selected image enhancement operation is applied (step 60) by means of an “enhancement control signal” (step 50) determined using the belief map. *Id.*, [0045]. This control signal, Luo-250 explains, “is generated for controlling the amount of selected enhancement appropriate for the target subject matter and the background subject matters.” *Id.*

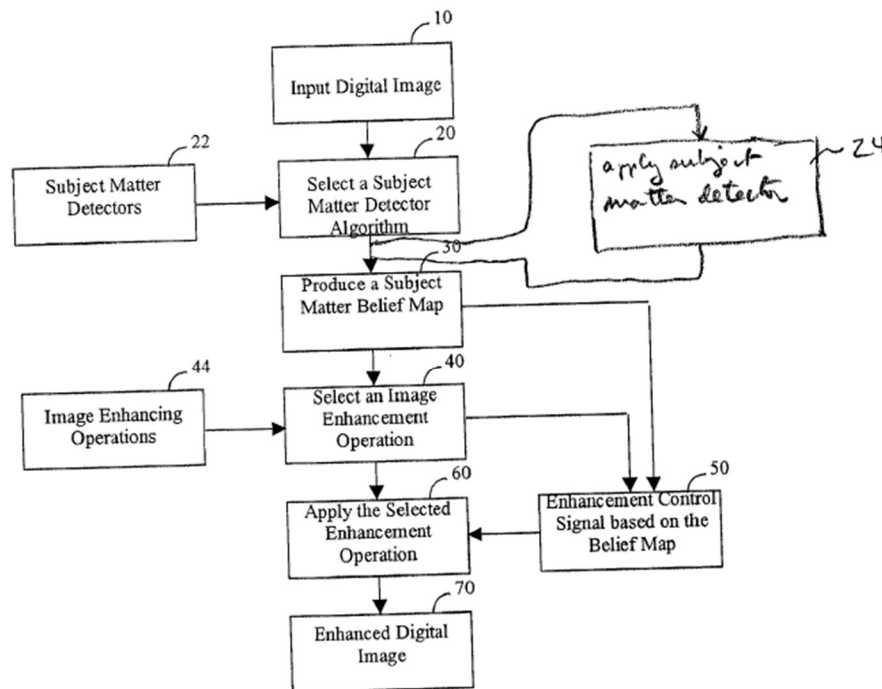


Fig. 1

Luo-250 envisions “added flexibility in tuning the selected image enhancement operation for the target subject matter” by allowing either “conservative” or “aggressive” tuning. Luo-250, [0046], [0076]. “Consider[ing] image sharpening ... as an example,” Luo-250 explains that its device selects, based on color, regions of the image to “conservatively sharpen” and regions of the image to “aggressively sharpen.” Luo-250, [0046]. Luo-250 explains, the device may “conservatively sharpen image regions in which human flesh is detected and aggressively sharpen image regions in which human flesh is not detected[.]” *Id.* A POSITA would have understood from Luo-250 that such “conservative” or

“aggressive” tuning applies to the other enhancement operations Luo-250 describes, including color re-mapping. Ex. 1003, ¶191; Luo-250, [0076], [0080].

Thus, Luo-250 teaches low correction image data for using the color value as reference to determine low correction target data, among the image data, which is targeted for correction with low correction levels at or below the correction level, because Luo-250 teaches that, in regions of a certain color, the device determines regions in the image to conservatively sharpen at a level below the “aggressive[] sharpen[ing]” applied to other regions. Ex. 1003, ¶¶192-19; Luo-250, [0046]. Luo-250 also teaches correcting the low correction target image data by applying the low correction level to the color value because Luo-250 describes “conservatively sharpen[ing]” the regions of the color. Luo-250, [0046].

It would have been obvious to implement the low correcting step as a low correcting module in Luo-250’s computer program product, or in a hardware module, for at least the reasons in 1[a]. Ex. 1003, ¶193.

23. Claim 27: An image processing device according to claim 26, wherein the low correction target data is data other than the main object image data among the image data.

Luo-250 teaches this because Luo-250 teaches “generat[ing]” an “enhancement control signal” for background subject matters (other than the target subject matters), and Luo-250’s enhancement includes “conservatively

sharpen[ing]” regions in the image of subject matter other than a target subject matter. Luo-250, [0045]; Ex. 1003, ¶¶195-197.

For example, when the target subject matter is grass, the remaining regions (including regions of human flesh and blue sky) are background subject matter. Luo-250, [0040], [0079]. Luo-250 proposes using a value of $T_3 = 6.0$ to aggressively sharpen grass and using smaller values of $T_1 = 1.5$ and $T_2 = 1.5$ to conservatively sharpen human flesh and blue sky, thus “conservatively sharpen[ing] image regions in which human flesh is detected and aggressively sharpen[ing] image regions in which human flesh is not detected[,]” which would include the regions of target subject matter grass. Luo-250, [0046], [0064]-[0066]; Ex. 1003, ¶196. Indeed, Luo-250 recognizes that “oversharpening for an image of a human face” may “result in an undesirable appearance ... (e.g., wrinkles, blemishes may be unpleasantly ‘enhanced’, i.e., made more visible.)” Luo-250, [0003]. Thus, Luo-250 teaches “conservatively sharpen[ing]” regions in the image (the background subject matter regions of human skin and blue sky) other than the target subject matter region (grass). Ex. 1003, ¶196.

Luo-250 also describes using aggressive or conservative sharpening to enhance the target subject matter or the background subject matter in an image, which a POSITA would have recognized includes conservatively sharpening regions other than the target subject matter in the image. Luo-250, [0045]-[0046],

[0053], [0078]; Ex. 1003, ¶197. A POSITA would have found it obvious to selectively implement Luo-250's disclosed enhancement operations, including to conservatively sharpen image regions in which the target subject matter grass is not detected. Ex. 1003, ¶197. A POSITA would have had a reasonable expectation of success implementing Luo-250 this way at least because Luo-250 teaches that "[i]n processing a digital image, it is well known to sharpen the image and enhance fine detail with sharpening algorithms," and Luo-250 describes example algorithms to sharpen regions of images using a "control signal" that controls sharpening at each "particular location (x,y)" in the image. *Id.*; Luo-250, [0053]-[0078]. A POSITA would have recognized such an implementation would (1) involve nothing more than combining prior art elements (Luo-250's conservative sharpening of regions of the image) according to known methods (known sharpening algorithms) to yield predictable results (conservative sharpening of regions other than the target subject matter regions in the image); and (2) be obvious to try given Luo-250's description of various permutations of aggressively or conservatively sharpening various target subject matters in an image. Ex. 1003, ¶197.

24. Claim 30: An image processing device according to claim 23, wherein the main object image data is specified by segmenting the image data into a plurality of image data areas and by using

the **color range** data and **position data** of the **image data areas**.

Luo-250 teaches this because the **target subject matter** of the **image** is specified by segmenting the **image** into the **candidate subject matter areas** and by using the **color** and **pixel position** of the **candidate subject matter areas**. Ex. 1003, ¶198; Luo-250, [0031], [0035]-[0038], [0042]-[0043], [0062], [0069], [0072], [0079], Figures 2, 5, 9; *see* 1[c], 1[d], 1[e].

25. Claim 31: An image processing device according to claim 23, wherein the **color range has hue, saturation, and brightness parameters.**

See claim 22.

26. Claim 32

a. 32[p] An image processing method comprising:

See 1[p].

b. 32[a] determining the **main object image data corresponding to the **main object** characterizing the **image**;**

See 18[a].

c. 32[b] acquiring the **properties of the determined **main object image** data;**

See 18[b].

d. 32[c] acquiring **correction conditions corresponding to the **properties** that have been acquired; and**

See 18[c].

- e. 32[d] **adjusting** the picture quality of the **main object image** data using the acquired **correction conditions**;

See 18[d].

- f. 32[e] wherein each of the operations of the image processing method is executed by an integrated circuit.

See 1[f].

27. Claim 33

- a. 33[p] An image processing method for improving the picture quality of the **main object** characterizing an **image**, the image processing method comprising:

See 23[p].

- b. 33[a] specifying the **main object image** data corresponding to the **main object** ;

See 23[a].

- c. 33[b] acquiring the **color value** of the specified **main object image** data;

See 23[b].

- d. 33[c] **classifying** the **main object** using the acquired **color values**;

See 23[c].

- e. 33[d] acquiring **standard color values** corresponding to the classified **main object**; and

See 23[d].

f. 33[e] **adjusting** the picture quality of the **main object image** data using the acquired **color values** and **standard color values**;

See 23[e].

g. 33[f] wherein each of the operations of the image processing method is executed by an integrated circuit.

See 1[f].

B. Ground 2: Luo-250 and Hibi Would Have Rendered Obvious Claims 2, 20, 23, and 28

1. Claim 2: An image processing device according to claim 1, wherein the **main object** determining module determines that the **main object** is the sky when the **color range area** exhibits a sky blue **color range**, and the location of the **color range** area is an upper area in the **image**.

Luo-250 teaches determining that the **target subject matter** is the sky when the **candidate subject matter region** exhibits a sky blue **color range** and other “unique characteristics.” Luo-250, [0043]. Luo-250 also recognizes that “us[ing] color classification only to detect sky” can cause “many types of sky-colored subject matters, such as clothing, man-made object surface, and water, [to be] mistaken as sky.” Luo-250, [0041]. This “[f]ailure to reliably detect the presence of primary subject matters” like sky can “lead to failures in downstream applications (e.g., falsely detected sky regions may lead to incorrect inference of image orientation).” *Id.* The weakness in these “conventional techniques” is their “lack of consideration of unique characteristics of the subject matters.” *Id.* Accordingly,

Luo-250 aims for “a more robust primary subject detection method” that considers such “unique characteristics.” *Id.*, [0041]-[0042].

One such “unique characteristic” is **location**. *Id.*, [0043]. As explained for 1[e], Luo-250 teaches determining a **target subject matter** using both the **color range** and the **location** of the **candidate subject matter region**. “In the case of lawn grass,” Luo-250’s device “label[s]” a **candidate subject matter region** as the **target subject matter** lawn grass using both the **color** (green) and the **location** (“near bottom of the images and in contact with image borders”) of the **candidate subject region**. *Id.*; Ex. 1003, ¶¶213-214.

While Luo-250 does not expressly teach using the unique characteristic of **location** when the **target subject matter** is sky, a POSITA would have been motivated and found it obvious to do so. Ex. 1003, ¶215. A POSITA would have been motivated by Luo-250’s teachings that **color** alone leads to mistaken detection of sky, and that such mistaken detection can lead to “failures in downstream applications.” *Id.*; Luo-250, [0041]-[0042]. A POSITA would have found it obvious to use **location** (alongside **color**) to determine a **target subject matter** is sky at least because Luo-250 expressly teaches using **location** (alongside **color**) to determine other **target subject matters**, like lawn grass. Ex. 1003, ¶215; Luo-250, [0043].

It was known in the art to use **location** (alongside **color**) to determine that a **target subject matter** is sky. Ex. 1003, ¶216. Hibi teaches using **location** (alongside **color**) to determine an **object** is sky. Hibi, [0015]. Just as Luo-250 describes a device that uses **location** (alongside **color**) to determine that a certain **candidate subject matter region** is a particular **target subject matter**, Hibi describes an “image processing device” that uses **location** (alongside **color**) to determine that a “certain **closed area**” is a particular “**object**.” Hibi, Abstract, [0022], Figure 2. “The **object**, for example, ‘sky area’ can be recognized by having ... the **position** at the top of the image; and **color** information captured the closed area included in the blue phase.” *Id.*, [0015], [0022]; *see also* Sato, [0051].

Thus, a POSITA would have been motivated and found it obvious to modify Luo-250’s detection of the sky target subject matter to consider **location** (alongside **color**). Ex. 1003, ¶¶217-218. A POSITA would have understood from Hibi that **location** may be used to determine whether a certain **area** (like Luo-250’s **candidate subject matter region**) is sky and would have been motivated to modify Luo-250’s device to use both **color** and a “**position** at the top of the image” to determine that a **candidate subject matter region** is the target subject matter sky. *Id.* Luo-250’s modified device would determine that the **main object** is the sky when the **color range area** exhibits a sky blue **color range**, and the **location** of the **color range** area is an upper area in the **image** because the modified device would determine that the

target subject matter is sky when the **candidate subject matter region** exhibits a sky blue **color**, and the **position** of the **color** is at the top of the **image**. *Id.*

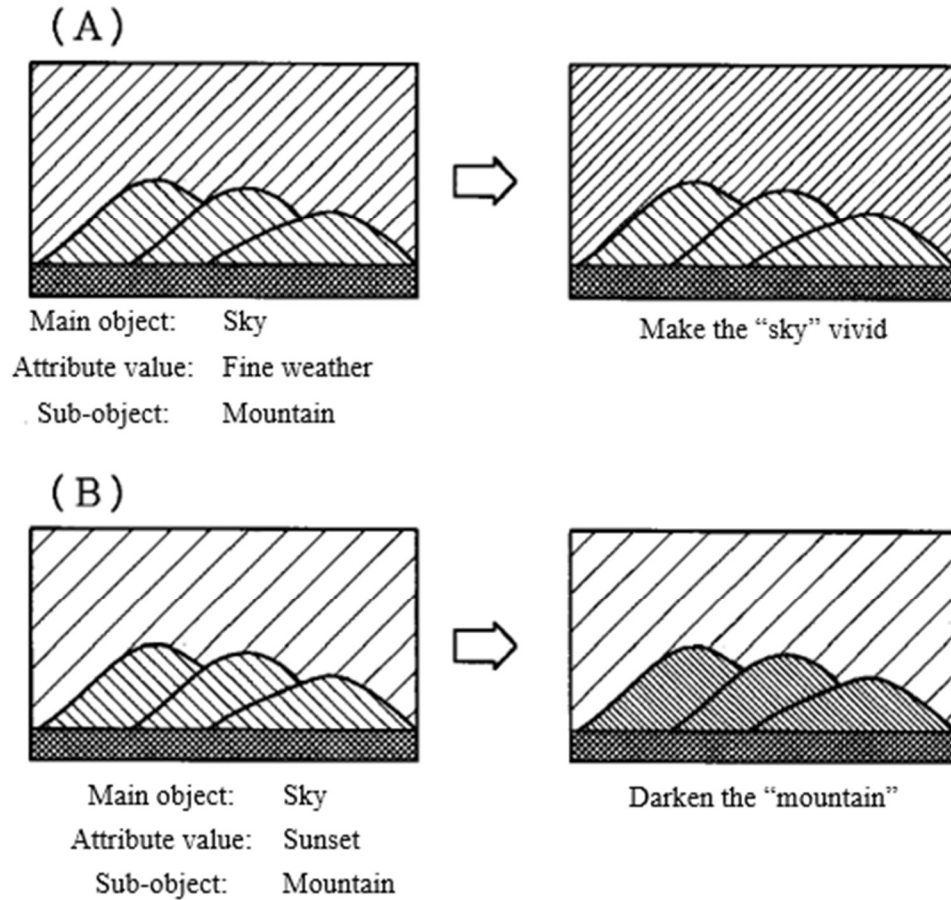
2. Claim 20: An image processing device according to claim 19, wherein the **main object image data is classified into a plurality of **main object image** data by different **color range** for the same **main object**, and a plurality of **correction standard values** are prepared for each classified **main object image** data.**

Luo-250 and Hibi teach this. Ex. 1003, ¶¶219-224. As explained for 18[a] and 18[b], Luo-250 teaches determining the region of the **image** that includes the **target subject matter** and acquiring the property of **color** of the pixels (which together form the candidate subject matter area) in the **image** determined to be the **target subject matter**. *See also* 1[p], 1[e]. Further, as explained for 18[c], Luo-250 teaches acquiring **correction conditions** corresponding to the **properties** that have been acquired because Luo-250's device acquires "preferred" or "memory" colors that correspond to the **colors** of the pixels.

Luo-250 also teaches further classifying the **target subject matter** region of the **image** based on a "texture" of the acquired **color** of the pixels. Luo-250, [0043], [0087]; 23[c]. Luo-250 does not teach further classifying the **target subject matter** region of the **image** into a plurality of **target subject matter** regions of the **image** by different **color range** for the same **target subject matter**. However, this would have been obvious based on Hibi.

Just as Luo-250's device classifies regions of an **image** as **target subject matters**, Hibi describes a device for recognizing a "**main object**" in an "**image**," such as a "face" or a "sky." Ex. 1003, ¶221; Hibi, Summary, [0022]. Hibi also teaches further classifying an **image main object**, including by different **colors** for the same **main object**. Hibi, [0043], For example, regions of an **image** of the **main object** "sky" may be further classified as skies of different **colors**, such as a "clear sky" or a "sunset sky." *Id.* As Figure 10 shows, the **main object** sky is further classified by adding an "attribute value" that indicates "Fine weather" or "Sunset." *Id.* Such attribute values, Hibi teaches, make it possible to "emphasize the **colors** of the sunset" when correcting the image. *Id.*

[FIG. 10]



Hibi, Figure 10.

A POSITA would have been motivated and found it obvious to augment Luo-250's classification of **target subject matter** regions of the **image** to further classify **target subject matter** regions into a plurality of **target subject matter** regions by different **color** for the same **target subject matter** "to improve the image quality," including "color balance." Ex. 1003, ¶222; Luo-250, [0002]-[0003],

[0016]. A POSITA would have recognized that “color balance” and “local quality” would be further improved through further classification of the **target subject matter** regions of differing **colors** (e.g., blue sky and cloudy sky) because more accurate “preferred” or “memory” **colors** could be prepared for these further-classified **target subject matter** regions (e.g., a preferred color for blue sky and a preferred color for cloudy sky). Ex. 1003, ¶222.

For example, a POSITA would have been motivated and found it obvious to augment Luo-250’s classification so that sky regions in the image may be further classified by colors in the sky region. Ex. 1003, ¶223. A POSITA would have been motivated and found it obvious to augment Luo-250’s acquisition of “preferred” or “memory” **colors** that correspond to the **colors** of the target subject matters to prepare a plurality of **preferred**” or “memory” **colors** for each of the further-classified **target subject matter** regions. *Id.* For example, a POSITA would have been motivated and found it obvious to augment Luo-250’s acquisition of a “preferred” or “memory” **color** for sky regions to prepare a plurality of “preferred” or “memory” **colors** for each of a clear or fine weather sky and a sunset sky. *Id.*

A POSITA would have been motivated to augment Luo-250 in these ways because Luo-250 aims “to improve the image quality,” including “color balance.” Ex. 1003, ¶224; Luo-250, [0002]-[0003], [0016]. A POSITA would have recognized that “color balance” would be further improved through further

classification of the **target subject matter** regions of differing **colors** (e.g., blue sky and cloudy sky) because more accurate “preferred” or “memory” **colors** could be prepared for these further-classified **target subject matter** regions (e.g., a preferred color for clear or fine weather sky and a preferred color for sunset sky). Ex. 1003, ¶224. A POSITA would have had a reasonable expectation of success in augmenting Luo-250’s classification to include such “attributes” at least because the use of attributes in image processing was well known. *Id.*; Sato, [0051], [0073].

3. Claim 23

a. 23[a]-23[b] and 23[d]-23[f]

See claim 23 in Ground 1.

b. 23[c] main object classifying module that **classifies** the **main object** using the acquired **color values**;

As explained for 23[c] in Ground 1, Luo-250 teaches this. Ex. 1003, ¶¶226-229. To the extent this is disputed, a POSITA would have found it obvious based on Hibi. *Id.*

Just as Luo-250’s device “improve[s] the image quality” based on determined target subject matter in the image (Luo-250, [0045], [0049]; 23[e]), Hibi’s device “correct[s] an image” based on determined “objects” in the image. Hibi, [0008]. For example, Hibi teaches that “the color of the ‘sky area’ which is the main object can be corrected to be more vivid[.]” *Id.*, [0029].

Hibi explains that “more detailed adjustments can be made by using object attributes.” *Id.*, [0043]. For instance, Hibi teaches adding the attribute “clear skies” or “sunset” to a “sky” object. *Id.*, [0043]-[0044], Figure 10. “[B]y utilizing the object attributes, correction processing according to the respective attributes is possible, and more detailed correction processing is possible.” *Id.*, [0045]. For a “sky” object with a “sunset” attribute, for example, Hibi teaches a correction method that “emphasize[s] the colors of the sunset.” *Id.*, [0044].

A POSITA would have been motivated and found it obvious to augment Luo-250’s classification of a candidate subject matter region as a target subject matter to include “attributes” as well, as Hibi teaches. Ex. 1003, ¶229. A POSITA would have been motivated by Hibi’s teaching that using such attributes permits “more detailed correction processing” to further enhance the image based on the detected subject matter. *Id.*, Hibi, [0045]; Luo-250, [0018]. A POSITA would have had a reasonable expectation of success in augmenting Luo-250’s classification to include such “attributes” at least because the use of such attributes in image processing was well known. Ex. 1003, ¶229; Sato, [0051], [0073].

4. Claim 28: An image processing device according to claim 23, wherein the **main object is classified into a plurality of **main objects** by different **color range** for the same **main object**, and a plurality of **standard color values** are prepared for each classified**

main object.

Luo-250 and Hibi teach this for the same reasons Luo-250 and Hibi teach that **main object** image data is classified into a plurality of **main object** image data by different **color range** for the same **main object**, and a plurality of **correction standard values** are prepared for each classified **main object** image data, as explained for claim 20. Luo-250's "preferred" or "memory" colors are **standard color values**. Ex. 1003, ¶230; *see also* 23[d].

C. Ground 3: Luo-250 and Luo-668 Would Have Rendered Obvious Claim 4

1. **Claim 4: An image processing device according to claim 1, wherein the **main object** determining module determines that the **main object** is a person when the **color range area** exhibits a flesh tone **color range**, and the **location** of the color range area includes the central area of the **image**.**

Luo-250 and Luo-668 teach this. Ex. 1003, ¶¶231-235. Luo-250 teaches determining that the **target subject matter** is a person when the **candidate subject matter region** exhibits a "skin-tone" **color range** and other "unique characteristics." Luo-250, [0033]-[0040], [0042], [0079], Figures 2-3. Luo-250 also recognizes that "us[ing] color classification only" to detect target subject matter can cause other subject matters to be "mistaken as" the target subject matter, which can "lead to failures in the downstream applications." Luo-250, [0041]. "[A] more robust primary subject detection method," Luo-250 recommends, would consider "unique characteristics of the subject matters." *Id.*, [0041]-[0042].

One such “unique characteristic” that Luo-250 proposes is **location**. As explained for 1[e], Luo-250 teaches determining a **target subject matter** using both the **color range** and the **location** of the **candidate subject matter region**. Luo-250, [0043], 1[e].

Luo-250 does not expressly identify unique characteristics for determining that the **target subject matter** is a person or “face” or “skin region,” but a POSITA would have been motivated and found it obvious to use other “unique characteristics,” like **location**, to determine a **target subject matter** is a person. Ex. 1003, ¶233. A POSITA would have been motivated by Luo-250’s teachings that **color** alone leads to mistaken detection of target subject matters. *Id.*; Luo-250, [0041]-[0042]. A POSITA would have found it obvious to use **location** (alongside **color**) to determine a **target subject matter** is a person at least because Luo-250 expressly teaches using **location** (alongside **color**) to determine other **target subject matters**, like lawn grass. Ex. 1003, ¶233; Luo-250, [0043].

Luo-668 teaches that “[i]n terms of location, the main subject tends to be located near the center instead of the periphery of the image[.]” Luo-668, 6:12-16; *see also* Hibi, [0024], Figure 4. From Luo-668, a POSITA would have been motivated and found it obvious to implement Luo-250’s detection of the person target subject matter to consider a central **location** (alongside **color**). Ex. 1003, ¶¶234-235. A POSITA would have also understood from Luo-668 that a centrally

located person is likely a target subject matter. *Id.* Luo-250's device would thus teach determining that the main object is a person when the color range area exhibits a flesh tone color range, and the location of the color range area includes the central area of the image because the device would determine that the target subject matter is a person when the candidate subject matter region exhibits a "skin-tone" color, and the location of the color includes the center of the image. *Id.*

D. Ground 4: Luo-250 and Miyano Would Have Rendered Obvious Claims 24, 25, and 29

1. Claim 24: An image processing device according to claim 23, wherein the picture quality adjusting module comprises: correction level determining module that determines the level of correction so that the difference between the color value and standard color value is eliminated or reduced; and picture quality correcting module for applying the correction level that has been determined to the color value in order to correct the picture quality of the image data in the main object area.

To the extent it is disputed that Luo-250 teaches claim 24 (as discussed for Ground 1), it would have been obvious based on Miyano. Ex. 1003, ¶¶236-239.

Miyano describes "white balance adjusting" that, like Luo-250's color-remapping, serves to correct "color failure" in images. Miyano, Abstract, 1:38-52; Ex. 1003, ¶237. In Miyano's method, as in Luo-250's, the "image signal is divided into a plurality of blocks," each having a color indicated by "R, G, and B components." Miyano, 8:40-45, 9:26-31. Miyano's method determines "white balance adjusting signals Radj and Badj" that are used to "adjust[] the white

balance for the inputted image signal” by “add[ing] the white balance adjusting signals of R_{adj} and B_{adj} to the R and B components of all image pixels, respectively in order to adjust the white balance.” *Id.*, 13:13-19.

A POSITA would have been motivated and found it obvious to implement Luo-250’s color re-mapping using the “adjusting signals R_{adj} and B_{adj}” taught by Miyano. Ex. 1003, ¶238. Luo-250 teaches that, during re-mapping, the color of the target subject matter in the image is “modified to” or “modified in the direction of” the preferred color, and a POSITA would have recognized that these “adjusting signals R_{adj} and B_{adj}” would have been an obvious technique to implement such “modif[y]ing.” Luo-250, [0049]; Ex. 1003, ¶238. A POSITA would have been motivated at least by Luo-250’s lack of implementation details, which would have led a POSITA to look to known techniques, like Miyano’s, for “modif[y]ing” a color in an image “to” or “in the direction of” the preferred color and for performing a “scene balance,” which includes color balance. Ex. 1003, ¶238; Luo-250, [0049]-[0050]. A POSITA would also have been motivated by Miyano’s teaching that the use of such “adjusting signals R_{adj} and B_{adj}” allows the image to be “appropriately adjusted,” regardless of the light source used when the image was captured. Ex. 1003, ¶238; Miyano, Abstract, 13:15-19, 13:26-31. As Miyano explains, certain light sources can discolor an image. For example, a “fluorescent lamp in a room” typically produces “[a] greenish image.” *Id.*, 1:38-40. “[I]n taking

pictures of a sunset,” Miyano explains, “the sky itself is properly imaged,” but “subjects except the sky and the sunset” require white balance adjusting. *Id.*, 1:66-2:3. Miyano teaches that adjusting the image using its “adjusting signals *Radj* and *Badj*” serves to “appropriately adjust[] the white balance of an *image* of [a] *subject* irradiated by a plurality of light sources or by an unidentified light source,” such as a “sunset.” *Id.*, 2:8-11, 13:15-19. A POSITA would have had a reasonable expectation of success implementing Luo-250’s color re-mapping using Miyano’s method at least because a POSITA would have recognized such an implementation would involve nothing more than (1) combining prior art elements (Luo-250’s device and Miyano’s white balance adjusting method) according to known methods to yield predictable results (a color re-mapped image); (2) use of a known technique (Miyano’s white balance adjusting method) to improve similar devices (Luo-250’s and Miyano’s devices) in the same way (by adjusting colors in the image); and (3) applying a known technique (Miyano’s white balance adjusting method) to a known device ready for improvement (Luo-250’s device) to yield predictable results (a color re-mapped image). Ex. 1003, ¶238.

It would have been obvious to implement the picture quality adjusting and picture quality correcting steps as a picture quality adjusting module and picture quality correcting module, respectively, that form part of Luo-250’s computer program product for at least the reasons in 1[a]. Ex. 1003, ¶239.

2. Claim 25: An image processing device according to claim 24, wherein the correction level determining module determines the **correction level by a formula that is modified according to the symbols of the difference.**

Luo-250 and Miyano teach this. Ex. 1003, ¶¶240-241. A POSITA would have recognized that Luo-250's color re-mapping, implemented using Miyano's method as described for claim 24, would determine the **correction level** by a formula that is modified according to the symbols of the difference. Ex. 1003, ¶240. Miyano teaches that the "adjusting signals of **Radj** and **Badj**" are "add[ed] ... to the R and B components of all image pixels ... to adjust the white balance." Miyano, 13:15-19. A POSITA would have recognized that such "add[ing]" is a formula. Ex. 1003, ¶240. A POSITA would have recognized that, when the R or B component of an image pixel needs to be lowered to achieve the appropriate white balance, the formula would be modified to require subtraction, rather than addition. *Id.* The formula would be modified according to the symbols of the difference because the formula would be modified from a positive symbol (for addition) to a negative symbol (for subtraction). Ex. 1003, ¶¶240-241; '365 patent, 20:29-21:24.

3. Claim 29: An image processing device according to claim 28, wherein the picture quality adjusting module comprises correction level determining module that determines the **level of correction, by a formula that is modified according to the type of classified **main object**, so that the difference between the **color value** and **standard color value** is eliminated or reduced; and picture quality correcting module that correct [sic] the picture quality of the **image** data in the **main object** area by applying the**

correction level that determined to the color value.

Luo-250 and Miyano teach this. Ex. 1003, ¶¶242-243. As explained for claims 24 and 25, Luo-250 and Miyano teach determining the **level of correction** by a formula that is modified (there, according to the symbols of the difference) so that the difference between the **color value** and **standard color value** is eliminated or reduced. Luo-250 and Miyano teach correcting the picture quality of the **image** data in the **main object** area by applying the determined **correction level** to the **color value** for at least the reasons that Luo-250 and Miyano teach “applying the **correction level** that has been determined to the **color value** in order to correct the picture quality of the **image** data in the **main object** area” in claim 24.

Luo-250 and Miyano also teach modifying the formula according to the type of classified **main object**. Ex. 1003, ¶243. As explained for claim 24, a POSITA would have been motivated and found it obvious to implement Luo-250’s color re-mapping using the “adjusting signals **Radj** and **Badj**” taught by Miyano to modify the **color** of the **target subject matter** to or in the direction of the **preferred color**. *Id.* A POSITA would have recognized that these “adjusting signals **Radj** and **Badj**” are modified according to the type of classified **target subject matter**, because the **preferred color** of each **target subject matter** is different, thus requiring different “adjusting signals **Radj** and **Badj**.” *Id.*

VII. DISCRETIONARY DENIAL UNDER 35 U.S.C. §§ 314(a) OR 325(d) WOULD BE IMPROPER

A. Discretionary Denial Under § 314(a) Is Improper

Apple Inc. v. Fintiv, Inc., IPR2020-00019, Paper 11, at 5-6 (P.T.A.B. Mar. 20, 2020) (precedential), and the Office’s interim guidelines dated June 21, 2022 (“Guidance Memo”), do not warrant discretionarily denying institution. There is no active parallel district court litigation. Ex. 1015. The court in *Longitude Licensing Ltd.*³ *v. Google LLC*, No. 3:23-cv-03046 (N.D. Cal.) dismissed the proceeding under Rule 12(b)(6) upon determining that the claims of the ’365 patent (among others) are directed to patent ineligible subject matter under 35 U.S.C. § 101. Ex. 1011. The plaintiff voluntarily dismissed the remaining claims, and the Court entered final judgment and closed the file. Exs. 1014, 1015. No claim construction proceedings were underway, fact discovery had only begun, and the parties had not exchanged any infringement or invalidity contentions (and therefore no § 102/§ 103 issues had been raised or addressed). Although Longitude has appealed the § 101 order, institution is nevertheless appropriate. *See Google LLC v. Geoscope Techs. Pte. Ltd.*, IPR2023-01209, Paper 14, at 10-21 (P.T.A.B. Feb. 20, 2024) (instituting review where district court determined that the challenged claims were

³ Longitude Licensing Ltd. “is the exclusive worldwide licensee” of the ’365 patent. Ex. 1013, ¶13.

ineligible under § 101 and appeal was pending); *id.*, Paper 22 (denying director review).

Thus, the *Fintiv* factors favor institution because there is no case to stay or trial date (factors 1 and 2); minimal investment by the parties (factor 3); no overlapping issues (factor 4); and the evidence of obviousness is strong (factor 6). Factor 5 is at worst neutral.

B. Discretionary Denial Under § 325(d) Is Improper

The factors in *Becton, Dickinson & Co. v. B. Braun Melsungen AG*, IPR2017-01586, Paper 8, at 17-18 (P.T.A.B. Dec. 15, 2017) (precedential) weigh against discretionary denial because none of the references were previously evaluated by the Examiner. *See generally* Ex. 1002. The examiner allowed the claims without any rejection. *See* Section II.B. The Board should decline to exercise its discretion to deny institution under § 325(d).

VIII. MANDATORY NOTICES

A. Real Parties-in-Interest Under 37 C.F.R. § 42.8(b)(1)

Google LLC is the real party-in-interest for this Petition.⁴

⁴ Google LLC is a subsidiary of XXVI Holdings Inc., which is a subsidiary of Alphabet Inc. XXVI Holdings Inc. and Alphabet Inc. are not real parties-in-interest to this proceeding.

B. Related Matters Under 37 C.F.R. § 42.8(b)(2)

To the best knowledge of Petitioner, the '365 patent is or has been involved in the following district court litigations:

Name	Number	Court	Filed
<i>Longitude Licensing Ltd. v. Google LLC</i>	3:23-cv-03046-VC	N.D. Cal.	June 21, 2023

The above district court litigation is currently on appeal to the Court of Appeals for the Federal Circuit, No. 24-1202, filed November 28, 2023.

C. Lead and Back-Up Counsel Under 37 C.F.R. § 42.8(b)(3)

Lead Counsel	Back-Up Counsel
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D. Service Information Under 37 C.F.R. § 42.8(b)(4)

Please address all correspondence to lead and back-up counsel at the addresses shown above and Google-Longitude-IPRs@finnegan.com. Petitioner also consents to electronic service by e-mail.

IX. GROUNDS FOR STANDING

Petitioner certifies that the '365 patent is available for IPR and Petitioner is not barred or estopped from requesting IPR to challenge the claims on the grounds above. Petitioner filed this Petition within one year of service of the original complaint against Petitioner in the district court litigation.

X. CONCLUSION

Petitioner requests the Board institute IPR and cancel each challenged claim as unpatentable.

Date: June 21, 2024

Respectfully submitted,

/Erika H. Arner/

Erika H. Arner, Lead Counsel
Reg. No. 57,540

CERTIFICATE OF COMPLIANCE

The undersigned hereby certifies that the foregoing **Petition for *Inter Partes* Review** contains 13,976 words, excluding those portions identified in 37 C.F.R. § 42.24(a), as measured by the word-processing system used to prepare this paper.

/Erika H. Arner/
Erika H. Arner, Lead Counsel
Reg. No. 57,540

CLAIMS APPENDIX

[1p] 1. An image processing device that determines the main object which characterizes an image, the image processing device comprising:

[1a] image data acquiring module that acquires image data that is data of the target image and that is composed of a plurality of pixel data;

[1b] color range determining module segmenting that segments the image data into a plurality of pixel data groups according to the plurality of areas into which the image is split, analyzes the image data in terms of pixel data units, and determines the color range exhibited by the pixel data groups;

[1c] color range area defining module that defines color range areas by associating pixel data groups that exhibit the same color range and that are adjacent to each other among pixel data groups exhibiting specific color range;

[1d] position data acquiring module that acquires position data for the color range areas; position condition acquiring module that acquires position conditions stipulating the position where an object that corresponds to the specific color range to be present; and

[1e] main object determining module that determines the main object corresponding to the color range areas using the color range and the position data of the color range areas as well as the position conditions;

[1f] wherein each of the modules of the image processing device is executed by an integrated circuit.

2. An image processing device according to claim 1, wherein the main object determining module determines that the main object is the sky when the color range area exhibits a sky blue color range, and the location of the color range area is an upper area in the image.

3. An image processing device according to claim 1, wherein the main object determining module determines that the main object is vegetation when the color range area exhibits a green color range, and the location of the color range area is a lower area in the image.

4. An image processing device according to claim 1, wherein the main object determining module determines that the main object is a person when the color range area exhibits a flesh tone color range, and the location of the color range area includes the central area of the image.

[5p] 5. An image processing device that determines the main object which characterizes an image, the image processing device comprising:

[5a] image data acquiring module that acquires image data which is data of the target image;

[5b] image data analyzing module that segments the image data into a plurality of areas for analysis in terms of area units;

[5c] position data acquiring module that acquires position data of the areas of the image data; and

[5d] main object determining module that determines the main object using the acquired position data and the results of analysis;

[5e] wherein each of the modules of the image processing device is executed by an integrated circuit.

6. An image processing device according to claim 5, wherein the results of analysis include information on the color range of the areas of the image data, and the main object is determined with the use of object determining conditions stipulating the object by means of color range and location, and the position data of the areas of the image data and the color range data.

7. An image processing device according to claim 1, wherein the areas are composed of one pixel, and the plurality of pixel data groups corresponding to the areas are composed of one pixel datum.

8. An image processing device according to claim 1, wherein the areas are composed of a plurality of pixels, and the plurality of pixel data groups corresponding to the areas are composed of a plurality of pixel data.

9. An image processing device according to claim 1, wherein the color range comprise at least hue as a parameter.

[10p] 10. An image processing device that determines the main object which characterizes an image, the image processing device comprising:

[10a] image data acquiring module that acquires image data which is data of the target image and which is composed of a plurality of pixel data;

[10b] image data analyzing module that segments the image data into a plurality of pixel data groups according to the plurality of areas into which the image is split, and analyzes the image data in terms of pixel data units;

[10c] position data acquiring module that acquires position data for the pixel data groups; and

[10d] main object determining module that determines the main object using the acquired position data and results of analysis;

[10e] wherein each of the modules of the image processing device is executed by an integrated circuit.

11. An image processing device according to claim 10, wherein the results of analysis include color range data exhibited by the pixel data groups, and the main object determining module comprises object identification condition acquiring module that acquires the object determination conditions that identifies objects by means of color range and location; and main object identifying module that identifies the main object using the position data and color range of the pixel data groups, and the acquired object identification conditions.

12. An image processing device according to claim 10, wherein the areas are composed of one pixel, and the plurality of pixel data groups corresponding to the areas are composed of one pixel datum.

13. An image processing device according to claim 10, wherein the areas are composed of a plurality of pixels, and the plurality of pixel data groups corresponding to the areas are composed of a plurality of pixel data.

14. An image processing device according to claim 10, wherein the color range includes at least the hue as a parameter.

[15p] 15. A method that determines the main object which characterizes an image, the method comprising:

[15a] acquiring image data which is data of the target image and which is composed of a plurality of pixel data;

[15b] segmenting the image data into a plurality of pixel data groups according to the plurality of areas into which the image is split, analyzing the image data in terms of pixel data units to obtain the color range exhibited by the pixel data groups;

[15c] defining color range areas by associating pixel data groups that exhibit the same color range among pixel data groups exhibiting specific color range;

[15d] acquiring position data for the color range areas;

[15e] acquiring position conditions stipulating the position where an object that corresponds to the specific color range to be present; and

[15f] determining the main object that characterizes the image using the color range and position data of the acquired color range areas as well as the position conditions;

[15g] wherein each of the operations of the method is executed by an integrated circuit.

[16p] 16. An image processing method that determines the main object which characterizes an image, the image processing method comprising:

[16a] acquiring image data which is data of the target image;

[16b] segmenting the image data into a plurality of areas for analysis in terms of area units;

[16c] acquiring position data of the areas of the image data; and

[16d] determining the main object using the acquired position data and the results of analysis;

[16e] wherein each of the operations of the image processing method is executed by an integrated circuit.

[17p] 17. An image processing method that determines the main object which characterizes an image, the image processing method comprising:

[17a] acquiring image data which is data of the target image and which is composed of a plurality of pixel data;

[17b] segmenting the image data into a plurality of pixel data groups according to the plurality of areas into which the image is split, and analyzing the image data in terms of pixel data units;

[17c] acquiring position data for the pixel data groups; and

[17d] determining the main object using the acquired position data and results of analysis;

[17e] wherein each of the operations of the image processing method is executed by an integrated circuit.

[18p] 18. An image processing device comprising:

[18a] main object image data determining module that determines the main object image data corresponding to the main object characterizing the image;

[18b] property acquiring module that acquires the properties of the determined main object image data;

[18c] correction condition acquiring module that acquires correction conditions corresponding to the properties that have been acquired; and

[18d] picture quality adjusting module that adjusts the picture quality of the main object image data using the acquired correction conditions;

[18e] wherein each of the modules of the image processing device is executed by an integrated circuit.

19. An image processing device according to claim 18, wherein the correction conditions are correction standard values corresponding to the acquired properties, and the picture quality adjusting module adjusts the picture quality of the main object image data so as to eliminate or reduce the

difference between the acquired property values and the correction standard values.

20. An image processing device according to claim 19, wherein the main object image data is classified into a plurality of main object image data by different color range for the same main object, and a plurality of correction standard values are prepared for each classified main object image data.

21. An image processing device according to claim 18, wherein the main object image data is determined by segmenting the image data into a plurality of image data areas and by using the color range data and position data of the image data areas.

22. An image processing device according to claim 18, wherein the color range has hue, saturation, and brightness parameters.

[23p] 23. An image processing device for improving the picture quality of the main object characterizing an image, the image processing device comprising:

[23a] main object image data specifying module that specifies the main object image data corresponding to the main object;

[23b] color value acquiring module that acquires the color value of the specified main object image data;

[23c] main object classifying module that classifies the main object using the acquired color values;

[23d] standard color value acquiring module that acquires standard color values corresponding to the classified main object; and

[23e] picture quality adjusting module that adjusts the picture quality of the main object image data using the acquired color values and standard color values;

[23f] wherein each of the modules of the image processing device is executed by an integrated circuit.

24. An image processing device according to claim 23, wherein the picture quality adjusting module comprises: correction level determining module that determines the level of correction so that the difference between the color value and standard color value is eliminated or reduced; and picture quality correcting module for applying the correction level that has been determined to the color value in order to correct the picture quality of the image data in the main object area.

25. An image processing device according to claim 24, wherein the correction level determining module determines the correction level by a formula that is modified according to the symbols of the difference.

26. An image processing device according to claim 24, further comprising low correction image data for using the color value as reference to determine low correction target data, among the image data, which is targeted for correction with low correction levels at or below the correction level; and low correcting module that corrects the low correction target image data by applying the low correction level to the color value.

27. An image processing device according to claim 26, wherein the low correction target data is data other than the main object image data among the image data.

28. An image processing device according to claim 23, wherein the main object is classified into a plurality of main objects by different color range for the same main object, and a plurality of standard color values are prepared for each classified main object.

29. An image processing device according to claim 28, wherein the picture quality adjusting module comprises correction level determining module that determines the level of correction, by a formula that is modified according to the type of classified main object, so that the difference between the color value and standard color value is eliminated or reduced; and picture quality correcting module that correct the picture quality of the image data in the main object area by applying the correction level that determined to the color value.

30. An image processing device according to claim 23, wherein the main object image data is specified by segmenting the image data into a plurality of image data areas and by using the color range data and position data of the image data areas.

31. An image processing device according to claim 23, wherein the color range has hue, saturation, and brightness parameters.

[32p] 32. An image processing method comprising:

[32a] determining the main object image data corresponding to the main object characterizing the image;

[32b] acquiring the properties of the determined main object image data;

[32c] acquiring correction conditions corresponding to the properties that have been acquired; and

[32d] adjusting the picture quality of the main object image data using the acquired correction conditions;

[32e] wherein each of the operations of the image processing method is executed by an integrated circuit.

[33p] 33. An image processing method for improving the picture quality of the main object characterizing an image, the image processing method comprising:

[33a] specifying the main object image data corresponding to the main object;

[33b] acquiring the color value of the specified main object image data;

[33c] classifying the main object using the acquired color values;

[33d] acquiring standard color values corresponding to the classified main object; and

[33e] adjusting the picture quality of the main object image data using the acquired color values and standard color values;

[33f] wherein each of the operations of the image processing method is executed by an integrated circuit.

CERTIFICATE OF SERVICE

The undersigned certifies that, in accordance with 37 C.F.R. §§ 42.6(e) and 42.105, the **Petition for *Inter Partes* Review of U.S. Patent No. 7,668,365, the associated Power of Attorney, and Exhibits 1001-1025** were served via FedEx Priority Overnight on the correspondence address of record with the USPTO as follows:

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Dated: June 21, 2024

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