

Petitioner's Demonstratives

Google LLC

v.

138 East LCD Advancements Limited

IPR2024-00958

U.S. Patent No. 8,482,638

October 30, 2025

U.S. Patent No. 8,482,638

the main image GM (step S190). The viewfinder image GF is generated by generating pixel values of the superimposed portion by alpha blending in which the pixel values s of the partial image GSp and the pixel values m of the main image GM are mixed based on a coefficient α for indicating the transparency of the top sub-image GS with respect to the bottom main image GM. The pixel values m of the main image GM are used to generate the portion outside the superimposed portion. FIG. 8 is a view showing the generated viewfinder image GF. As shown in FIG. 8, the superimposed portion of the viewfinder image GF is generated as a double image by alpha blending. In the superimposed portion, the

Ex. 1001, 7:18-32

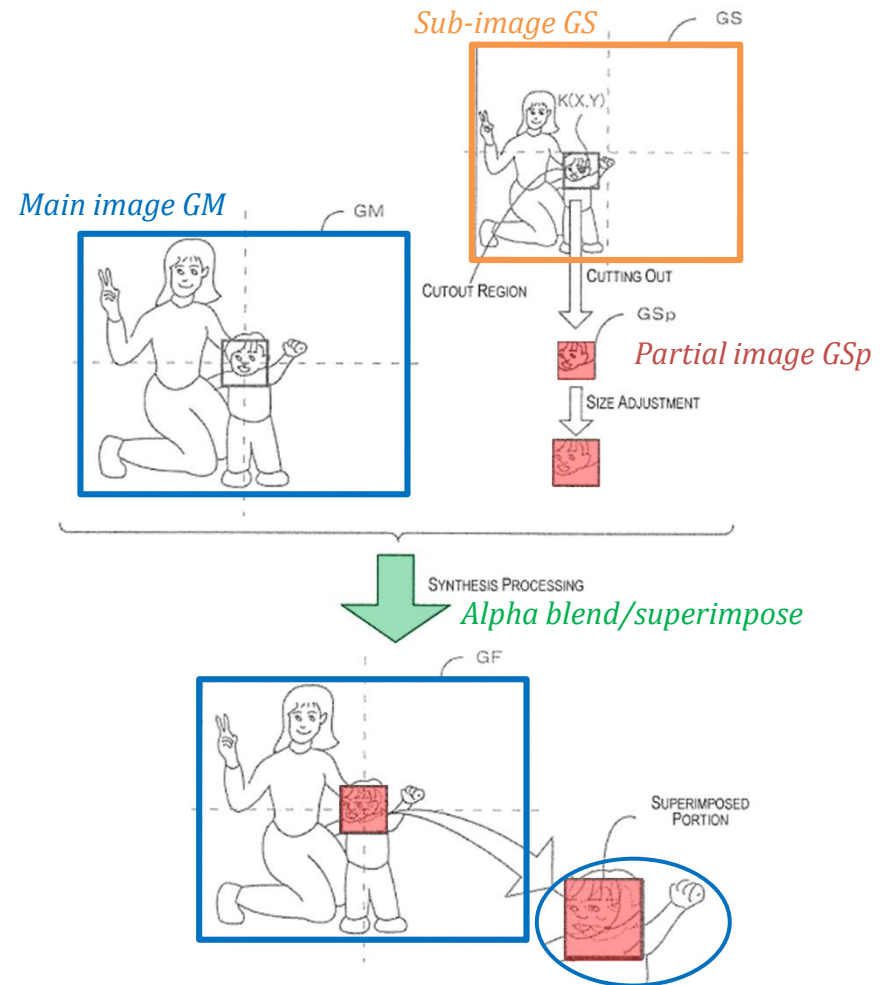


Fig. 8

See, e.g., Pet. 2, 23, 24, 57

Amended independent claim 7

7. (Proposed Substitute for original claim 1) A digital camera having a focusing function and a focal length varying function of a main lens, the digital camera comprising:

a main imaging unit configured to generate a main image by performing a photoelectric conversion from a subject obtained via the main lens;

a sub-imaging unit configured to generate a sub-image by performing a photoelectric conversion from the subject obtained via a sub-lens;

a focal length acquiring unit configured to acquire the focal length of the main lens;

a magnification setting unit configured to set a level of magnification on the basis of the focal length;

a composite image generating unit configured to determine a cutout region in the sub-image, cut out a partial image from the cutout region, magnify at the level of magnification at least one of the main image and the sub-image, and generate a composite image by

~~[combining]~~ superimposing the partial image on the main image ~~[and the sub-image]~~ by mixing pixel values of the partial image with pixel values of the main image,

wherein the generation of the composite image occurs after at least one of the main image and the sub-image is magnified at the level of magnification;

an image display unit configured to display the composite image; and

wherein the magnification setting unit is configured to set the level of the magnification in order to match substantially a size of the main image and a size of the sub-image.

See, e.g., Revised Motion to Amend, Appx A at 1-2 (strikethrough added)

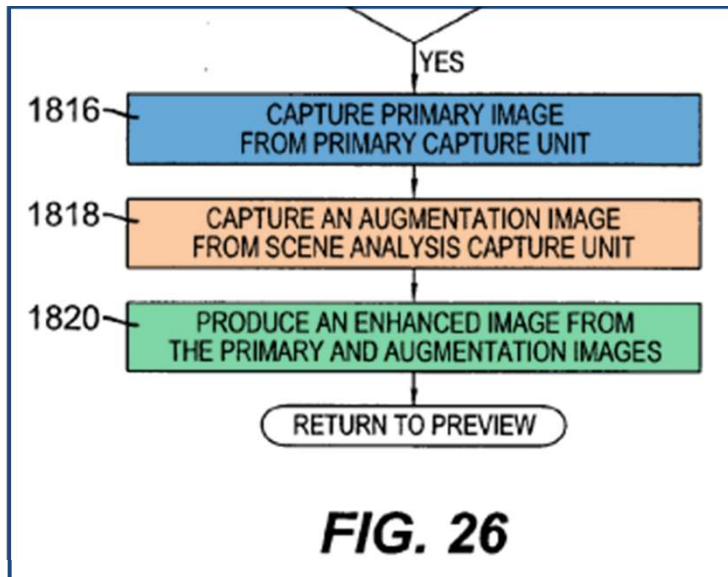
Grounds of unpatentability

Ground	Revised Claims	Basis	Prior Art
1	7, 8, 10-12	35 U.S.C. § 103	Parulski and Safonov
2	7, 8, 10-12	35 U.S.C. § 103	Parulski and Johnson
3	7, 8, 10-12	35 U.S.C. § 103	Parulski, Safonov, and Johnson
4	7, 8, 10-12	35 U.S.C. § 103	Parulski and Hoshino

- Patent Owner argues patentability only for independent claim 7
- No patentability arguments for dependent claims

See, e.g., Opp. RevMTA; Pet'r Sur-Reply Opp. RevMTA

Prior art: Parulski



Parulski Fig. 26 (annotated, excerpted)

scene analysis (block 1812). Next, when the shutter button 42a is fully (S2) pressed (yes to block 1814), a primary image is captured from the primary capture unit using the set parameters (block 1816) and an augmentation image is captured from the scene analysis capture unit (block 1818), which is now designated the secondary capture unit. Then an enhanced image is produced by the image processor 50 from the primary and augmentation images (block 1820), and the process returns to the preview mode. If the shutter button 42a was not

Parulski [0138]

[0031] The secondary output image may be used by the processing stage for a number of purposes, including without limitation: to sharpen portions of the primary image (e.g., to ing stage to capture the primary output image); to modify the dynamic range of the primary image (e.g., where the second- no motion blur) to obtain a modified image with relatively low noise and good sharpness.

Parulski [0031]

ows. Then, a modified image is created with a broadened dynamic range by replacing portions of the primary image with portions of the secondary image.

Parulski [0140]

See, e.g., Pet. 13, 16-17, 20-32, 59; Opp. RevMTA 4, 9-13; Pet'r Sur-Reply Opp. RevMTA 4-7

Prior art: Safonov

Some photographs, such as those affected by backlit defects, have low dynamics in shadow and/or highlight areas. Therefore, for an observer, it causes difficulty in identifying details in shadows and highlights especially with corresponding brighter and darker contrasts than moderately exposed areas. Therefore, it is necessary to increase local contrast in the shadow and highlight areas, increase luminance within the shadow, and also decrease luminance in the highlight.

Let's take "detail image" D_s with high local contrast in shadows, and "digital image" D_h with high local contrast in the highlight area, i.e. images that can identify digital correspondingly well in shadows and highlights. It is then possible to increase the local contrast and luminance of the source image I using the following alpha blending formula of I and D_s :

* * *

In the same way, it is possible to increase the local contrast of the source image I and also reduce luminance using the following alpha blending formula of I and D_h :

* * *

The results of the shadow and highlight correction can be synthesized by the following formula:

$$L_c(r, c) = (I_{es}(r, c) + I_{eh}(r, c)) / 2 = \\ = I(r, c) + k_s * (1 - \alpha_s(r, c)) * (D_s(r, c) - I(r, c)) - k_h * (1 - \alpha_h(r, c)) * (I(r, c) - D_h(r, c)), (4)$$

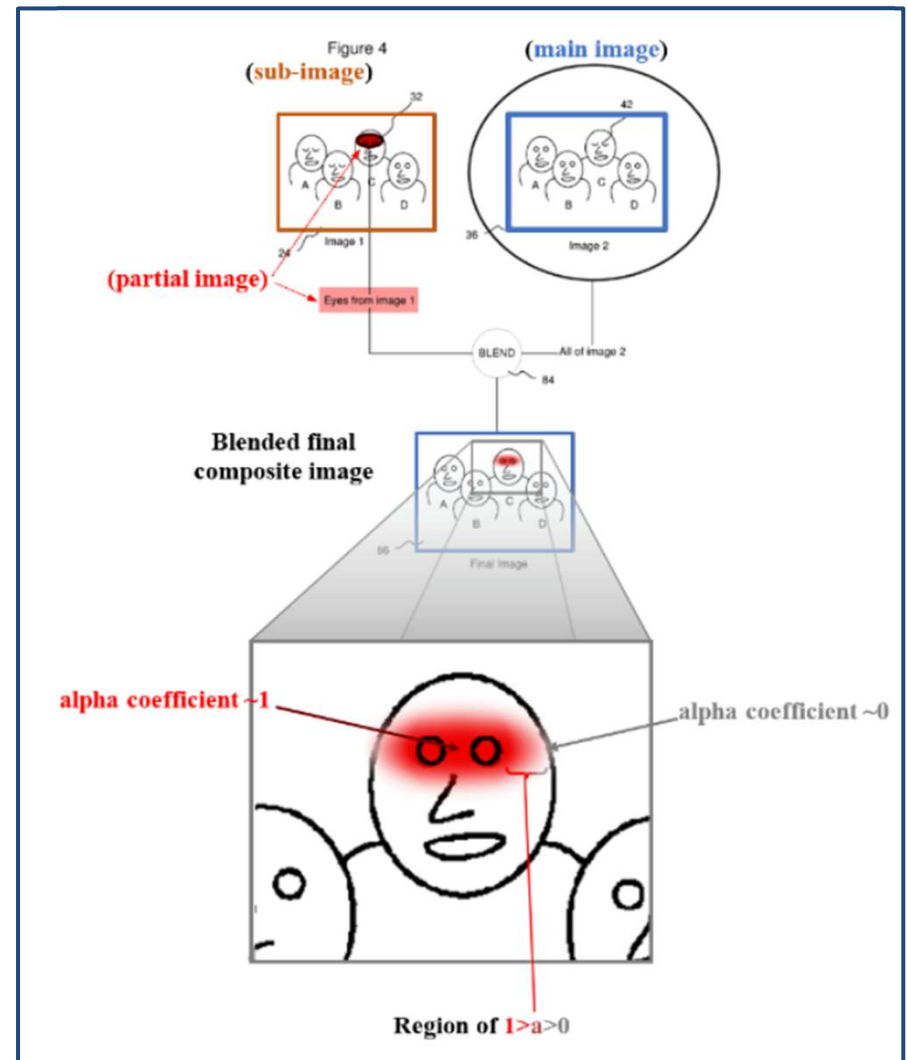
Safonov 7-8

See, e.g., Opp. RevMTA 8-10, 14-15; Pet'r Sur-Reply Opp. RevMTA 4-7

Prior art: Johnson

FIG. 4 is a graphical representation of the blending operation. The region of each eye from Subject C 32 is blended 84 into the content of the second image 36, which effectively replaces the closed eyes of Subject C 42, creating a single final image 86 where all subjects have open eyes.

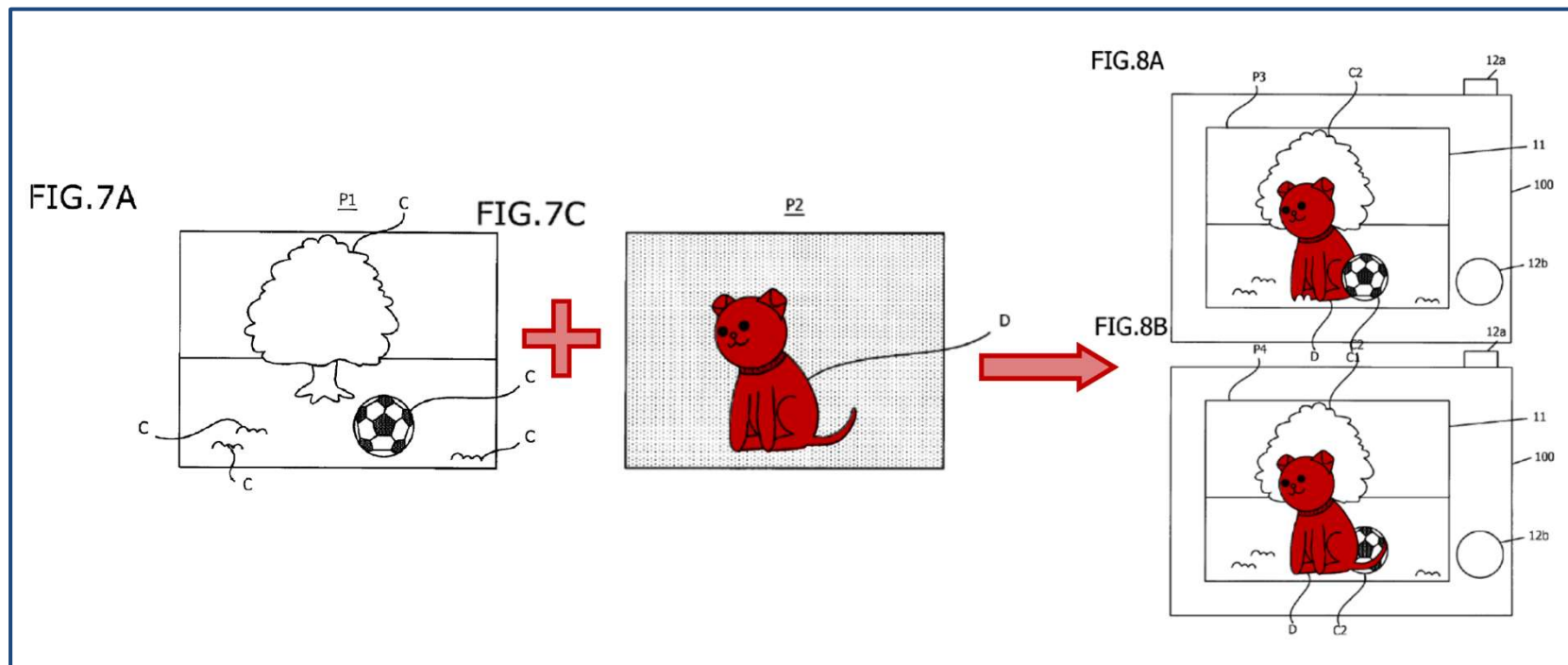
Johnson 3:46-50



Stevenson 3rd ¶156 (annotating Johnson Fig. 4, callout added)

See, e.g., Opp. RevMTA 17-19; Pet'r Sur-Reply Opp. RevMTA 9-11; Stevenson 3rd ¶156

Prior art: Hoshino



Stevenson 3rd ¶175 (annotating Hoshino Figs. 7A, 7C, 8A, 8B)

[0039] In the map, the pixels of the subject-background image E1 each are given a weight represented by an alpha (α) value where $0 \leq \alpha \leq 1$ with which the subject image D is alpha blended with a predetermined background.

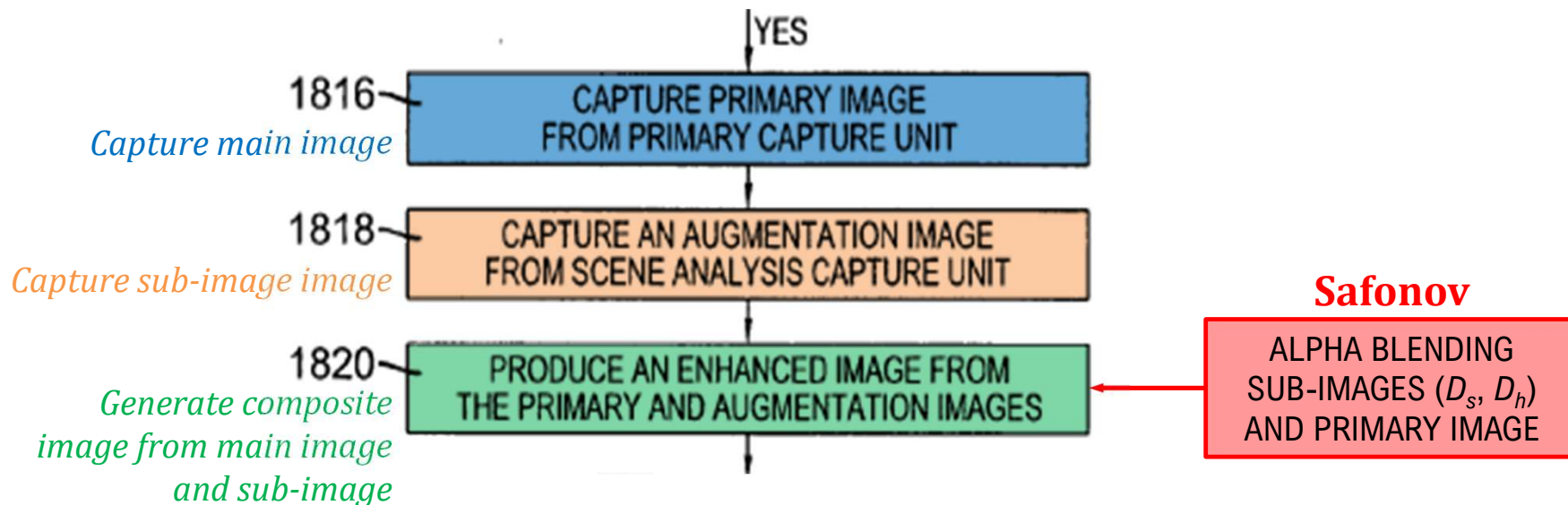
Hoshino [0039]

See, e.g., Hoshino, Figs. 7A, 7C, 8A, 8B (annotated); Opp. RevMTA 24-25; Stevenson 3rd ¶176

Ground 1: Parulski and Safonov

Parulski-Safonov combination: Using alpha blending to combine main and sub-images to create enhanced composite image

Parulski, Fig. 26 (excerpted)



- Sole dispute – Whether it would have been obvious to use alpha blending (taught by Safonov, well known to POSITA) when combining Parulski's main image and sub-image

See, e.g., Pet. 20-27, 54-59; Opp. Rev.MTA 4, 9-13; Pet'r Sur-Reply Opp. RevMTA 4-7

Motivation to combine 1: Improve dynamic range and contrast (Parulski)

[0031] The secondary output image may be used by the processing stage for a number of purposes, including without limitation: to sharpen portions of the primary image (e.g., to extend the depth of field of the primary still image or to selectively sharpen portions of the primary still image and defocus other portions of the image, particularly where the secondary output image is captured by the second imaging stage at a different focus position than used by the first imaging stage to capture the primary output image); to modify the dynamic range of the primary image (e.g., where the secondary output image is captured by the second imaging stage at a different exposure level than used by the first imaging stage to capture the primary output image); to provide scene analysis data for setting the capture parameters for the primary image; or to replace portions of the primary image (areas of lower noise but with some motion blur) with corresponding portions of the secondary image (areas of higher noise but little or no motion blur) to obtain a modified image with relatively low noise and good sharpness.

Parulski [0031]

[0140] In another type of augmentation or modification according to the present invention, the image could be examined by the image processor 50 for its dynamic range. When the dynamic range exceeds a predetermined threshold, the scene analysis capture unit is used to produce a secondary image with different dynamic range than the primary image. For example, the primary image could be captured at a normal exposure, while the secondary image could be captured at more of an extreme exposure, i.e., either under- or over-exposed. Then, if for example, highlights are blown out in the primary exposure, the secondary exposure could be underexposed to capture detail in the highlights. Alternatively, if shadows are darkened in the primary exposure, the secondary exposure could be overexposed to capture detail in the shadows. Then, a modified image is created with a broadened dynamic range by replacing portions of the primary image with portions of the secondary image.

Parulski [0140]

See, e.g., Opp. RevMTA 7-15; Pet'r Sur-Reply Opp. RevMTA 4-7

Motivation to combine 1: Improve dynamic range and contrast (Safonov)

Some photographs, such as those affected by backlit defects, have low dynamics in shadow and/or highlight areas. Therefore, for an observer, it causes difficulty in identifying details in shadows and highlights especially with corresponding brighter and darker contrasts than moderately exposed areas. Therefore, it is necessary to increase local contrast in the shadow and highlight areas, increase luminance within the shadow, and also decrease luminance in the highlight.

Let's take "detail image" D_s with high local contrast in shadows, and "digital image" D_h with high local contrast in the highlight area, i.e. images that can identify digital correspondingly well in shadows and highlights. It is then possible to increase the local contrast and luminance of the source image I using the following alpha blending formula of I and D_s :

* * *

In the same way, it is possible to increase the local contrast of the source image I and also reduce luminance using the following alpha blending formula of I and D_h :

Safonov 7

See, e.g., Opp. RevMTA 7-15; Pet'r Sur-Reply Opp. RevMTA 4-7

Motivation to combine 1: Use alpha blending between 0 and 1 (Safonov)

For all pixels (r, c) of Image I , in the above formula, α_s is an alpha-channel of permeability with a value close to 1 in the bright area and a value close to 0 in the dark area, and the factor k'_s controls the amplification level of the local contrast in the shadow. After opening the parenthesis, we can get the following formula:

* * *

In the above formula, α_h is a permeable alpha-channel having a value close to zero in the bright area and a value close to 1 in the dark area, and the factor k'_h controls the amplification level of the local contrast in the highlight.

The results of the shadow and highlight correction can be synthesized by the following formula:

$$I_c(r, c) = (I_{cs}(r, c) + I_{ch}(r, c)) / 2 = \\ = I(r, c) + k_s * (1 - \alpha_s(r, c)) * (D_s(r, c) - I(r, c)) - k_h * (1 - \alpha_h(r, c)) * (I(r, c) - D_h(r, c)), (4)$$

Safonov 7-8

See, e.g., Opp. RevMTA 7-15; Pet'r Sur-Reply Opp. RevMTA 4-7

Motivation to combine 2: Smooth edge boundaries between partial image and main image

combining the main image and sub-image. For example, a POSITA would have understood that the combined image should be created in a way that minimizes or hides the edges where the main image and sub-image meet, and would have recognized that blending the images would have smoothed the transition to prevent the user from seeing where the second image was used to replace part of the main image. In my opinion, a POSITA would have found it obvious to use alpha blending on some (e.g., edges) or all of the sub-image portion added to the main image, such as where the sub-image has been superimposed over the main image because it has less blur or improved dynamic range compared to the main image, to blend away any differences in resolution, color variation, or gain settings, thereby cohesively integrating the sub-image into the main image. *See* Ex. 1025, 1; Ex.

Stevenson 3rd ¶76

83. Incorporating alpha blending into a composite image generating unit provides significant advantages that would have been readily apparent to a POSITA. This is particularly useful when creating images that integrate different layers, each possibly containing different levels of detail, such as the system described in Parulski. A POSITA would have known that alpha blending enables the seamless combination of multiple images or layers by using a transparency (the alpha channel), which dictates how each pixel of the composite image is created by using the pixels from the images being combined. A POSITA would have understood that alpha blending allows for smooth transition between layers without harsh edges or visible seams, which is crucial for creating natural-looking composite images.

Stevenson 3rd ¶83

See, e.g., Opp. RevMTA 7, 9-10; Pet'r Sur-Reply Opp. RevMTA 3-4, 6-7

Petitioner's expert explains that alpha blending was well known for mixing pixels from different images

1026 (Image and Video Matting), 1, 7, 21. Porter and Duff (1984) teach that alpha blending provides a mathematically simple and computationally efficient way to seamlessly combine images by using an alpha channel to respect partial pixel coverage, thereby eliminating visible seams and preventing aliasing at boundaries. Ex. 1025, 1; *see also* Ex. 1026, 1. This teaching would have motivated a POSITA to use alpha blending, using an alpha coefficient between 0 and 1, to improve Parulski's replacement using sub image portions to smooth the transition between the sub image and the main image, so that the integration does not expose differences in resolution, sharpness, color balance, or gain settings. For example,

Stevenson 3rd ¶76

See, e.g., Opp. RevMTA 7, 11, 18; Pet'r Sur-Reply Opp. RevMTA 5-8

Alpha blending was well known for mixing pixels from different images

Alpha Blending

[0003] In computer graphics, alpha blending, or alpha channel blending, refers to the use of an alpha channel with other channels in an image in order to show translucency. The

Yadav [0003]

[0007] Embodiments may use alpha blending to blend one or more regions selected from one or more source images with a base image. Embodiments may provide one or more blending level user interface elements via which a user may adjust the alpha blending level for a region overlaid on the base image from fully opaque to fully transparent. In some

Yadav [0007]

foreground matting. This problem was mathematically established by Porter and Duff in 1984 [29]. They introduced the alpha channel as the means to control the linear interpolation of foreground and background colors for anti-aliasing purposes when rendering a foreground over an arbitrary background. Mathematically, the observed image I_z ($z = (x, y)$) is modeled as a convex combination of a foreground image F_z and a background image B_z by using the alpha matte α_z :

$$I_z = \alpha_z F_z + (1 - \alpha_z) B_z, \quad (1.1)$$

where α_z can be any value in $[0, 1]$. If $\alpha_z = 1$ or 0, we call pixel z *definite foreground* or *definite background*, respectively. Otherwise we call pixel z *mixed*. In most natural images, although the majority of pixels are either definite foreground or definite background, accurately estimating alpha values for mixed pixels is essential for fully separating the foreground from the background.

Video Matting 1

See, e.g., OppRevMTA 7, 11, 18; Pet'r Sur-Reply Opp. RevMTA 5-8; Stevenson 3rd ¶76

Alpha blending was well known since at least the 1980s

Computer Graphics Volume 18, Number 3 July 1984

* * *

Compositing Digital Images

Thomas Porter

Tom Duff †

Computer Graphics Project
Lucasfilm Ltd.

Porter and Duff 1

2. The Alpha Channel

A separate component is needed to retain the matte information, the extent of coverage of an element at a pixel. In a full color rendering of an element, the RGB components retain only the color. In order to place the element over an arbitrary background, a mixing factor is required at every pixel to control the linear interpolation of foreground and background colors. In general, there is no way to encode this component as part of the color information. For anti-aliasing purposes, this mixing factor needs to be of comparable resolution to the color channels. Let us call this an *alpha* channel, and let us treat an alpha of 0 to indicate no coverage, 1 to mean full coverage, with fractions corresponding to partial coverage.

Porter and Duff 2

foreground matting. This problem was mathematically established by Porter and Duff in 1984 [29]. They introduced the alpha channel as the means to control the linear interpolation of foreground and background colors for anti-aliasing purposes when rendering a foreground over an arbitrary background. Mathematically, the observed image I_z

Video Matting 1

See, e.g., Opp. RevMTA 8; Pet'r Sur-Reply Opp. RevMTA 5-8; Stevenson 3rd ¶80

Yadav is prior art as of its filing date to show obviousness and knowledge of a POSITA



“[B]y virtue of § 102(e)(1), a published patent application—this *specific* type of ‘printed publication’—is deemed prior art as of its filing date.”

Lynk Labs, Inc. v. Samsung Elecs. Co., Ltd.,
125 F.4th 1120, 1126-27 (Fed. Cir. 2025)

See, e.g., Pet’r Sur-Reply Opp. RevMTA 7 n.2

Ground 2: Parulski and Johnson

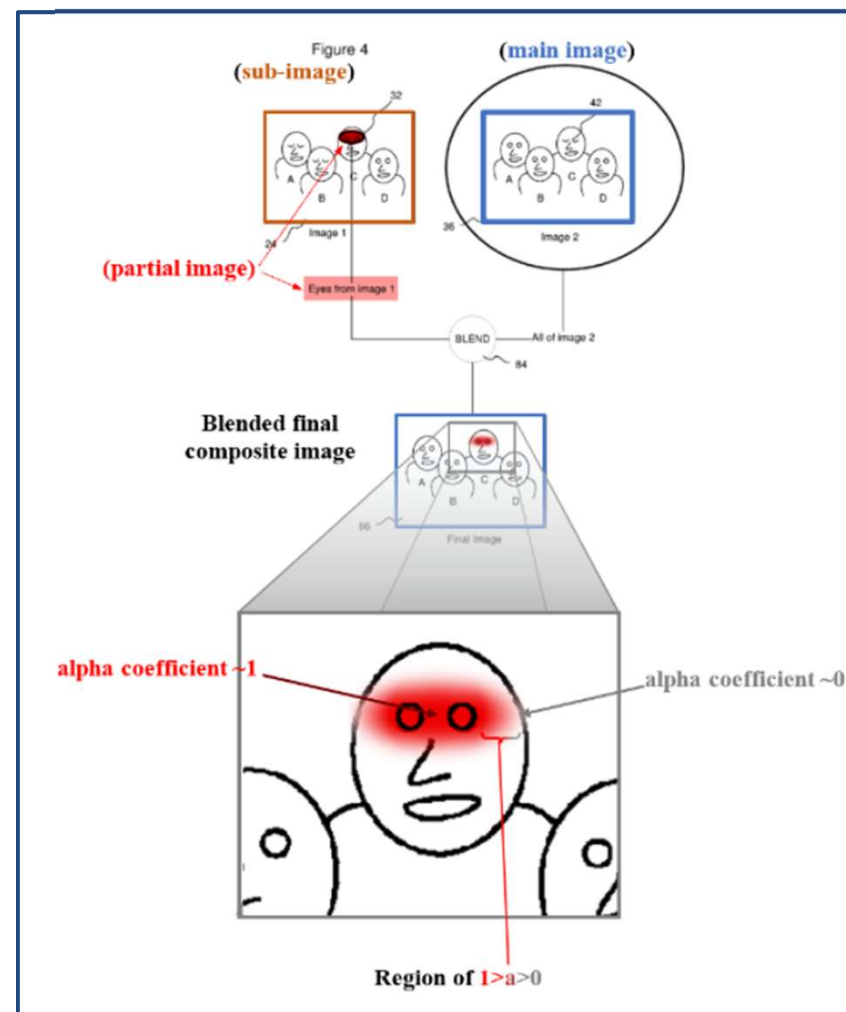
Johnson teaches blending a portion of one image into another image, which a POSITA would have understood as alpha blending

FIG. 4 is a graphical representation of the blending operation. The region of each eye from Subject C 32 is blended 84 into the content of the second image 36, which effectively replaces the closed eyes of Subject C 42, creating a single final image 86 where all subjects have open eyes.

Johnson 3:46-50

86 where all subjects have open eyes.”). When read in context, a POSITA would have understood that “effectively replace” does not mean replacement without any mixing. For example, Figure 4 illustrates “blend[ing]” (superimposing) an eye region (partial image) of “image 1” (sub-image) with the corresponding eye region in “image 2” (main image) to generate a “final image” (composite image) having “elements of both images” (characteristics of both images). Johnson, 1:59-61, 3:46-50, Fig. 4. A POSITA would have understood Johnson’s blending to be alpha blending. Blending helps eliminate or minimize the boundaries of the replacement open-eye portion that was superimposed onto the original image. Ex. 1009, [0003],

Stevenson 3rd ¶156



Stevenson 3rd ¶156 (annotating Johnson Fig. 4, callout added)

See, e.g., Opp. RevMTA 17-19; Pet'r Sur-Reply Opp. RevMTA 9-11

Petitioner's expert explains why a POSITA would have been motivated to use Johnson's alpha blending with Parulski

158. Johnson explains that “blend[ing]” (superimposing) a desired region (cut partial image) of image 1 (sub-image) into image 2 (main image) “provide[s] an optimal result.” Johnson, 3:46-53, 5:27-57 (enumerating various advantages of the disclosed processing algorithm). A POSITA would have been motivated to implement Johnson’s portion correlation, cutting, and blending techniques because a POSITA would have recognized that Johnson’s solution to blend a preferred cut out portion of a sub-image into a correlated portion of the main image aligns with Parulski’s goal of replacing the non-preferred blurred or washed out/obscured portions of a main image with the preferred sharp image or detail-visible portions of a sub-image, and would have understood that modifying Parulski to implement Johnson’s cutout and blending processes would have furthered Parulski’s to obtain an enhanced image to provide an “optimal result.” Parulski, [0031], [0071], [0107]-[0109], [0140], [0145]; Johnson, 3:51-53.

Stevenson 3rd ¶158

See, e.g., Opp. RevMTA 18-19; Pet’r Sur-Reply Opp. RevMTA 9-11

Ground 3: Parulski, Johnson, and Safonov

Petitioner's expert explains why a POSITA would have been motivated to use Safonov's alpha blending with Parulski and Johnson

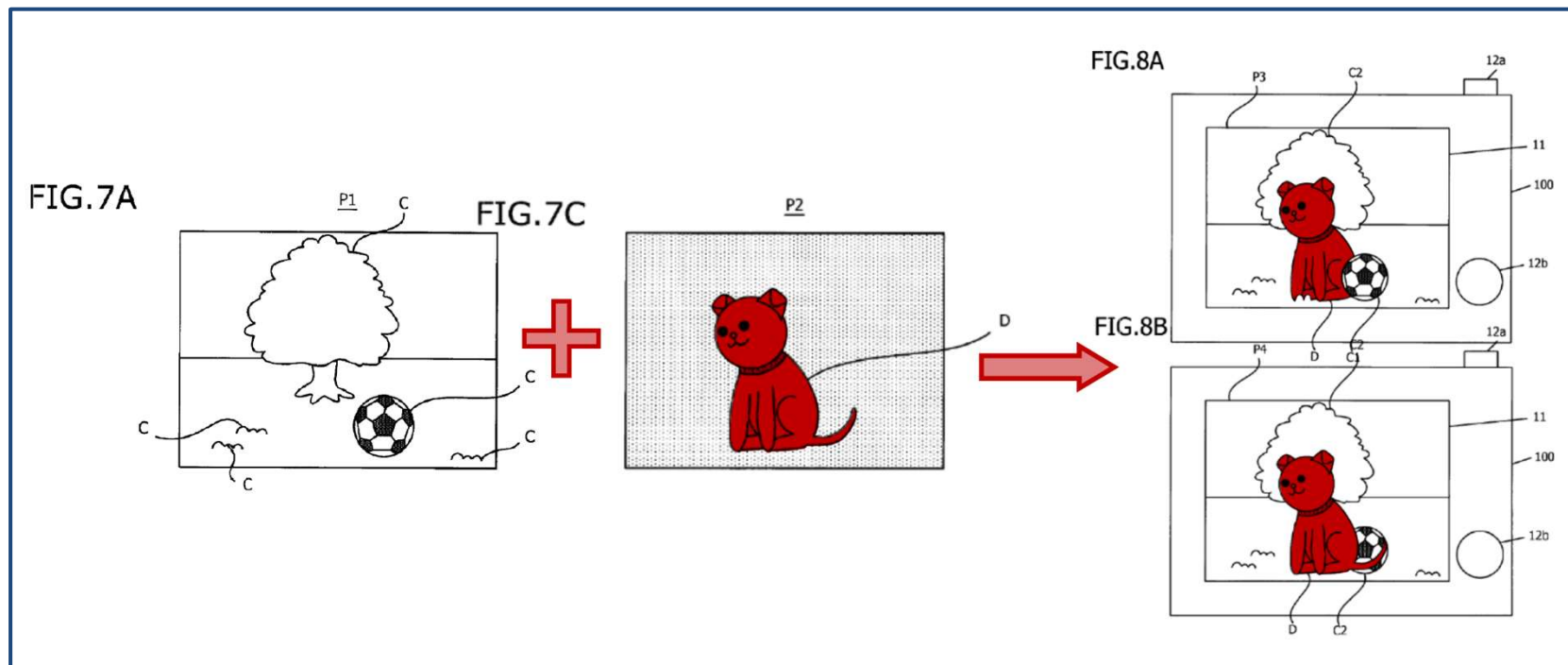
169. In my opinion, a POSITA would have been motivated to use Safonov's well-known alpha-blending technique as the "blend[ing]" for combining image portions in the Parulski-Johnson combination because alpha blending would have allowed the partial image (in the Parulski-Johnson combination) to be more seamlessly integrated into the main image and minimized or mitigated the visual transition between the superimposed portion and the main image. *See* Yadav, [0003]; *see supra* Grounds 1, 2. A POSITA also would have been motivated to utilize alpha blending because it was a well-known technique used to edit, process, and combine images, and thus represents a known technique in the art that would have yielded predictable results. Yadav, [0003]; *see supra* Grounds 1, 2.

Stevenson 3rd ¶169

See, e.g., Opp. RevMTA 19-21; Pet'r Sur-Reply Opp. RevMTA 12

Ground 4: Parulski and Hoshino

Patent Owner does not dispute that Parulski and Hoshino renders obvious amended claims 7, 8, and 10-12



Stevenson 3rd ¶175 (annotating Hoshino Figs. 7A, 7C, 8A, 8B)

[0039] In the map, the pixels of the subject-background image E1 each are given a weight represented by an alpha (α) value where $0 \leq \alpha \leq 1$ with which the subject image D is alpha blended with a predetermined background.

Hoshino [0039]

See, e.g., Opp. RevMTA 24-25; Pet'r Sur-Reply Opp. RevMTA 12

Petitioner's expert explains why a POSITA would have been motivated to combine Parulski and Hoshino

176. Hoshino then generates “combined image[s] P3” and “P4”⁸ by “superimpos[ing]” the extracted subject image D (cutout partial image) on a “background image P1” (main image). Hoshino, [0011], [0016]-[0017], [0100], [0118], Figs. 7A-8B; *see also* Hoshino, Fig. 4 (describing combined image producing process). Specifically, subject image D is “alpha blend[ed]” and superimposed on the background image. *See, e.g.*, Hoshino, [0048]-[0052], [0086]-[0104], [0115]-[0118], Figs. 4, 7A-8B; *see also* Hoshino, [0038].

Stevenson 3rd ¶176

178. In my opinion, a POSITA would have been motivated to implement Hoshino’s correlating, extracting (cutting), and alpha blending techniques. Hoshino explains that the “mere combin[ing] of the subject image and the background image might produce an unnatural image,” and discloses techniques to produce better combined images. Hoshino, [0005]-[0006], [0103]-[0104]. A POSITA would have been motivated and found it obvious to use Hoshino’s correlation, cutting, and superimposition (e.g., alpha blending) processes as part of Parulski’s replacing a portion of the main image with the extracted sub-image portion for the same reasons I articulate in Grounds 2 and 3, and to produce a more natural looking combined image. Hoshino, [0005]-[0006], [0103]-[0104], Figs. 2, 4.

Stevenson 3rd ¶178

See, e.g., Opp. RevMTA 24-25; Pet’r Sur-Reply Opp. RevMTA 12

Appendix

Amended independent claim 7

7. (Proposed Substitute for original claim 1) A digital camera having a focusing function and a focal length varying function of a main lens, the digital camera comprising:

a main imaging unit configured to generate a main image by performing a photoelectric conversion from a subject obtained via the main lens;

a sub-imaging unit configured to generate a sub-image by performing a photoelectric conversion from the subject obtained via a sub-lens;

a focal length acquiring unit configured to acquire the focal length of the main lens;

a magnification setting unit configured to set a level of magnification on the basis of the focal length;

a composite image generating unit configured to determine a cutout region in the sub-image, cut out a partial image from the cutout region, magnify at the level of magnification at least one of the main image and the sub-image, and generate a composite image by

[combining] superimposing the partial image on the main image[and the sub-image] by mixing pixel values of the partial image with pixel values of the main image.

wherein the generation of the composite image occurs after at least one of the main image and the sub-image is magnified at the level of magnification;

an image display unit configured to display the composite image; and

wherein the magnification setting unit is configured to set the level of the magnification in order to match substantially a size of the main image and a size of the sub-image.

Revised Motion to Amend, Appx A at 1-2 (strikethrough added)

Amended dependent claims 8, 9

8. (Proposed Substitute for original claim 2) The digital camera according to claim [1]7, wherein the sub-lens is a pan-focus lens.

9. (Proposed Substitute for original claim 3) The digital camera according to claim [1]7, wherein

the magnification setting unit is configured to set the level of the magnification in a correction mode in which a predetermined magnification rule applies in setting the level of the magnification, and

the digital camera further includes

an instruction receiving unit configured to receive an instruction to change the level of the magnification such that difference between the size of the main image and the size of the sub-image in the composite image is less than or equal to a predetermined amount in the correction mode, and

a correcting unit configured to correct the magnification rule by using amount to change the level of the magnification as amount of correction in the correction mode, when the focal length of the main lens is in predetermined length.

Amended dependent claims 10, 11, 12

10. (Proposed Substitute for original claim 4) The digital camera according to claim [1]7, further comprising

A[n] focusing amount acquiring unit configured to acquire amount of the focusing, wherein

[the composite image generating unit is configured to generate the composite image by combining the main image and the sub-image by setting a cutout position on the sub-image, cutting out a partial image from the cut out position, and adding the partial image on the main image, and]

misalignment of the composite image decreases as the composite image is in focus with the subject on the basis of the amount and a predetermined cutout rule.

11. (Proposed Substitute for original claim 5) The digital camera according to claim [4]10, wherein

the predetermined cutout rule is based on a principle of triangulation based on an interval between the main lens and the sub-lens, and distance from the digital camera to the subject on the basis of the amount.

12. (Proposed Substitute for original claim 6) The digital camera according to claim [1]7, wherein

the main image of the object is captured from a different angle from the sub-image of the subject.