UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ARASHI VISION (U.S.) LLC (D/B/A INSTA360)
Petitioner,

v.

GOPRO, INC.
Patent Owner.

Patent No. 10,015,413

Inter Partes Review No. IPR2024-00984

PETITION FOR *INTER PARTES* REVIEW UNDER 35 U.S.C. §§ 311-319 AND 37 C.F.R. § 42.100 *et seq.*

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U.S. Patent No. 8,649,635 to Liu *et al.*	1005
U.S. Pub. No. 2006/0279583 to Obara *et al.*	1006
U.S. Patent No. 7,693,500 to Meulen *et al.*	1007
U.S. Pub. No. 2008/0095470 to Chao *et al.*	1008
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Petitioner Arashi Vision (U.S.) LLC (d/b/a Insta360) ("Petitioner") petitions for *inter partes* review of claims 1-20 of U.S. Patent No. 10,015,413 ("the '413 patent" (EX1001)) in accordance with 35 U.S.C. §§ 311-319 and 37 C.F.R. § 42.100 *et seq*.

I. INTRODUCTION

The '413 patent is directed to a system/method for converting an input image having one aspect ratio into an output image having another aspect ratio. (EX1001, Abstract.) The conversion involves a transformation that applies different (non-uniform) amounts of compression/enlargement to different regions of the input image. (*Id.*) The result is an output image having a "portion" (*e.g.*, center region) with less compression/enlargement compared to "others of the pixels" (*e.g.*, a non-center region, such as a corner region). (*Id.*)

Applying different amounts of compression/enlargement to different regions of an image was not new at the time of the '413 patent in 2013. Referred to as "panoramic scaling" ("panoramic stretching"), the prior art commonly used this transformation when converting to wide screen aspect ratios, such as from a 4:3 aspect ratio to a 16:9 aspect ratio. Discussed below, Fleming discloses "nonlinear scaling of video images . . . such that the original aspect ratio of the video image is preserved near the center region" of the image (less compression/enlargement at the center region), "and the image is gradually stretched (or compressed) as it is

mapped to the edges" (more compression/enlargement at a non-center region). (EX1004, Abstract.)

Likewise, Obara discloses "image data with an aspect ratio of, e.g. 4:3 can be displayed on the entire wide screen of the LCD 17 . . . ha[ving] an aspect ratio of, e.g. 16:9 or 16:10." (EX1006, [0049].) Obara's process is "without causing horizontal enlargement distortion of an image at the central area of the screen" (less compression/enlargement at the center region). (*Id.*) Similarly, Meulen discloses a wireless device, including a digital camera and a display, that progressively applies image compression/scaling to change the aspect ratio. (EX1007, Abstract.) "[M]ore image compression may be applied . . . at or near the edges of the display than . . . at or near the central region." (EX1007, 1:65-2:2.)

The challenged claims are unpatentable for the reasons set forth in this Petition, as supported by Dr. Katsaggelos. (EX1002.)

II. THE '413 PATENT

A. Summary

The independent claims of the '413 patent are directed to an image capture apparatus, system, and method for converting an ***input image 212 having a source aspect ratio*** (*e.g.*, 4:3) to an ***output image 216 having a target aspect ratio*** (*e.g.*, 16:9) (Figures 2A and 2B[1]) below. (EX1001, Claims 1, 2, 13, 3:63-67;

[1] All annotations in color have been added, unless otherwise noted.

EX1002, ¶¶10, 15-21.)

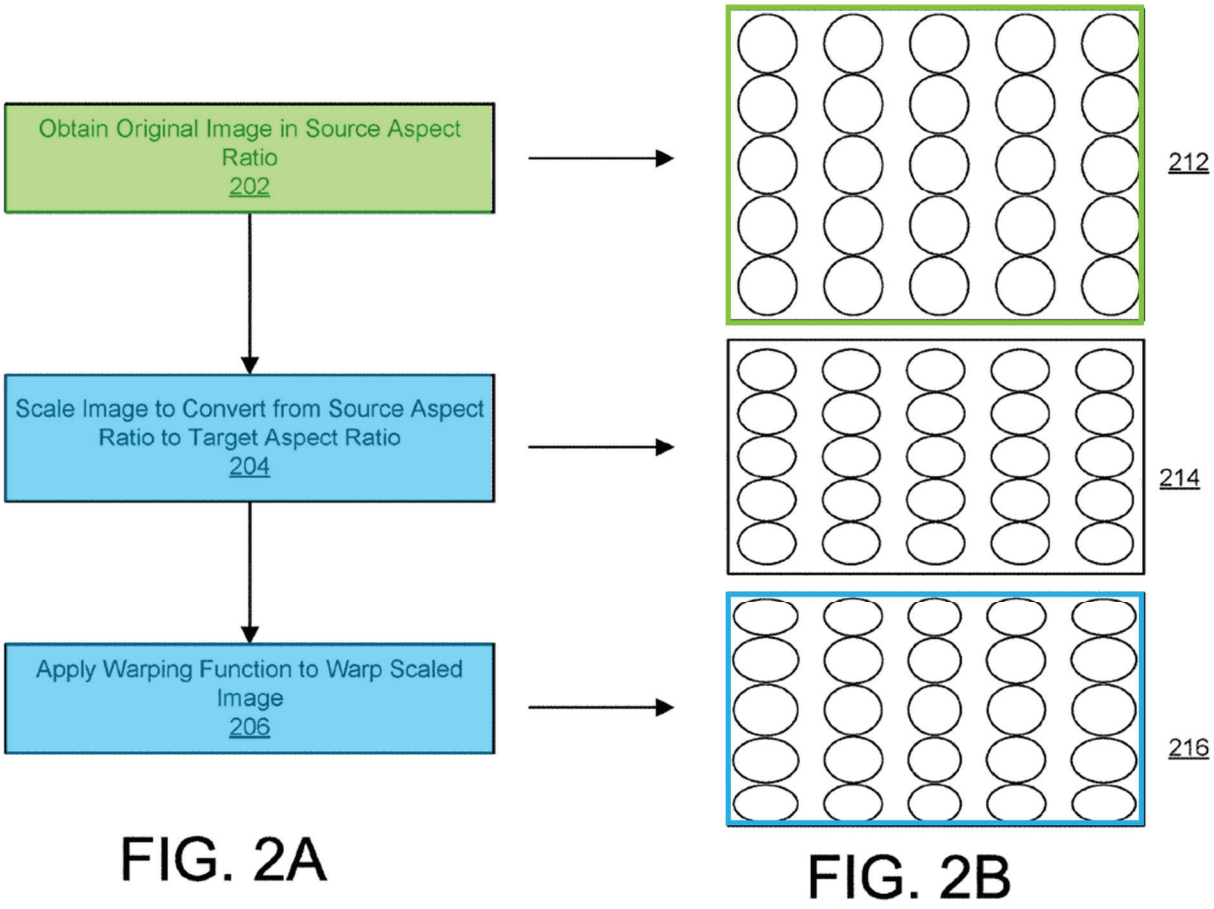


FIG. 2A

FIG. 2B

The transformation applies different amounts of compression/enlargement to different regions of the input image by non-uniformly shifting the pixels. (EX1001, Claims 1, 2, 13.) The "differences between the input positions and the output positions" of the independent claims refer to the relative amounts of compression/enlargement. (EX1002, ¶10.) Figure 2B below shows that there is less compression/enlargement ("differences") at a ***center portion*** of the ***output image 216***, where "the center circle . . . maintains the original circular shape of the corresponding circle in the input image 212." (EX1001, 4:23-25.) There is more

compression/enlargement ("differences") at ***another portion*** of the output image 216, and "[a]s a result, the circles in the ***corners*** exhibit the most distortion, because they have the ***highest amount of both vertical compression and horizontal stretching***." (EX1001, 4:1-35; EX1002, ¶¶11-14.)

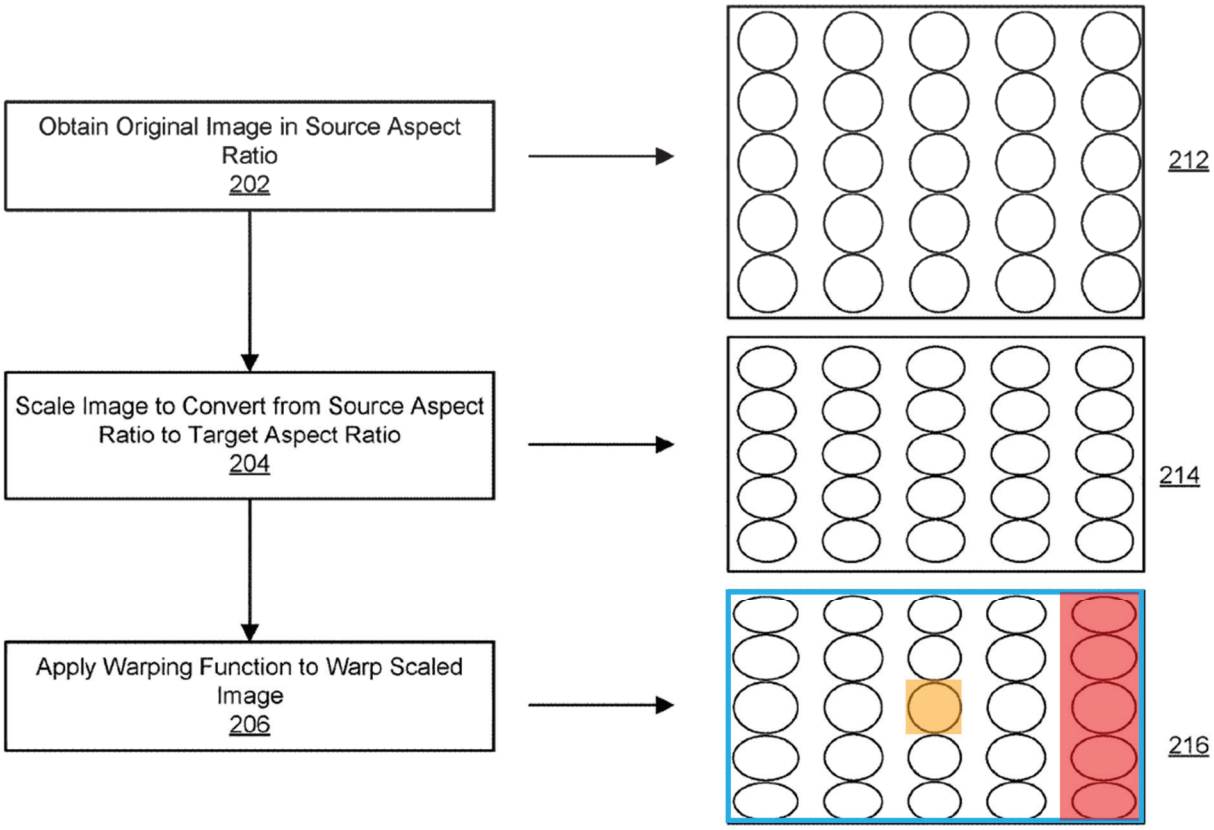


FIG. 2A FIG. 2B

B. Effective Filing Date

The '413 was filed on April 20, 2017, issued on July 3, 2018, and claims priority to three continuation applications filed on January 29, 2016, November 7, 2014, and February 14, 2014, and a provisional application filed on August 22, 2013. (EX1001.) For purposes of this Petition only, Petitioner relies on August

22, 2013 as the earliest effective filing date. (EX1002, ¶9.)

C. Prosecution History

During prosecution, the Examiner only issued one prior art-based Office Action, which identified Gleicher (EX1009) and Oosawa (EX1010) as the closest art to the independent claims. (EX1003, 45-50.) The claims, at the time of the Office Action, recited a broader version of the "differences" relationship (elements 1[h], 2[f], and 13[e] of the '413 claims): the pixels of the input image have less compression/enlargement ("differences") compared to "others of the pixels." (EX1003, 35; EX1002, ¶22.)

In response, Applicant amended the claims to require: (1) "the transformation non-uniformly shifts the pixels," thereby the transformation results in the "differences" relationship; and (2) the input image's "differences" be "within the portion." (EX1003, 33, 35; EX1002, ¶23.)

Applicant distinguished over the cited art by arguing that the "differences" relationship of the cited art ***compared pixels of two images***; whereas the "differences" relationship of the independent claims ***compared pixels within a portion of an image to other pixels in the same image***. (EX1003, 39.) Applicant further argued that, unlike the cited art, the "transformation" of the '413 claims leads to the "differences" relationship. (EX1003, 39; EX1002, ¶24.)

In the Notice of Allowance, the Examiner stated the '413 independent

claims were patentable in light of Applicant's arguments and amendments. (EX1003, 13; EX1002, ¶25.)

D. Level of Ordinary Skill in the Art

A person of ordinary skill in the art (POSITA) in the field of the '413 patent would have a bachelor's degree in engineering or computer science, or equivalent field, and two years of experience working on image or video processing, or digital cameras. Alternatively, a POSITA would have four years of experience working on image or video processing, or digital cameras. An advanced graduate degree in the disciplines cited above may make up for the work experience indicated above. (EX1002, ¶¶33-34.)

III. CLAIM CONSTRUCTION

For purposes of this Petition only, Petitioner does not believe any terms require a formal construction.[2] Each of the terms carries its "ordinary and customary meaning," which is "the meaning that the term would have to a person

[2] Petitioner interprets the challenged claims based on the breadth of GoPro's infringement allegations in the related International Trade Commission (ITC) proceeding. (EX1011; EX1012.) Petitioner reserves the right to argue in the ITC proceeding that GoPro's construction of the terms are incorrect and/or not supported by the '413 patent specification.

of ordinary skill in the art in question" at the time of the invention.[3] *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007) (citation omitted); EX1002, ¶36.)

IV. PRECISE REASONS FOR RELIEF REQUESTED

Pursuant to 37 C.F.R. § 42.104(b), Petitioner requests cancellation of the challenged claims based on the following references (EX1002, ¶¶37-42):

Prior Art Reference	Abbreviation (Exhibit No.)
U.S. Patent No. 7,158,158	"Fleming" (EX1004)
U.S. Patent No. 8,649,635	"Liu" (EX1005)
U.S. Pub. No. 2006/0279583	"Obara" (EX1006)
U.S. Patent No. 7,693,500	"Meulen" (EX1007)
U.S. Pub. No. 2008/0095470	"Chao" (EX1008)

The statutory grounds for the challenge of each claim are set forth below. All of the statutory citations are AIA.

[3] An IPR petition may only rely on prior art patents or printed publications. 35 U.S.C. § 311(b). Petitioner reserves the right to raise other invalidity issues, such as invalidity under § 101 or § 112, in the related ITC proceeding.

Ground	35 U.S.C. §	Claims	Prior Art Reference
1	103	1-8, 10, 12-16, 18, 20	Fleming
2	103	9, 11, 17, 19	Fleming, Liu
3	103	1-20	Obara, Liu
4	103	1-20	Meulen, Chao

Below, Petitioner discusses why the challenged claims are unpatentable under the statutory grounds raised, including how and where the prior art satisfies each element of each challenged claim, as required by 37 C.F.R. § 42.104(b)(4). Petitioner's showing establishes that there is a reasonable likelihood that it will prevail on each ground of unpatentability to each challenged claim.

A. Ground 1: Fleming Renders Obvious Claims 1-8, 10, 12-16, 18, 20

1. Summary of Fleming

Fleming was filed on March 12, 2003, and issued on January 2, 2007, qualifying as prior art at least under §§ 102(a)(1), 102(a)(2). The Examiner never found, and Applicant never cited, Fleming during prosecution.

Fleming discloses a system and method for nonlinear scaling of a ***first video image having a first aspect ratio*** to generate a ***second video image having a second aspect ratio*** (Figure 9 below). (EX1004, 8:36-40, Abstract; EX1002, ¶43.)

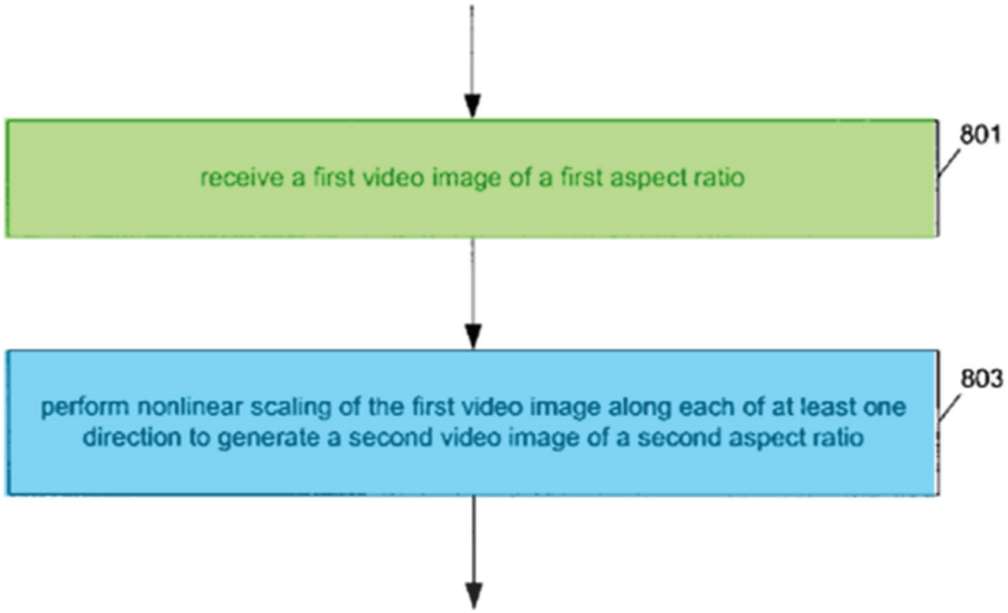
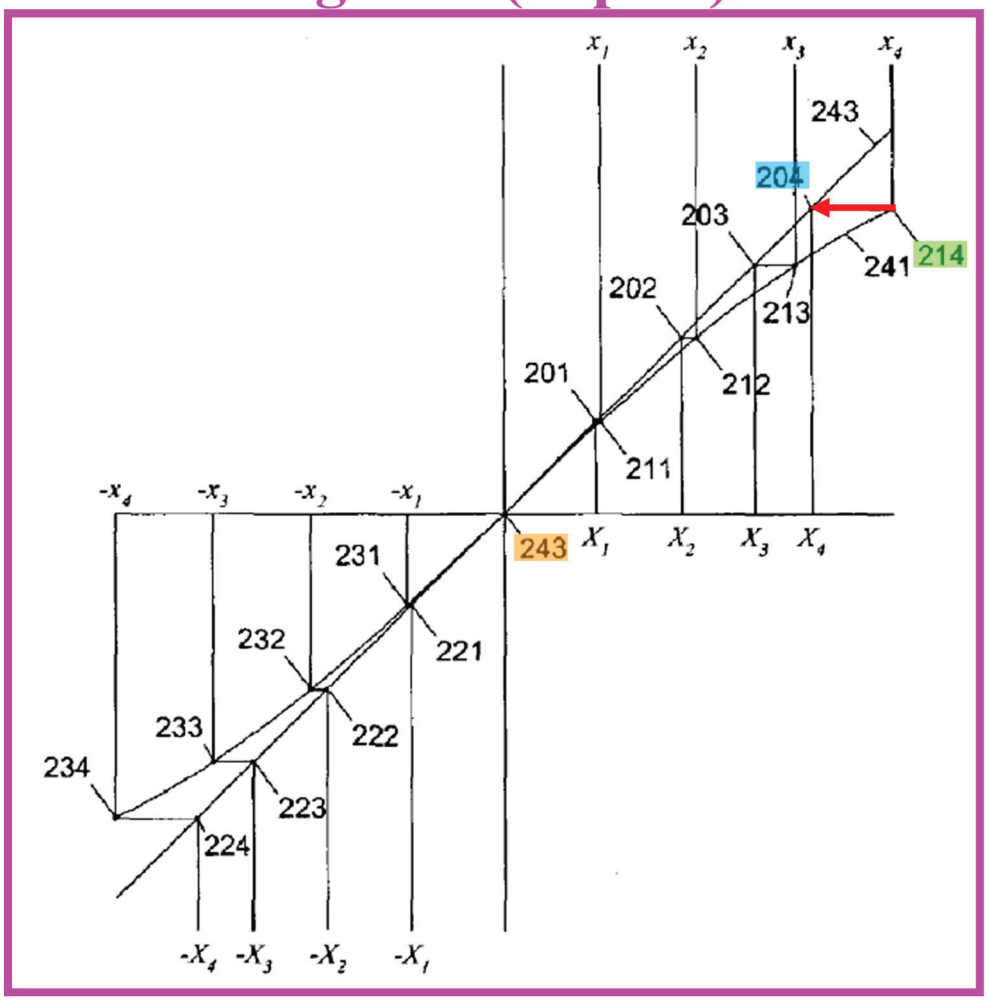


Fig. 9

Fleming's nonlinear scaling compresses/enlarges by shifting the pixels along the horizontal axis (Figure 2 below). For example, pixel x_4 at ***point 214*** is ***shifted (in the direction of red arrow)*** to ***point 204***. (EX1004, 4:56-60; EX1002, ¶44.)

Figure 2 (in part)



There is little to no shift at the ***center 243*** (Figure 2 above). Fleming "maintain[s] the original aspect ratio in an area of interest (e.g., at the center of the image) and gradually stretch[es] the image in other areas. Thus, the image in the area of interest is presented in the target display area with reduced distortion (or with no distortion), while other areas are distorted." (EX1004, 4:39-44; EX1002, ¶45.)

2. Claim 2

a. Preamble: "A system that converts between aspect ratios, the system comprising:"

To the extent the preamble is limiting (Petitioner does not concede), Fleming discloses the preamble.

Fleming discloses "apparatuses for nonlinear scaling of video images," *e.g.*, "data processing systems." (EX1004, 1:35-36, 2:27-28, Fig. 1.) Figure 9 below shows "receiv[ing] a first video image of a ***first aspect ratio***,"[4] and "perform[ing] nonlinear scaling of the first video image . . . to generate a second video image of a ***second aspect ratio***." (EX1004, 8:36-40, 4:49-51, 4:63-66, 5:17-19, 5:23-26, 5:43-45, Figs. 2-4; EX1002, ¶¶46-51.)

[4] All emphasis added, unless otherwise noted.

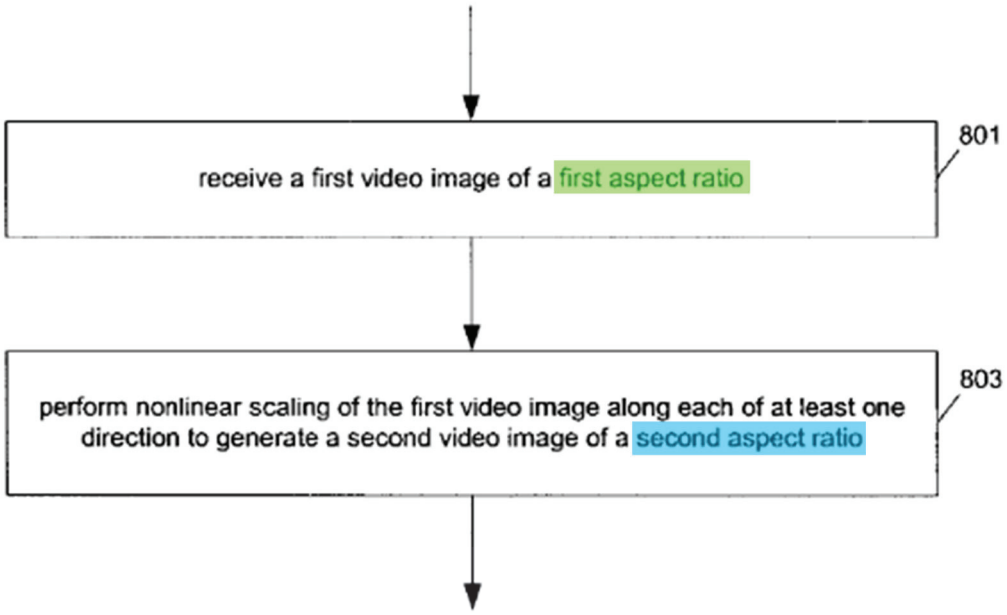


Fig. 9

b. 2[a]: "one or more physical processors configured by machine-readable instructions to:"

Fleming discloses "data processing systems which perform [the disclosed] methods, and computer readable media when executed on data processing systems cause the systems to perform these methods." (EX1004, 2:27-30, 3:20-21, Fig. 1.) For example, "graphics hardware (e.g., a graphics ***processing unit*** (GPU)) of a data processing system is ***instructed*** (e.g., by the central ***processing unit*** (CPU) of the data processing system) ***to perform*** the . . . scaling of the plurality of regions" of the video image. (EX1004, 2:11-15, 3:58-61.) A POSITA would have understood that GPUs and CPUs are physical processors. (EX1002, ¶¶52-54.)

c. 2[b]: "obtain an input image, the input image having a source aspect ratio, the input image including pixels located at input positions defined along a first axis and a second axis, the first axis perpendicular to the second axis;"

Fleming discloses "receiv[ing] a first video image of a first aspect ratio" (Figure 9 below). (EX1004, 8:37; EX1002, ¶55.)

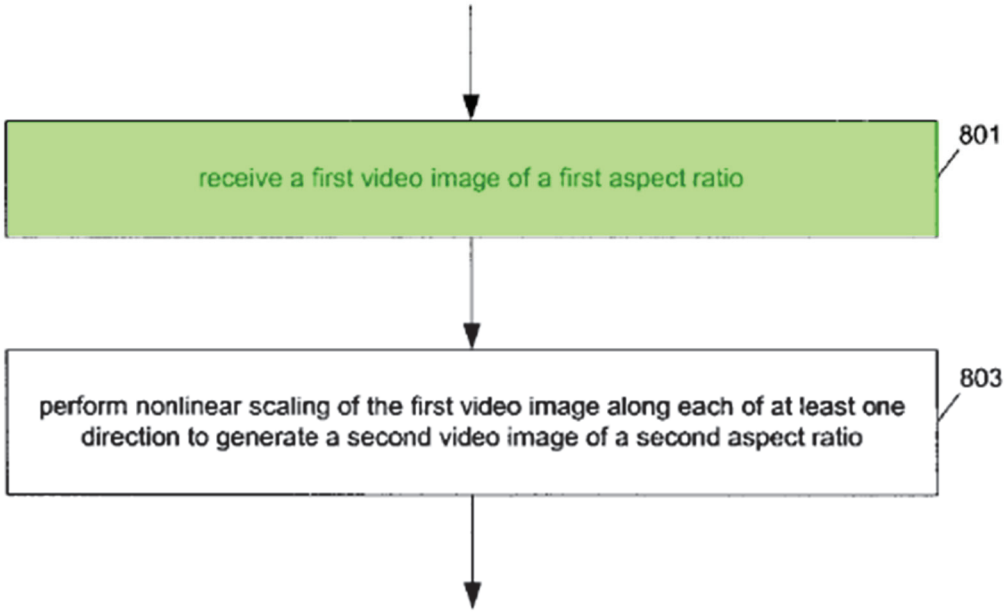


Fig. 9

Fleming explains: "[a] frame of a video image is typically represented by a rectangular array of pixels. The number of rows and columns of the rectangular array of pixels define the aspect ratio of the video image." (EX1004, 1:12-15.) Figure 2 below shows pixels located at input positions defined along the

"horizontal or vertical pixel lines of the ***first video image [271]***." (EX1004, 1:57-59.) The figure shows the vertical lines are perpendicular to the horizontal lines. (EX1002, ¶56.)

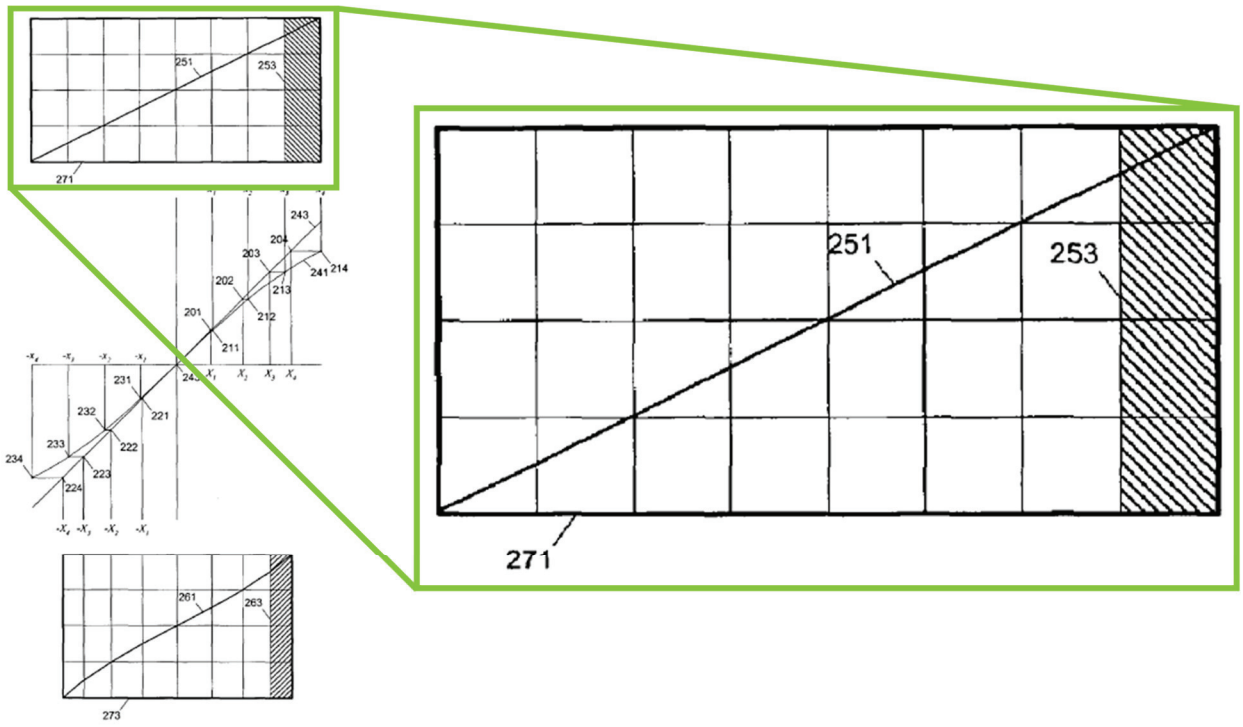


Fig. 2

Figure 3 shows, and corresponding descriptions similarly disclose input image 371. (EX1004, 5:17-19, Fig. 3.) Figure 4 shows, and corresponding descriptions disclose input image 401. (EX1004, 5:43-46, Fig. 4; EX1002, ¶¶57-58.)

d. 2[c]: "determine a portion within the input image, the portion including a subset of the pixels; and"

Fleming's image 271, 371, or 401 is an "input image." (*See* IV.A.2.c.)

Fleming discloses "maintain[ing] the original aspect ratio in an area of interest (e.g., at the center of the image)." (EX1004, 4:39-40.) In Figure 2 (below), for example, "a square region at the center of image 271 is mapped (or scaled)." (EX1004, 5:1-2, 5:17-66, Figs. 2, 3.) A POSITA would have understood that a region at the center of the image includes a subset of the pixels within the input image. (EX1002, ¶¶59-62.)

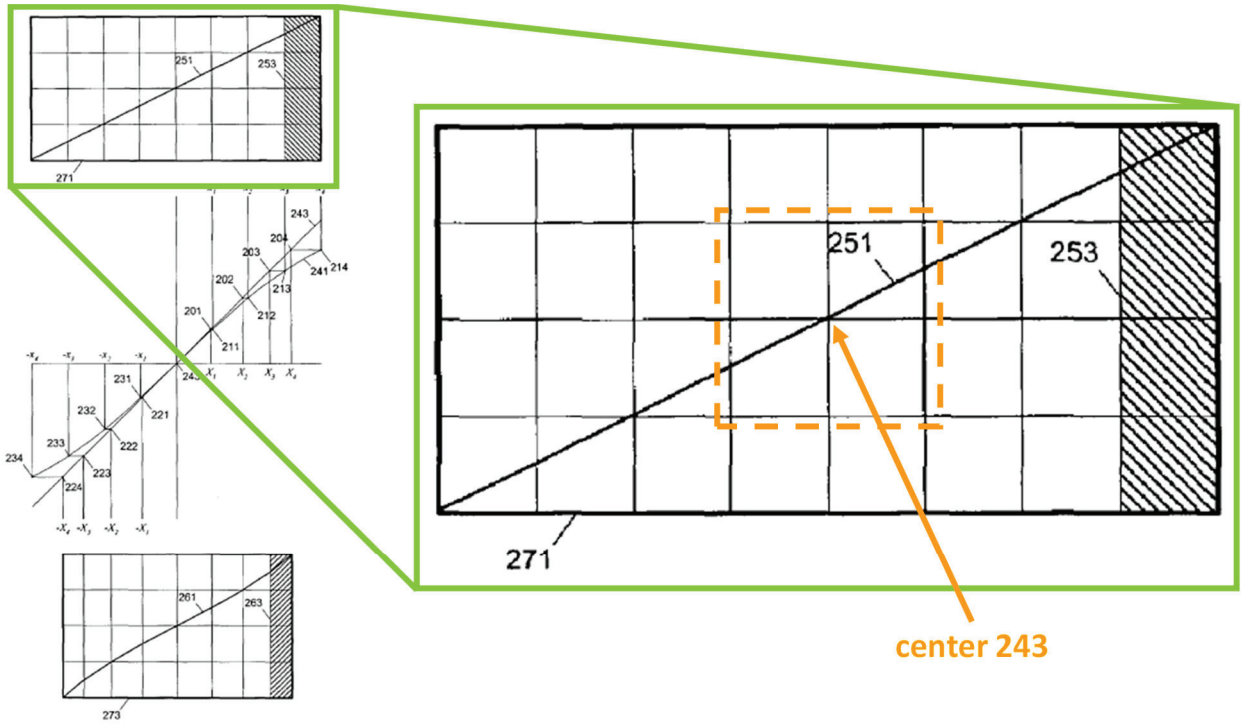


Fig. 2

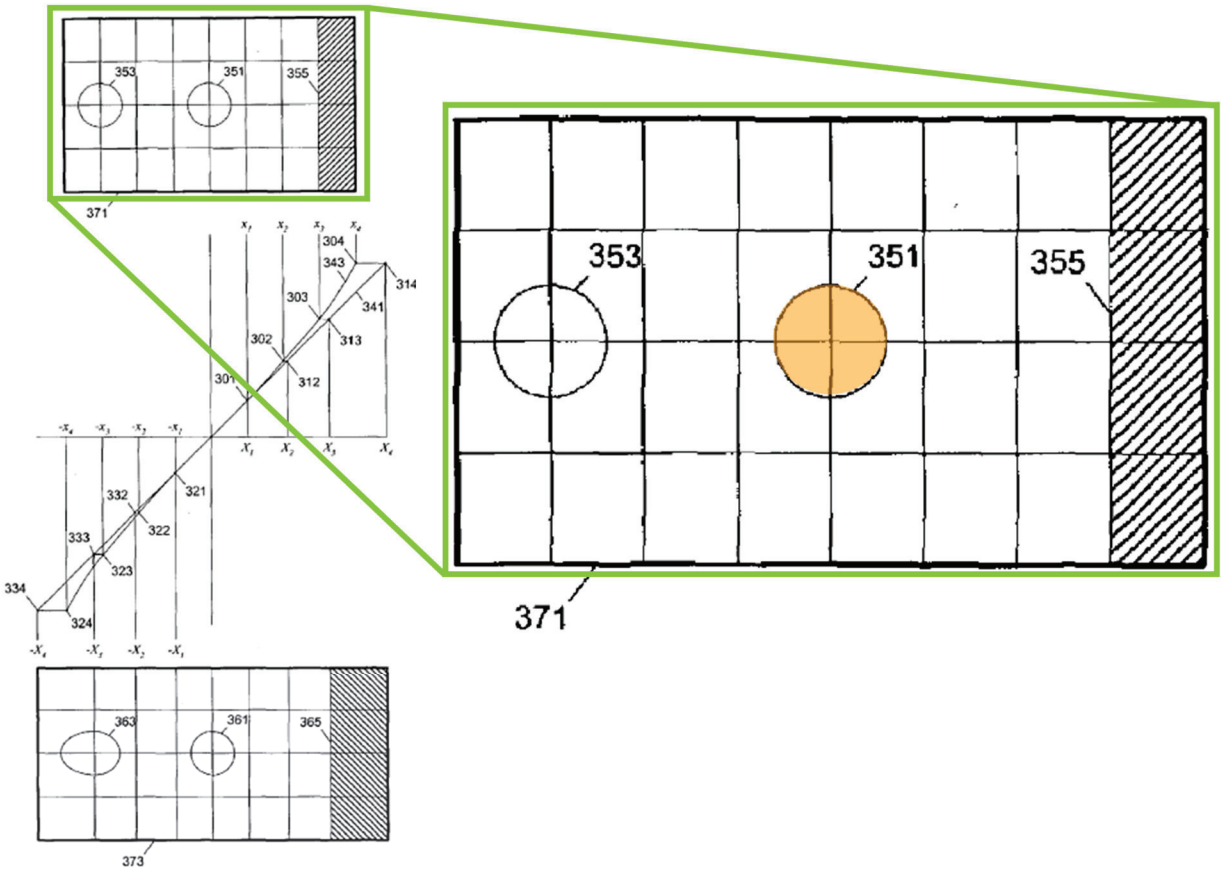


Fig. 3

e. 2[d]: "apply a transformation to the input image to generate an output image, the output image having a target aspect ratio different than the source aspect ratio, the output image including the pixels located at output positions defined along the first axis and the second axis,"

Figure 9 below shows Fleming "receives a ***first video image of a first aspect ratio***," and "performs ***nonlinear scaling*** of the first video image along each of at least one direction to ***generate a second video image of a second aspect ratio***." (EX1004, 8:37-40; EX1002, ¶63.)

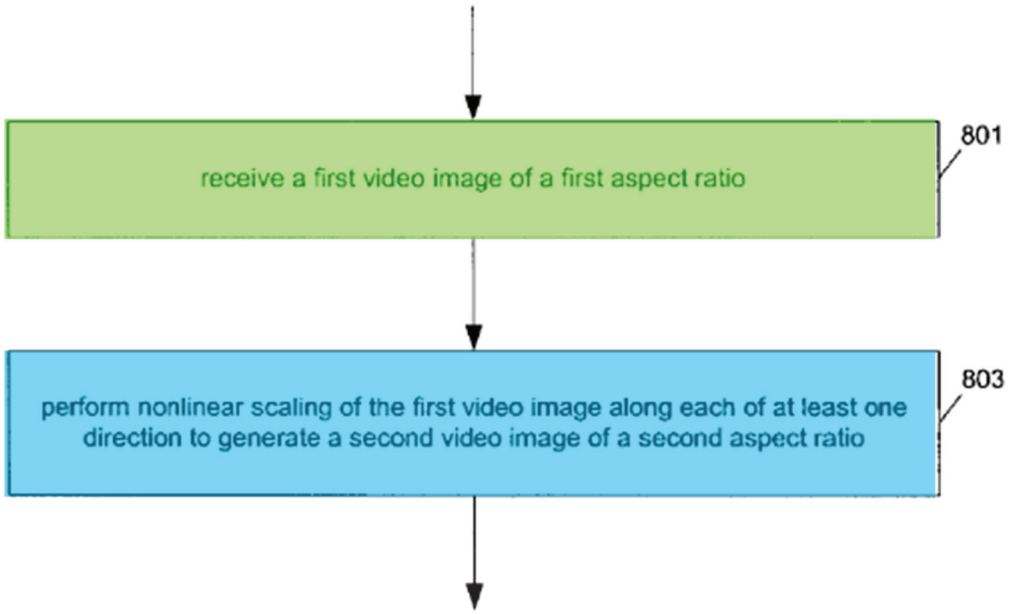


Fig. 9

Figure 2 below shows the ***nonlinear scaling*** being applied. (EX1004, 4:49-51.)

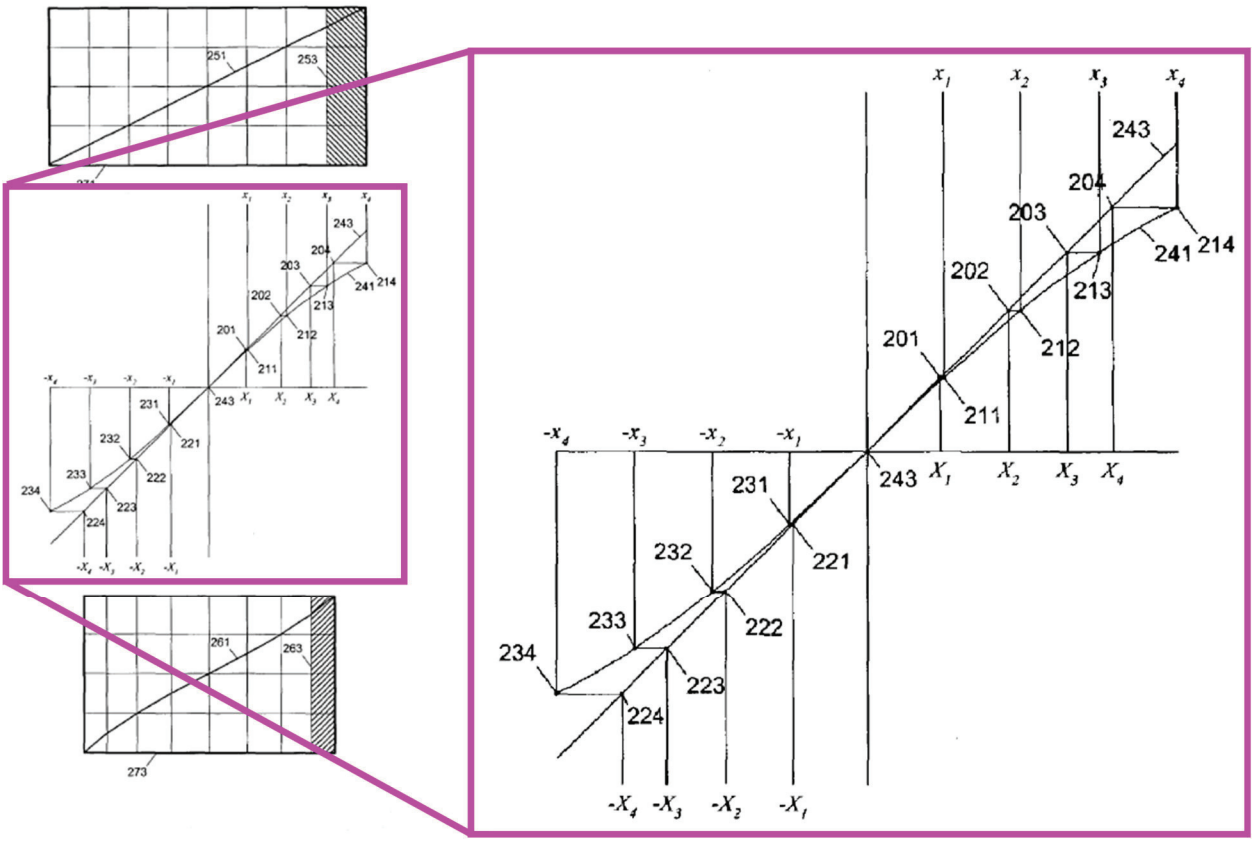


Fig. 2

Figure 2 below shows the "***second video image*** [has] a second aspect ratio that is different from the first aspect ratio [of the ***first video image***]." (EX1004, 1:58-59; EX1002, ¶¶64-65.)

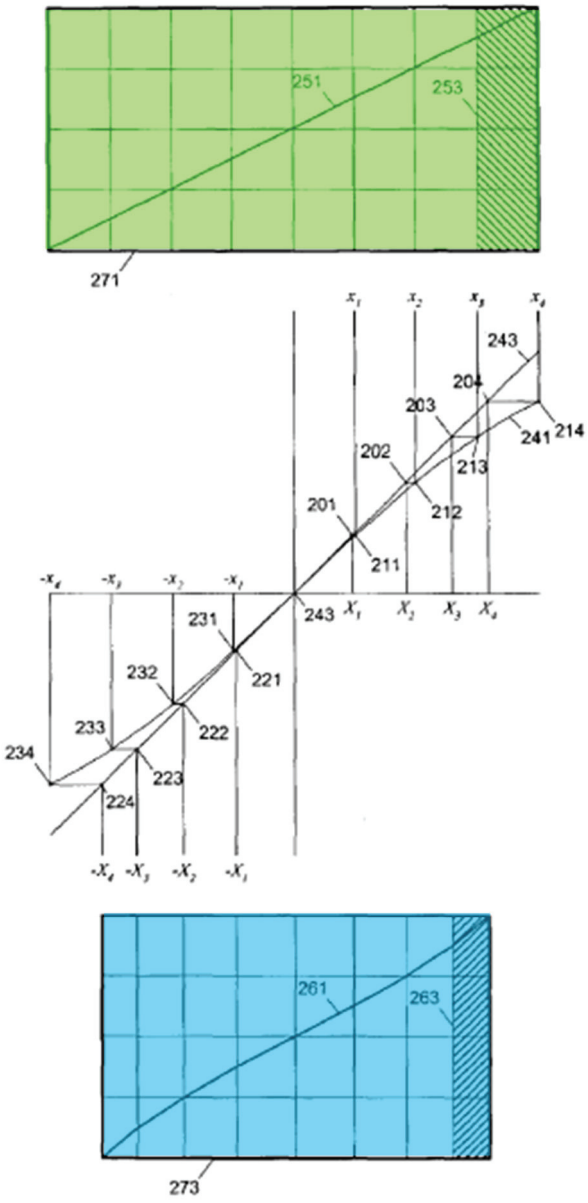


Fig. 2

Figure 2 below shows the "corresponding ***straight horizontal and vertical lines of image 273 [(output image)]***," including pixels located at output positions defined along the horizontal and vertical lines. (EX1004, 5:4-6, 1:12-15; EX1002,

¶66.)

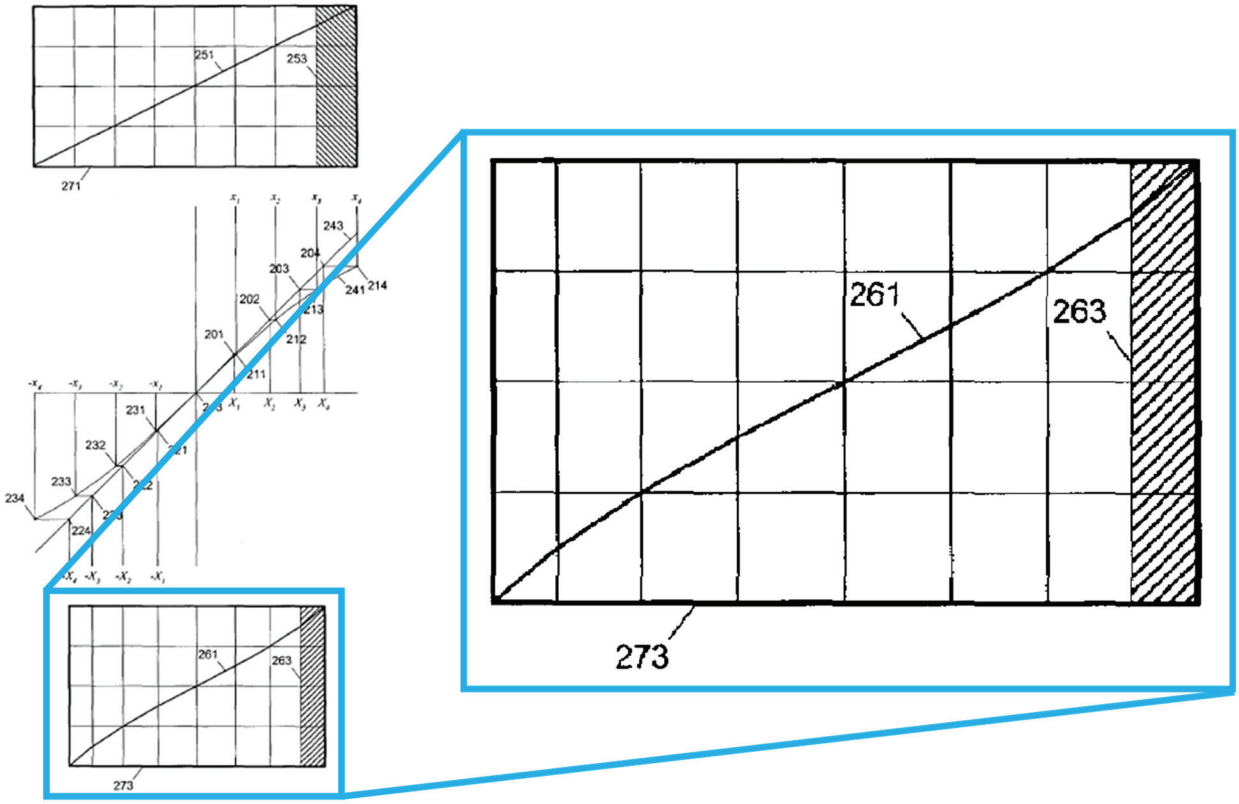


Fig. 2

Similarly, Figures 3 and 4 show, and corresponding descriptions disclose applying a transformation to generate the output image. (EX1004, 5:17-19, 5:43-45, Figs. 3, 4; EX1002, ¶¶67-72.)

f. 2[e]: "wherein: the transformation non-uniformly shifts the pixels from the input positions to the output positions based on (1) the input positions along the first axis, and (2) the input positions along the second axis; and"

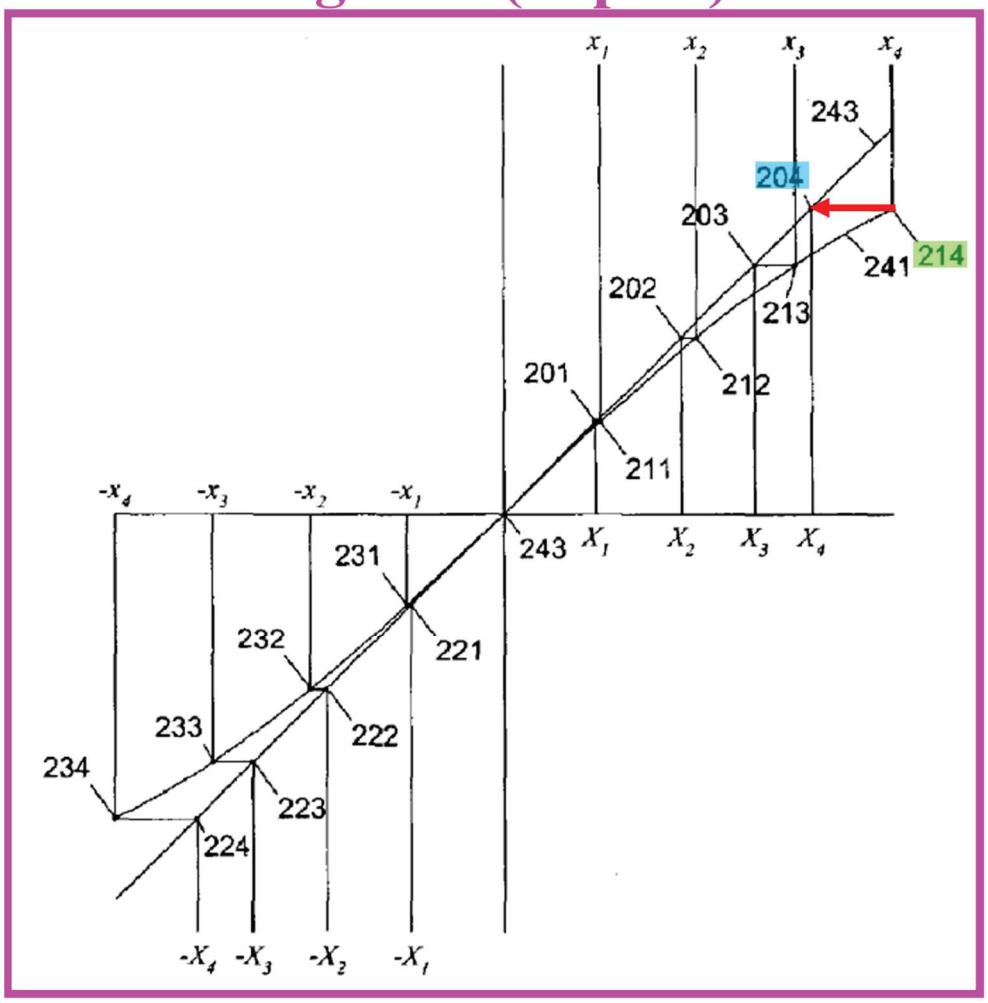
Fleming's image 271, 371, or 401 is the "input image" having input positions, and image 273, 373, or 403 is the "output image" having output

positions. (*See* IV.A.2.c, IV.A.2.e.)

"[I]mage 271 is ***scaled nonlinearly*** in the horizontal direction to reduce the width to that of image 273." (EX1004, 4:49-51.) "[H]orizontal positions represented by points 213, 212 and 211 (x_3, x_2, x_1) in image 271 are mapped to horizontal positions represented by points 203, 202 and 201 (X_3, X_2, X_1) in image 273; and 231-234 to 221-224." (EX1004, 4:56-60; EX1002, ¶¶73-74.)

Figure 2's nonlinear scaling is shown below: "the vertical line at ***$x=x_4$ (214)*** in image 271 is ***mapped to*** the vertical line at ***$X=X_4$ (204)*** in image 273." (EX1004, 4:54-56.) The nonlinear scaling (transformation) non-uniformly shifts the pixels based on the input positions along the horizontal axis. (EX1002, ¶75.)

Figure 2 (in part)



Figures 3 and 4 show, and their descriptions disclose non-uniformly shifting pixel positions. (EX1004, 5:17-23, 5:41-48, Figs. 3, 4; EX1002, ¶¶77-81.)

Each pixel has an input position along the vertical axis. (EX1004, 1:12-15.) Hence, the non-linear scaling is further based on the input positions along the vertical axis. (EX1002, ¶76.)

Fleming's "nonlinearly scaling is applied in both the vertical direction and the horizontal direction. In FIG. 4 [(below)], ***image 401*** is stretched in the

horizontal direction and compressed in the vertical direction to generate ***image 403***." (EX1004, 5:41-45; EX1002, ¶¶80-81.)

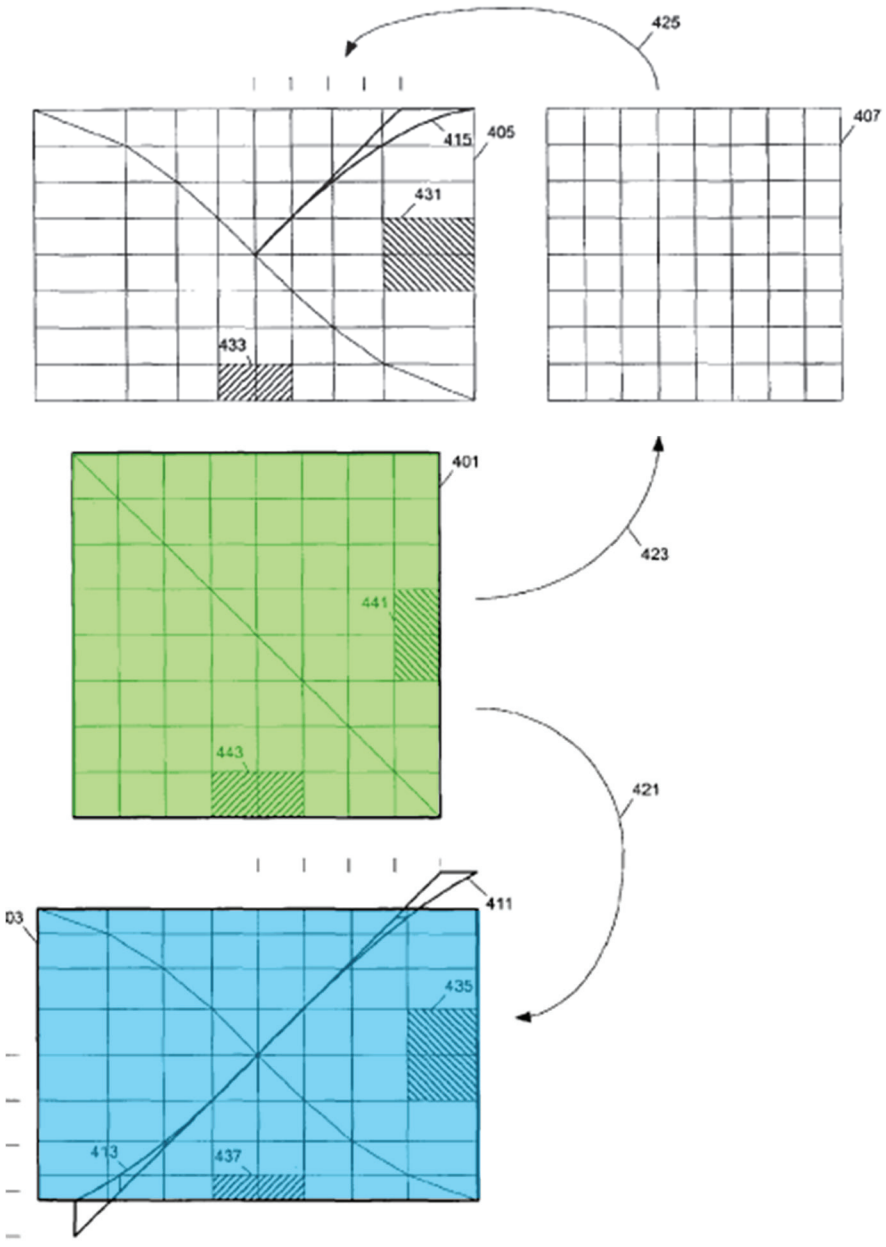


Fig. 4

"Curve 411 is used to map the horizontal positions of the vertical lines," in

other words, the nonlinear scaling shifts the pixels based on the positions along the horizontal axis. (EX1004, 5:46-67.) "[A]nd, curve 413 is used to map the vertical positions of the horizontal lines," that is, the nonlinear scaling shifts the pixels based on positions along the vertical axis. (EX1004, 5:47-48; EX1002, ¶¶80-81.)

g. 2[f]: "the transformation non-uniformly shifts the pixels such that differences between the input positions and the output positions of the subset of the pixels within the portion are less than differences between the input positions and the output positions of others of the pixels."

Fleming's region at the center of image 271, 371, or 401 includes a "subset of the pixels within the portion." (*See* IV.A.2.d.)

Fleming discloses "***maintain[ing] the original aspect ratio*** in an area of interest (e.g., at the ***center of the image***) and gradually stretch[ing] the image in other areas. Thus, the image in the area of interest is presented in the target display area with ***reduced distortion (or with no distortion)***, while other areas are distorted." (EX1004, 4:39-44.) This difference in distortion at the center relative to an outer region applies when compressing the image. (EX1004, Abstract (describing preserving near the center region and gradually stretching/compressing as mapped to edges); EX1002, ¶¶82-84.)

Figure 2 below shows there is little/no (less, as indicated by no arrow) stretching at the ***center 243*** of the image compared to an outer region (others of the

pixels) of the image. (EX1004, 2:49-51, 4:50-54.) The red arrow shown in Figure 2 below represents the ***amount of compression*** by shifting from the ***input position 214*** to the ***output position 204*** at an outer region. It would have been obvious to a POSITA that the amount of compression/stretching corresponds to the "differences between the input positions and the output positions." The "differences" at the region at the ***center 243*** is less than the "differences" of others. (EX1002, ¶¶85-86.)

Figure 2 (in part)

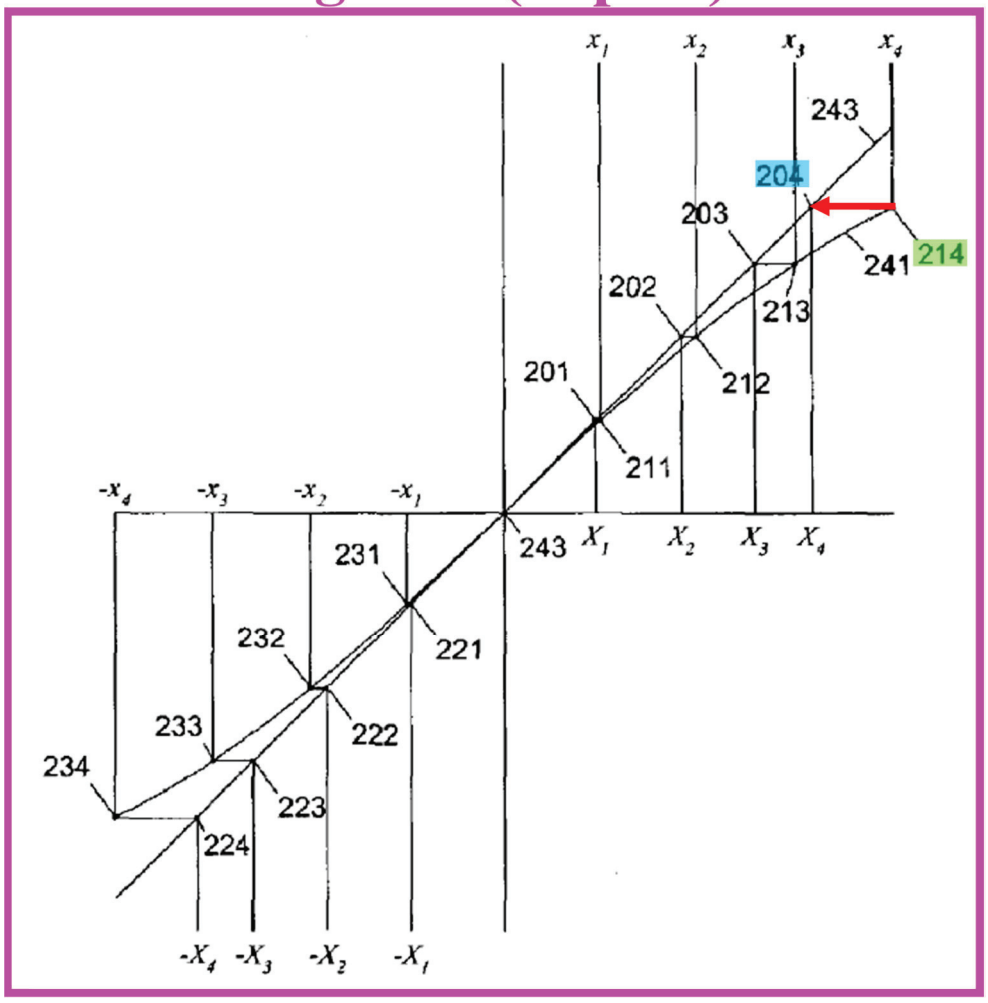


Figure 3 shows, and its corresponding description discloses the claimed "differences" relationship. (EX1004, 5:17-23; EX1002, ¶¶86-88.)

3. Claim 3

a. 3[a]: "The system of claim 2, wherein the transformation includes: a scaling function to uniformly stretch or compress the input image along the first axis; and"

Fleming's "linear scaling can be combined with nonlinear scaling," using linear scaling factors. (EX1004, 5:51-52, 5:35-40, 5:66-6:15, 5:9-12.) A POSITA would have understood that a linear scaling factor that does not equal 1 would uniformly stretch/compress. (EX1002, ¶89.)

b. 3[b]: "a warping function to non-uniformly warp the input image along the second axis."

Fleming discloses nonlinearly scaling the image 271, 371, or 401 (input image) along the horizontal axis. (*See* IV.A.2.g.)

"[W]hen a video image is required to fill a display area with a linear horizontal scaling factor A and a linear vertical scaling factor B, the image can be . . . ***nonlinearly scaled in the vertical direction***." (EX1004, 6:18-27; EX1002, ¶¶90-92.)

Fleming further discloses uniformly stretching/compressing along another axis. (*See* IV.A.3.a.; EX1002, ¶93.)

4. Claim 4: "The system of claim 3, wherein the scaling function and the warping function preserves the input

positions of the subset of the pixels as the output positions of the subset of the pixels."

Fleming's region at the center of image 271, 371, or 401 includes a "subset of the pixels within the portion." (*See* IV.A.2.d.)

"[T]he center (243) of the image is adjusted so that the original aspect ratio ***near the center is preserved*** in image 273. Thus, a square region at the center of image 271 is mapped (or scaled) as a square (or a rectangle substantially close to a square) in image 273." (EX1004, 4:66-5:4; EX1002, ¶¶94-95.)

Fleming discloses "***linear scaling*** in both directions can also be combined with ***nonlinear scaling*** (either in the vertical direction or in the horizontal direction) so that the ***aspect ratio of the area of interest (e.g., the center strip) is preserved***. Typically, the linear scaling and the nonlinear scaling are performed in one combined operation." (EX1004, 5:35-40; EX1002, ¶96.)

5. Claim 5: "The system of claim 3, wherein the scaling function changes the source aspect ratio to the target aspect ratio."

Fleming's scaling function changes the source aspect ratio to the target aspect ratio. (*See* IV.A.2.a, IV.A.3.a.) For example, "when a video image is required to ***fill a display area*** with a linear horizontal scaling factor A and a linear vertical scaling factor B, the image can be linearly scaled by factor A in the horizontal direction using mapping X=Ax." (EX1004, 6:18-27.) A POSITA would have understood that "fill[ing] a display area" refers to changing the aspect

ratio. (EX1002, ¶¶97-98.)

6. Claim 6: "The system of claim 2, wherein the one or more physical processors are included within a camera."

Fleming's GPU and CPU are "one or more physical processors." (*See* IV.A.2.b.) The GPU and CPU are "of the data processing system." (EX1004, 2:11-14, 3:19-21.)

It would have been obvious for Fleming's data processing system (including its GPU and CPU) to be included within a camera. At the time of the invention in 2013, digital cameras included processors for processing the image data captured by an image sensor. Digital cameras at this time stored files having a different aspect ratio (*e.g.*, EX1004, 16:9-11), or included LCD displays (for viewing the captured image) that had a different aspect ratio than the image data captured by an image sensor. Since the aspect ratio of the captured image was different than the aspect ratio of the stored file or the LCD display included in the camera, it would have been obvious for the digital camera to include data processing systems to transform the captured image into an output image (having the aspect ratio of the stored file or LCD display) to be presented on the camera display. A POSITA would have been motivated to have on-camera processing and display capabilities because it would have been less burdensome, cheaper, and saves time. Having processing and display capabilities on camera are known techniques used to

improve devices that are similar and/or ready for improvement. (EX1002, ¶¶99-100.)

7. Claim 7: "The system of claim 6, wherein the output image is presented on a display of the camera."

Fleming discloses a ***display device 709*** (Figure 7 below). (EX1004, 7:65-8:3, 8:12-21, Figs. 7, 8.)

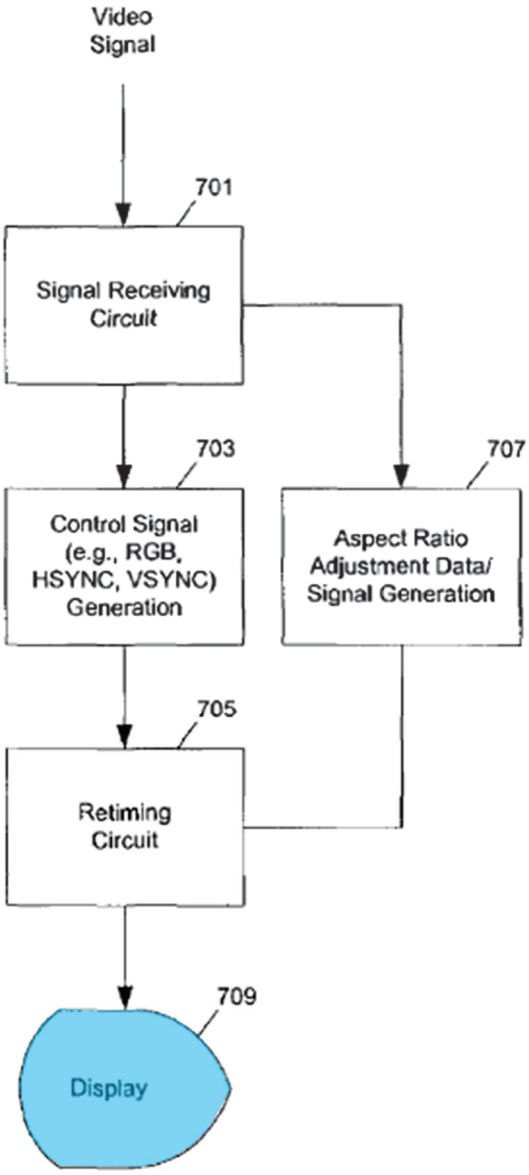


Fig. 7

It would have been obvious for Fleming's output image to be presented on a display of the camera. (*See* IV.A.6; EX1002, ¶¶101-102.)

8. Claim 8: "The system of claim 2, wherein the portion corresponds to a center portion of the input image."

Fleming's region at the center is a "portion." (*See* IV.A.2.d; EX1002, ¶103.)

9. Claim 10: "The system of claim 2, wherein the transformation non-uniformly shifts the pixels from the input positions to the output positions further based on distances between the input positions and the portion."

Fleming's region at the center is a "portion." (*See* IV.A.2.d.) Fleming's nonlinear scaling shifts the pixels from the input positions to the output positions. (*See* IV.A.2.g.)

Fleming's shifts are further based on distances between the input positions and the center 243 and its region (portion). Figure 2 below shows Fleming's nonlinear scaling, where the pixel at point 214 ***shifts (in the direction of green arrow labeled shift s4)*** from the input position (right side of green arrow) to the output position (left side of green arrow), and the pixel at point 212 ***shifts (in the direction of purple arrow labeled shift s2)*** from input position (right side of purple arrow) to the output position (left side of purple arrow). (EX1002, ¶¶104-106.)

Figure 2 (in part)

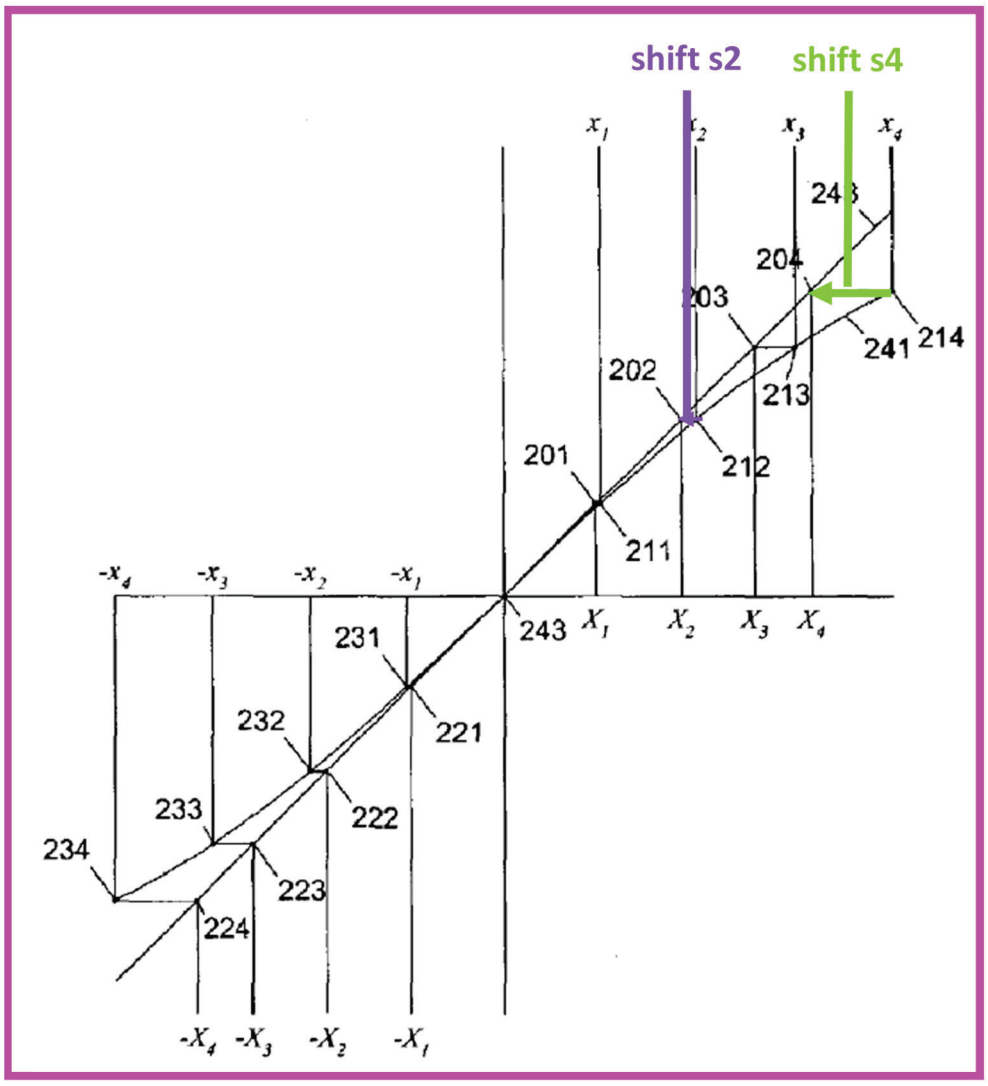
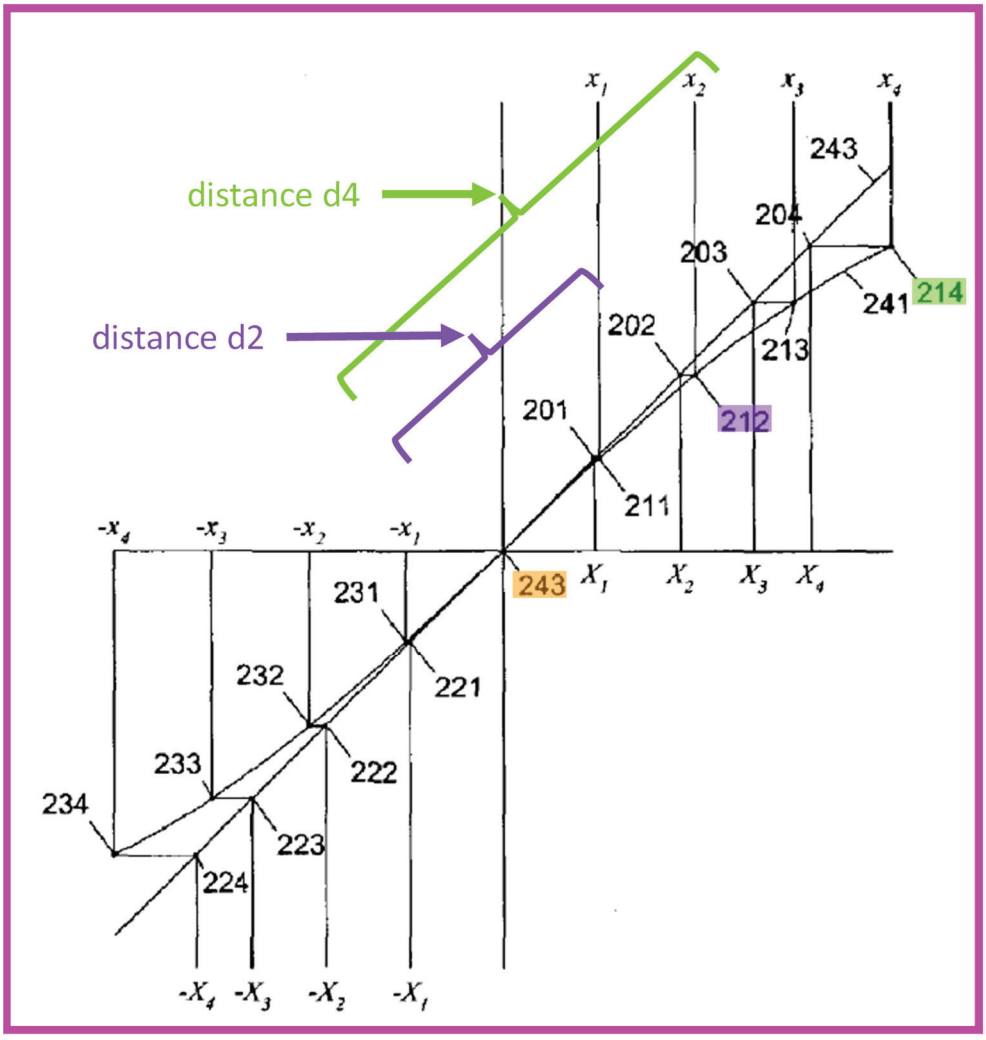


Figure 2 below shows that the ***point 214*** is located a ***distance d4*** from the ***center 243***, and ***point 212*** is located a ***distance d2*** from the ***center 243***. The figure shows ***distance d4*** (having a greater amount of ***shift s4***) being further away from ***center 243*** and its region than ***distance d2*** (having a lower amount of ***shift s2***). (EX1002, ¶107.)

Figure 2 (in part)



Figures 2 and 3 show other pixels (*e.g.*, at point 213) whose shifts are based on distances between the input positions (*e.g.*, x_3) to the center 243 and its region. Fleming discloses "it is desirable to ***maintain the original aspect ratio in an area of interest (e.g., at the center of the image) and gradually stretch the image in other areas***. Thus, the image in the area of interest is presented in the target display area with reduced distortion (or with no distortion), while other areas are

distorted." (EX1004, 4:38-44; EX1002, ¶¶108-109.)

10. Claim 12: "The system of claim 2, wherein the input image includes a video frame of a video."

Fleming's image 271, 371, or 401 is an "input image." (*See* IV.A.2.c.)

Fleming's Figure 2 "show[s] examples of nonlinear anamorphic scaling of video images." (EX1004, 4:46-48.) Figures 5 and 10 below show Fleming "process[ing] ***video data 501*** having separate frames. . . . Each frame of video image is nonlinearly scaled." (EX1004, 6:42-47, 8:49-50; EX1002, ¶¶110-111.)

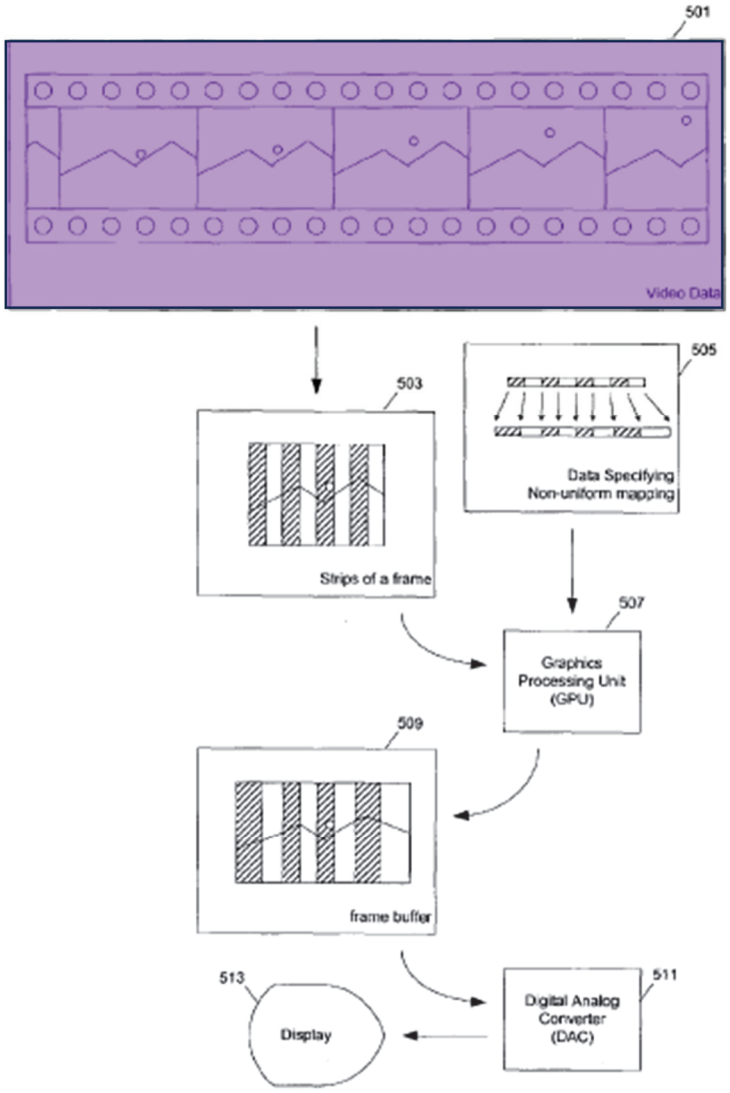

501
Video Data
503
Strips of a frame
505
Data Specifying
Non-uniform mapping
507
Graphics
Processing Unit
(GPU)
509
frame buffer
511
Digital Analog
Converter
(DAC)
513
Display

Fig. 5

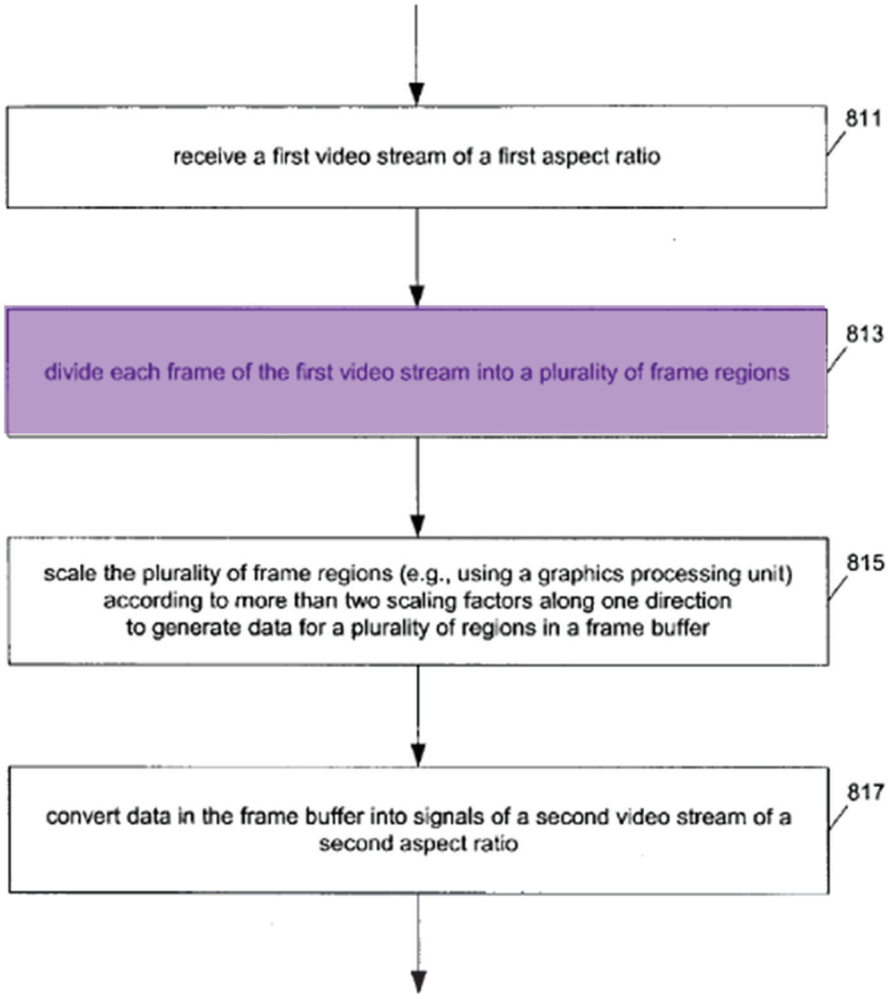


Fig. 10

Figures 6 and 11 show, and corresponding descriptions disclose video frames. (EX1004, 7:13-33, 8:63-67, Figs. 6, 11; EX1002, ¶¶112-113.)

11. Claim 1

a. Preamble: "An image capture apparatus, comprising:"

It would have been obvious for Fleming's data processing system to be included within a digital camera (image capture apparatus). (*See* IV.A.6; EX1002, ¶114.)

b. 1[a]: "an image sensor configured to capture an input image having a source aspect ratio, the input image including pixels located at input positions defined along a first axis and a second axis, the first axis perpendicular to the second axis;"

Element 1[a] recites limitations similar to element 2[b], except it requires "an image sensor [be] configured to capture" the input image. It would have been obvious for Fleming's data processing system to be included within a digital camera. (*See* IV.A.6.) Digital cameras comprise an image sensor configured to capture an input image. (EX1002, ¶¶115-116.)

c. 1[b]: "a display coupled to one or more physical processors; and"

It would have been obvious for Fleming's data processing system to be included within a digital camera, which includes a display and physical processor(s). (*See* IV.A.6, IV.A.7.) The data processing system transforms the captured image into an output image. (*Id.*) It would have been obvious for the output image to be presented on the display of the camera. (*Id.*) It would have

been obvious that the display is coupled to the physical processor(s). (EX1002, ¶¶117-118.)

d. 1[c]: "the one or more physical processors configured by machine-readable instructions to:"

Element 1[c] mirrors element 2[a]. (EX1002, ¶119.)

e. 1[d]: "obtain the input image;"

Element 1[d] recites a portion of element 2[b]. (EX1002, ¶120.)

f. 1[e]: "determine a portion within the input image, the portion including a subset of the pixels; and"

Element 1[e] mirrors element 2[c]. (EX1002, ¶121.)

g. 1[f]: "apply a transformation to the input image to generate an output image, the output image having a target aspect ratio different than the source aspect ratio, the output image including the pixels located at output positions defined along the first axis and the second axis,"

Element 1[f] mirrors element 2[d]. (EX1002, ¶122.)

h. 1[g]: "wherein: the transformation non-uniformly shifts the pixels from the input positions to the output positions based on (1) the input positions along the first axis, and (2) the input positions along the second axis; and"

Element 1[g] mirrors element 2[e]. (EX1002, ¶123.)

i. 1[h]: "the transformation non-uniformly shifts the pixels such that differences between the input positions and the output positions of the subset of the pixels within the portion are less than differences between the input positions and the output positions of others of the pixels; and"

Element 1[h] mirrors element 2[f]. (EX1002, ¶124.)

j. 1[i]: "present the output image on the display."

Element 1[i] recites a limitation similar to a portion of claim 7. (EX1002, ¶125.)

12. Claim 13

a. 13[pre]: "A method for converting between aspect ratios, the method performed by a computing system including one or more physical processors, the method comprising:"

Element 13[pre] is similar to elements 2[pre] and 2[a], except it requires the system be a "computing system."

Fleming's "computer system 101, which is a form of a data processing system." (EX1004, 3:19-21.) Its "techniques may be carried out in a computer system or other data processing system." (EX1004, 3:58-60; EX1002, ¶¶126-127.)

b. 13[a]: "obtaining, by the computing system, an input image, the input image having a source aspect ratio, the input image including pixels located at input positions defined along a first axis and a second axis, the first axis perpendicular to the second axis;"

Element 13[a] is similar to element 2[b], except it requires the "obtaining" be performed "by the computing system," which Fleming discloses. (*See* IV.A.12.a; EX1002, ¶¶128-129.)

c. 13[b]: "determining a portion within the input image, the portion including a subset of the pixels; and"

Element 13[b] mirrors element 2[c]. (EX1002, ¶130.)

d. 13[c]: "applying, by the computing system, a transformation to the input image to generate an output image, the output image having a target aspect ratio different than the source aspect ratio, the output image including the pixels located at output positions defined along the first axis and the second axis,"

Element 13[c] is similar to element 2[d], except it requires the "applying" be performed "by the computing system," which Fleming discloses. (*See* IV.A.12.a; EX1002, ¶¶131-132.)

e. 13[d]: "wherein: the transformation non-uniformly shifts the pixels from the input positions to the output positions based on (1) the input positions along the first axis, and (2) the input positions along the second axis; and"

Element 13[d] mirrors element 2[e]. (EX1002, ¶133.)

f. 13[e]: "the transformation non-uniformly shifts the pixels such that differences between the input positions and the output positions of the subset of the pixels within the portion are less than differences between the input positions and the output positions of others of the pixels."

Element 13[e] mirrors element 2[f]. (EX1002, ¶134.)

13. Claim 14: "The method of claim 13, wherein the transformation includes: a scaling function to uniformly stretch or compress the input image along the first axis; and a warping function to non-uniformly warp the input image along the second axis."

Claim 14 mirrors claim 3. (EX1002, ¶135.)

14. Claim 15: "The method of claim 14, wherein the scaling function and the warping function preserves the input

positions of the subset of the pixels as the output positions of the subset of the pixels."

Claim 15 mirrors claim 4. (EX1002, ¶136.)

15. **Claim 16: "The method of claim 13, wherein the portion corresponds to a center portion of the input image."**

Claim 16 mirrors claim 8. (EX1002, ¶137.)

16. **Claim 18: "The method of claim 13, wherein the transformation non-uniformly shifts the pixels from the input positions to the output positions further based on distances between the input positions and the portion."**

Claim 18 mirrors claim 10. (EX1002, ¶138.)

17. **Claim 20: "The method of claim 13, wherein the input image includes a video frame of a video."**

Claim 20 mirrors claim 12. (EX1002, ¶139.)

B. Ground 2: Fleming-Liu Renders Obvious Claims 9, 11, 17, 19

1. Summary of Liu

Liu was filed on March 28, 2011, published on July 14, 2011, and issued on February 11, 2014, qualifying as prior art at least under §§ 102(a)(1), 102(a)(2). Applicant cited, but the Examiner never characterized Liu during prosecution.

Liu discloses "an image scaling method and apparatus to reduce distortion of a scaled image." (EX1005, Abstract.) Figure 6 below shows Liu's image scaling method determines the main objects in a ***source image***, and nonlinearly scales the source image (having an aspect ratio of 4:3, for example) to a ***target image*** (having an aspect ratio of 16:9, for example). (EX1005, Abstract, 1:27-40, 6:9-11;

EX1002, ¶140.)

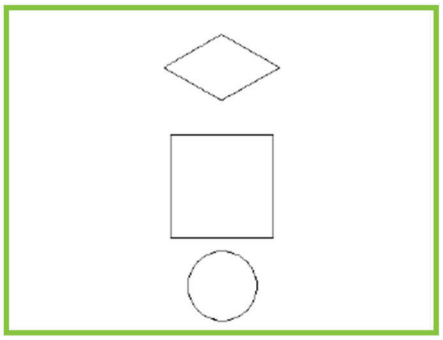


FIG. 6a

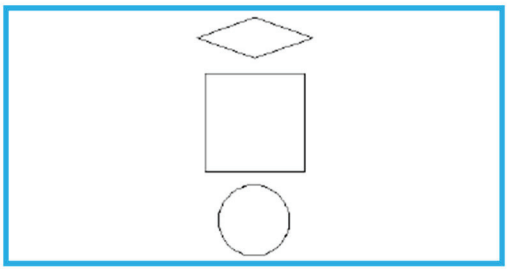


FIG. 6b

Liu's scaling is based on the location and distribution direction of the main objects. Liu explains: "[b]ecause the main objects of the source are centralized in the middle part and the lower part of the image and distributed horizontally, the scaling factor of the ***upper part*** ***is larger***, and the scaling factor of the middle part and the ***lower part*** ***is very small*** and approaches 1." (EX1005, 8:16-20.) Hence, there is little to no compression/enlargement in the main objects (rectangle and ***circle*** in Figures 6a and 6b below), but there is compression/enlargement in trivial objects (***diamond***). (EX1002, ¶141.)

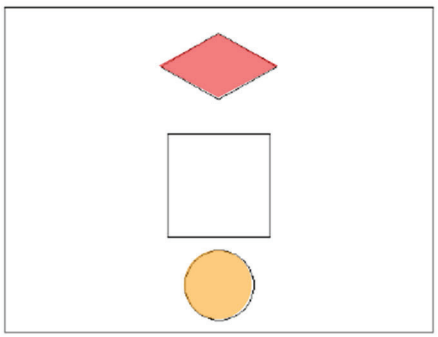


FIG. 6a

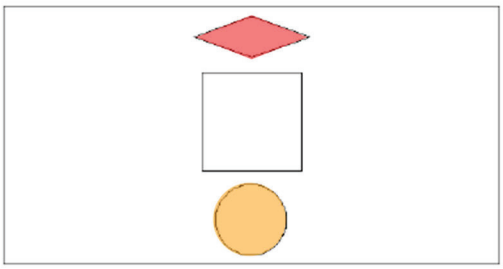


FIG. 6b

2. Claim 11: "The system of claim 2, wherein the one or more physical processors are further configured by machine-readable instructions to determine the portion based on a location of an object within the input image such that the portion includes the object."

Liu discloses "[d]etermin[ing] the distribution direction of the ***main objects in a source image***." (EX1005, 3:25-26.) Liu discloses "[s]cal[ing] the source image to a target image through a nonlinear scaling method according to the distribution direction of the main objects in the source image." (EX1005, 3:56-58.) That is, Liu determines where the main objects in the source image are and their locations. (EX1002, ¶142.)

Figures 6a and 6b below show "the main objects of the image are distributed in the middle part and the ***lower part*** of the image, as indicated by the rectangle and ***circle*** in FIG. 6a." (EX1005, 8:11-14.) "Because the main objects of the source are centralized in the middle part and the lower part of the image and distributed horizontally, the scaling factor of the ***upper part is larger***, and the

scaling factor of the middle part and ***lower part*** ***is very small*** and approaches 1." (EX1005, 8:16-20.) The middle and lower part ("portion") has less distortion ("differences" of element 2[f]) than the upper part. (EX1002, ¶143.)

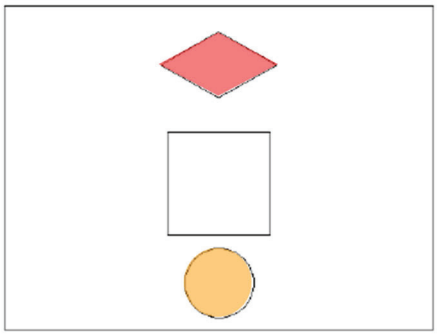


FIG. 6a

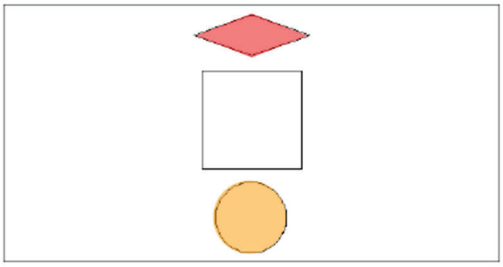


FIG. 6b

It would have been obvious to combine Fleming and Liu. "When an image is scaled through a horizontal nonlinear scaling algorithm, ***if the main objects in the image are in the middle of the image***, the main object area is little distorted after the scaling, and the visual effect is good." (EX1005, 1:55-59.) In other words, horizontal non-linear scaling processes that preserve the center area have good results when the main object is located in the center area. Fleming is one example horizontal non-linear scaling process. Fleming explains: "[s]ince the detail at the ***center strip is typically of more interest to a viewer***, the nonlinear scaling . . . preserves the original feature of the video image in the area of interest, the center strip." (EX1004, 5:29-32.) A POSITA would have understood that Fleming's non-linear process is suitable when the main object is in the center.

(EX1002, ¶144.)

But a POSITA would have understood that there are video images where the main object is not in the center. And Liu explains that the horizontal non-linear scaling processes (discussed in 1:55-59), such as Fleming's, would not have good results in such situations. Liu specifically states "however, if the main objects (such as persons) exist on the edge of the image, the persons at the edge are distorted sharply against the persons in the middle of the image after the image scaling, and the visual effect is deteriorated." (EX1005, 1:59-62; EX1002, ¶¶145-146.)

When there is a main object that is not in the center area, for example, a POSITA would have been motivated to use Liu's nonlinear scaling method so as to avoid the visual effect of a main object on the edge from being deteriorated. For example, Liu's image (Figures 6a and 6b below) includes a ***circle*** as a main object located in the lower part of the image. "The comparison between FIG. 6a and FIG. 6b shows that in the scaled image, the ***main objects are scarcely distorted*** in the middle part and the ***lower part***, to which the human eyes are sensitive, and that the trivial objects in the upper part are distorted greatly." (EX1005, 8:20-24; EX1002, ¶146.)

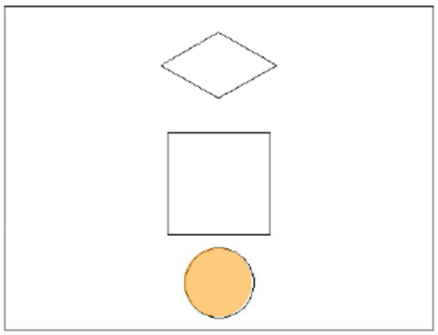


FIG. 6a

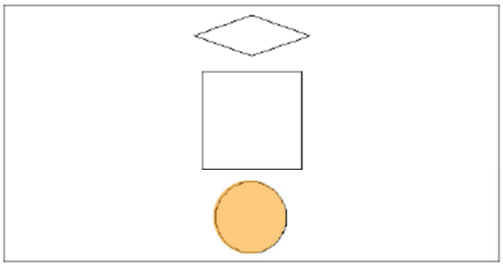


FIG. 6b

Liu provides a teaching/suggestion/motivation that would have led a POSITA to combine Fleming and Liu to "prevent distortion of the target image in the important area to which human eyes are sensitive" in some instances. (EX1005, 2:30-33.) The combination involves known techniques to improve similar and/or known methods/devices to yield predictable results and a reasonable expectation of success. (EX1002, ¶¶146-147.)

3. Claim 9: "The system of claim 2, wherein the portion corresponds to a non-center portion of the input image."

Liu discloses determining where a main object is located, and scaling according to the location of the main object. (*See* IV.B.2.) Figures 6a and 6b show "the main ***objects*** of the source image are centralized in the middle part and the ***lower part of the image*** and ***distributed horizontally***, the scaling factor of the upper part is larger, and the scaling factor of the middle part and the lower part is very small and approaches 1." (EX1005, 8:15-20; EX1002, ¶148.)

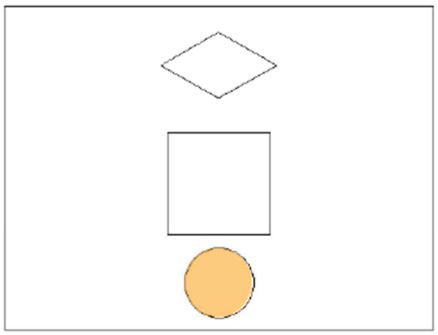


FIG. 6a

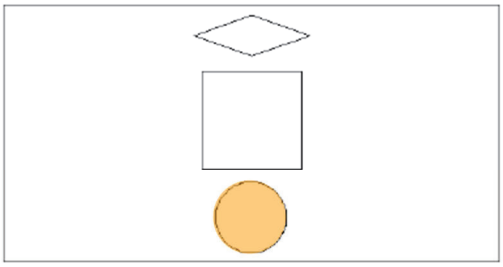


FIG. 6b

Liu discloses that "[a]n image may be scaled in the horizontal direction or the vertical direction, whichever makes the scaling direction of the image vertical to the distribution direction of the main objects." (EX1005, 3:62-65.) "For example, when the main objects in the image are distributed vertically, the image is scaled according to the horizontal nonlinear scaling method in the prior art." (EX1005, 3:65-67.) Fleming discloses one example horizontal nonlinear scaling method. (*See* IV.A.2; EX1002, ¶149.)

It would have been obvious to combine Fleming and Liu, and there would have been a reasonable expectation of success. (*See* IV.B.2; EX1002, ¶150.)

4. Claim 17: "The method of claim 13, wherein the portion corresponds to a non-center portion of the input image."

Claim 17 mirrors claim 9. (EX1002, ¶151.)

5. Claim 19: "The method of claim 13, further comprising determining the portion based on a location of an object within the input image such that the portion includes the object."

Claim 19 mirrors a subset of claim 11. (EX1002, ¶152.)

C. Ground 3: Obara-Liu Renders Obvious Claims 1-20

1. Summary of Obara

Obara was filed on June 9, 2006, and published on December 14, 2006, qualifying as prior art at least under §§ 102(a)(1), 102(a)(2). The Examiner never found, and Applicant never cited, Obara during prosecution. Figure 6 (below) shows an information processing apparatus and method that execute a non-linear scaling process on ***input image data having a first size*** to generate an ***output image having a second size***. (EX1006, Abstract, [0003], [0053], [0057], Figs. 5, 6; EX1002, ¶153.)

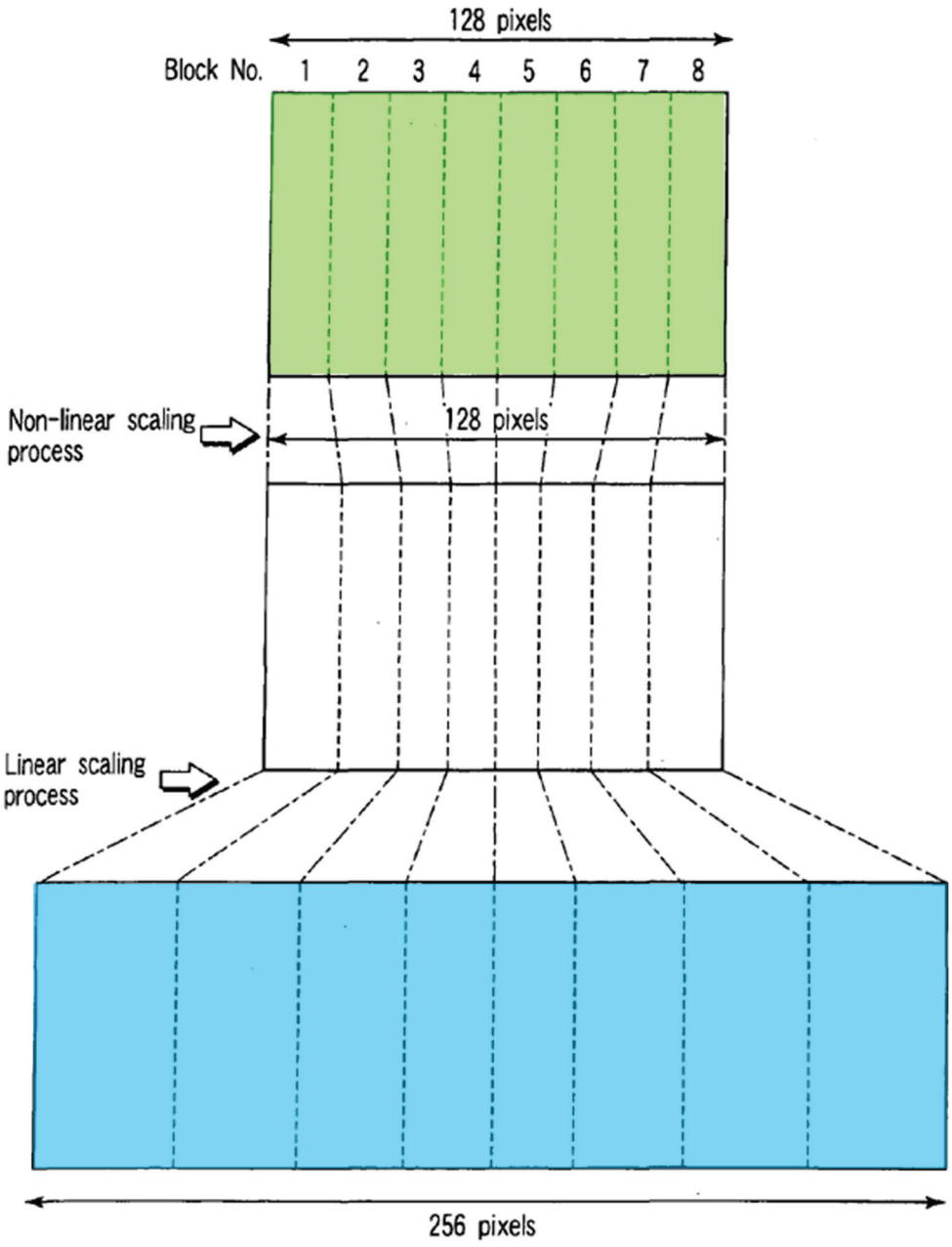


FIG. 6

Obara's non-linear scaling module horizontally reduces the central area blocks, and horizontally alters the sizes of the other blocks with different amounts of enlargement (enlargement ratios). (EX1006, [0053].) The horizontal alteration

is such that "enlargement ratios [] gradually increase [from the central area] toward both ends" of the image data. (EX1006, [0052], [0061].) Figure 6 below shows the amount of enlargement (shift) being less in the ***central area (no shift)*** than in an ***edge area (shift shown by red arrow)***. Thus, there is less compression/enlargement ("differences") in the central area than in an edge area. (EX1002, ¶154.)

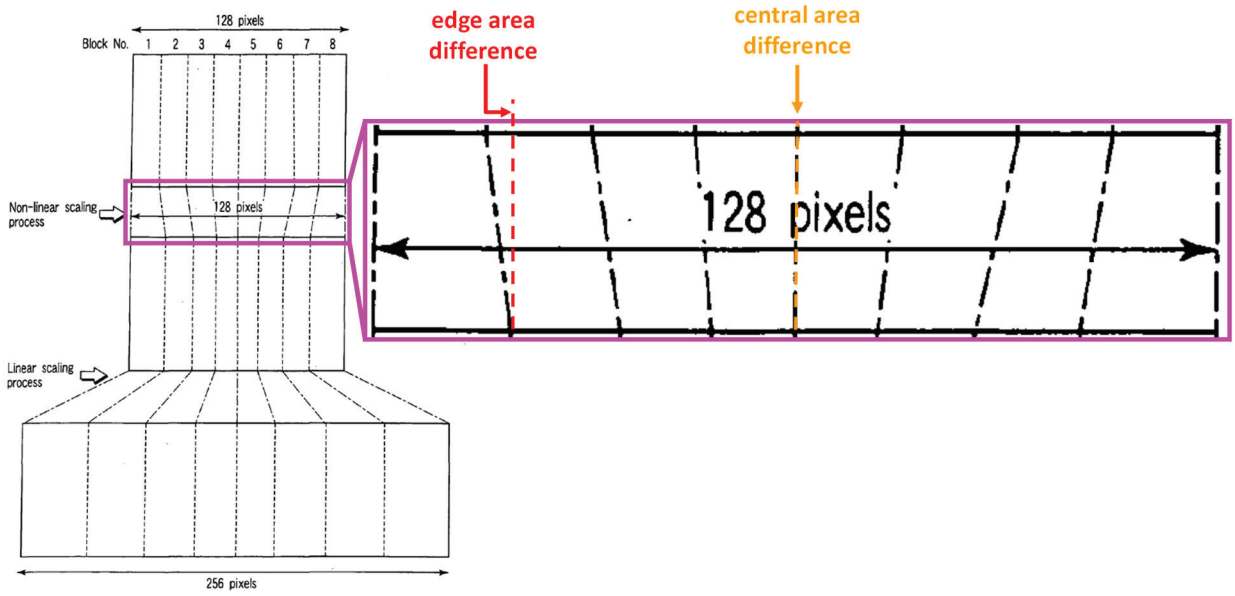


FIG. 6

2. Claim 2

a. Preamble: "A system that converts between aspect ratios, the system comprising:"

To the extent the preamble is limiting (Petitioner does not concede), Obara discloses the preamble.

"[I]nformation processing ***apparatus*** includes an image processing unit

which executes a non-linear scaling process of vertically dividing ***input image data having a first size*** . . . [and] generates ***output image data having a second size*** greater than the first size." (EX1006, Abstract, [0053] ("original image data (A) with, e.g. 720×480 pixels"), [0057] ("image data (C) of 1440×900 pixels"); EX1002, ¶¶155-156.)

b. 2[a]: "one or more physical processors configured by machine-readable instructions to:"

Obara's "information processing apparatus includes an ***image processing unit which executes a non-linear scaling process***." (EX1006, Abstract.) The information processing apparatus ("computer 10") includes a "CPU 111 [that] is a ***processor***." (EX1006, [0024], [0033].) "The CPU 111 executes the ***main operating system/sub-operating system and various application programs*** . . . , which are ***loaded from the hard disk drive (HDD) 121 into main memory 113***. The CPU 111 can execute a ***plurality of processes*** in parallel." (EX1006, [0033]; EX1002, ¶¶157-158.)

c. 2[b]: "obtain an input image, the input image having a source aspect ratio, the input image including pixels located at input positions defined along a first axis and a second axis, the first axis perpendicular to the second axis;"

Obara discloses "CPU 111 . . . the non-linear scaling module 215, ***inputs image data*** which is to be processed" (Figure 10 below). (EX1006, [0082]; EX1002, ¶159.)

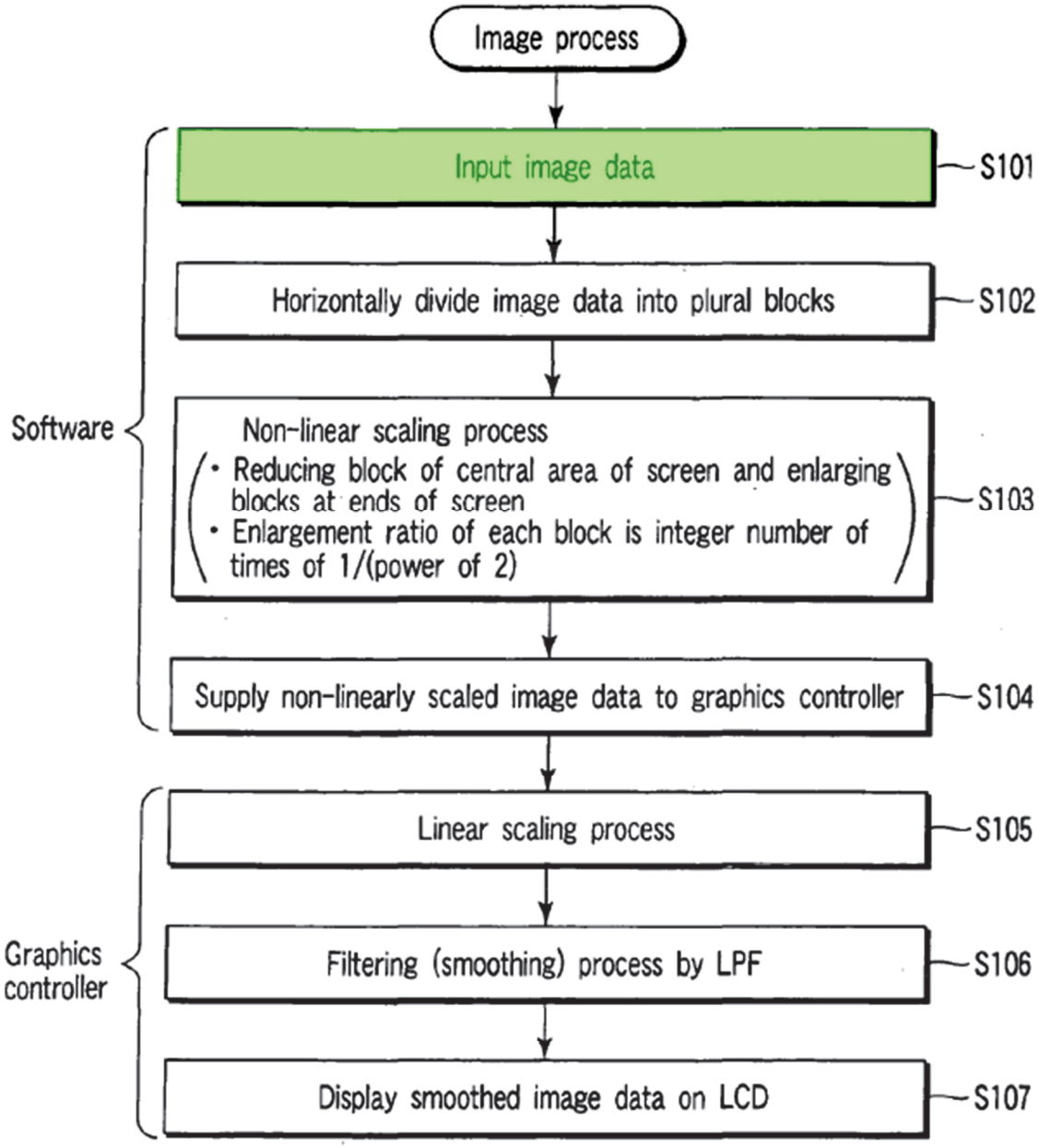


FIG. 10

Obara discloses an example where "[t]he size of ***original image data (A)*** ***[is] 720 x 480 pixels***." (EX1006, [0052].) The "total number of pixels" are counted "in the horizontal and vertical directions." (*Id.*; EX1002, ¶160.)

Figure 5 below shows the "non-linear scaling module 215 vertically divides ***original image data (A)*** with, e.g. 720×480 pixels into, e.g. 12 image blocks." (EX1006, [0053], [0061].) A POSITA would have understood that 720 pixels refers to the number of pixels in the horizontal direction, and 480 pixels refers to the number of pixels in the vertical direction, where pixels are located at input positions defined along these directions. Figures 5 and 6 show the vertical direction being perpendicular to the horizontal direction. (EX1002, ¶¶161-162.)

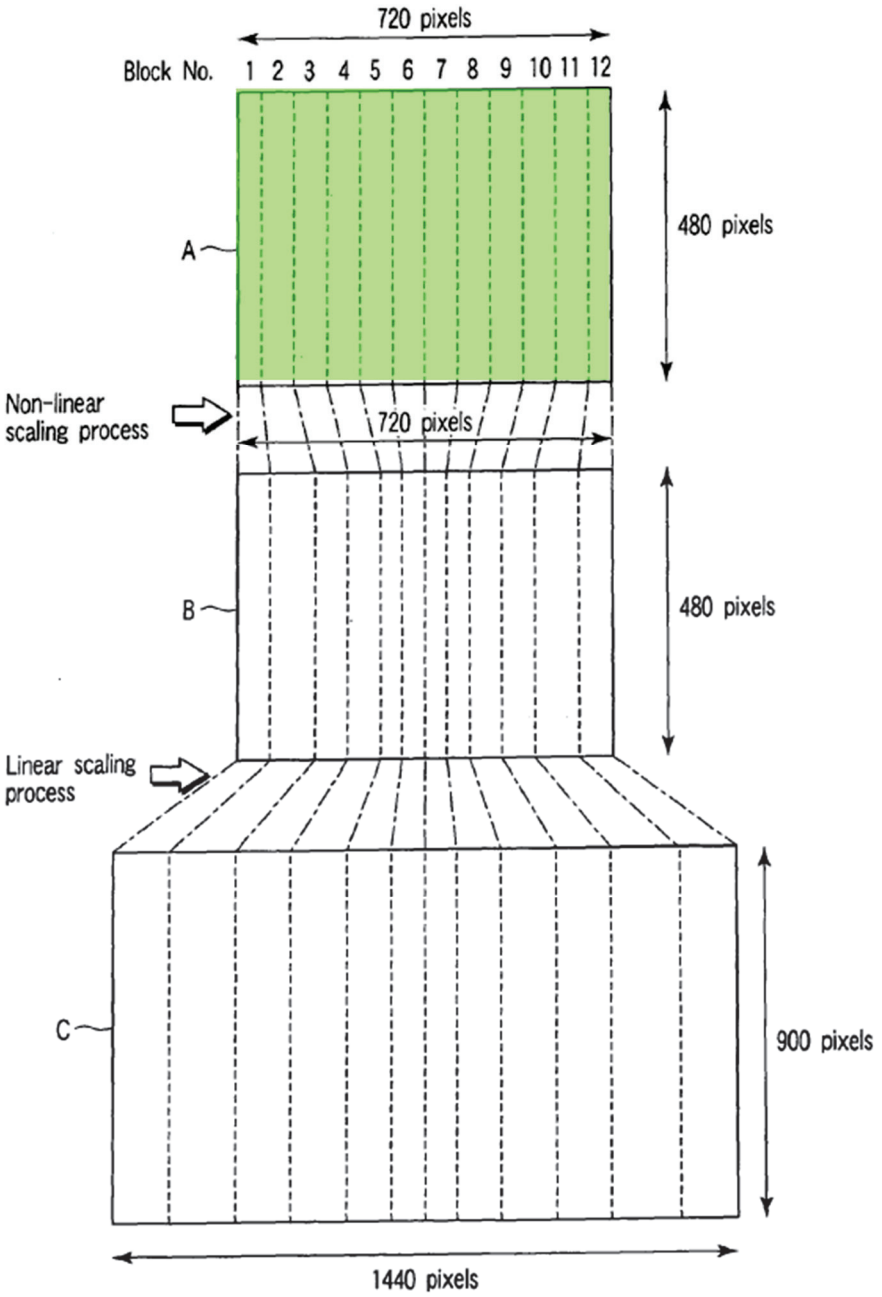

720 pixels
Block No. 1 2 3 4 5 6 7 8 9 10 11 12
A
480 pixels
Non-linear scaling process
720 pixels
B
480 pixels
Linear scaling process
C
900 pixels
1440 pixels

FIG. 5

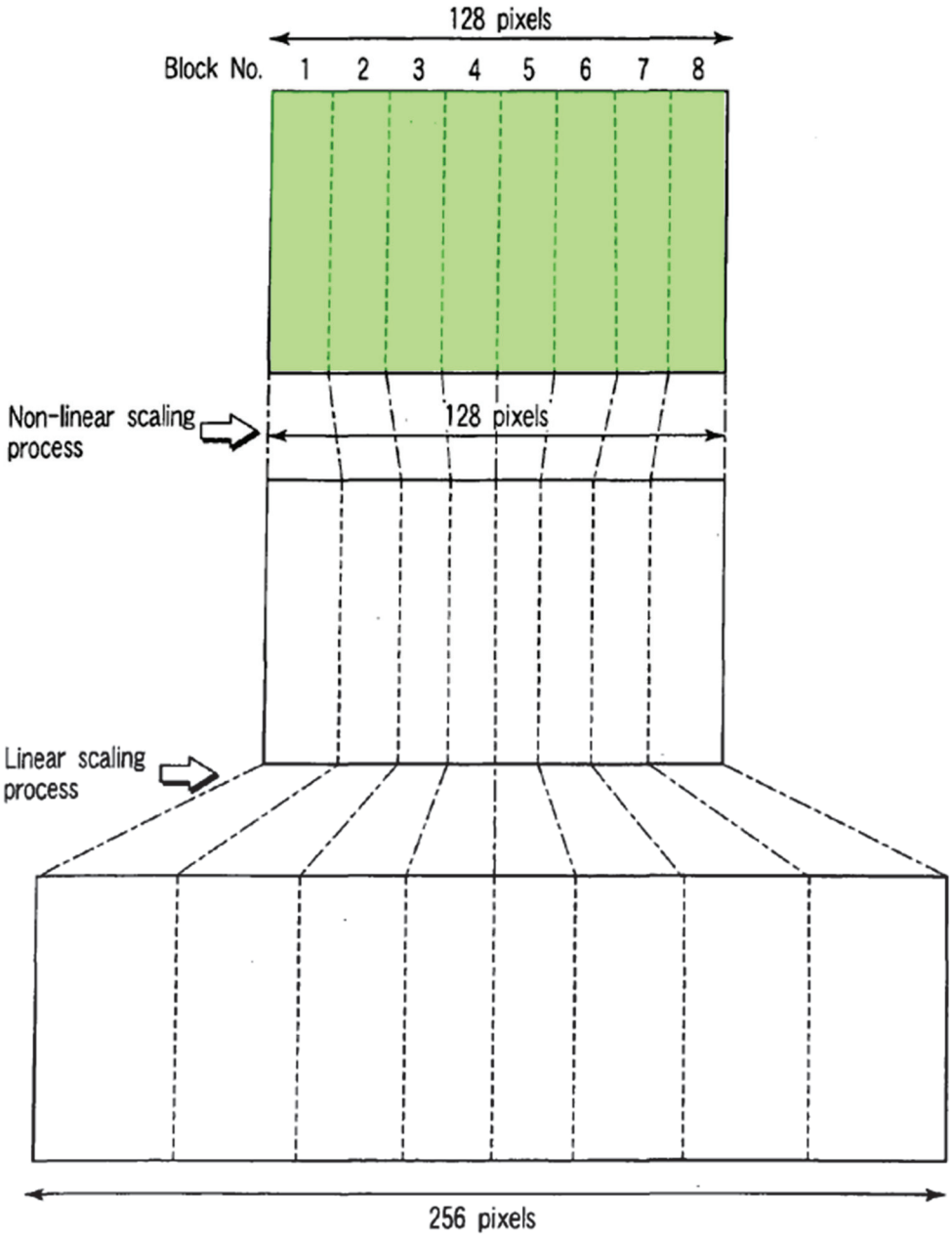


FIG. 6

d. 2[c]: "determine a portion within the input image, the portion including a subset of the pixels; and"

Obara's ***original image data A*** is an "input image." (*See* IV.A.2.c.)

"[N]on-linear scaling module 215 vertically divides the ***original image data (A)*** into, for example, eight image blocks. The non-linear scaling module 215 horizontally reduces image ***blocks 3, 4, 5 and 6 which belong to the central area***" (Figure 6 below). (EX1006, [0062].) A POSITA would have understood that blocks 3-6 at the central area include a subset of the pixels within original image data A (input image). (EX1002, ¶¶163-165.)

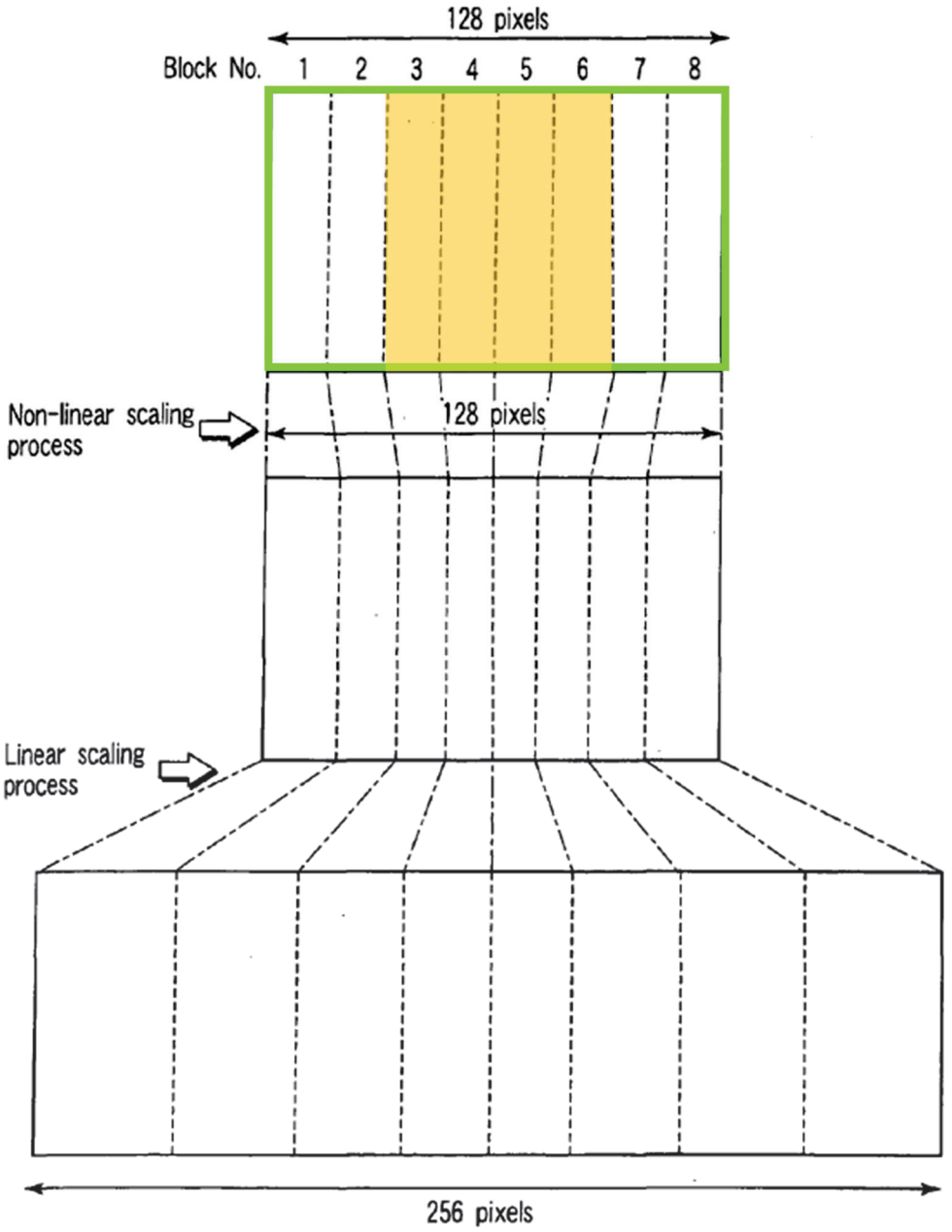


FIG. 6

Figure 5 shows "blocks 6 and 7 which belong to the ***central area***." (EX1006, [0053].) A POSITA would have understood that blocks 6 and 7 at the central area of original image data A (input image) include a subset of the pixels.

(EX1002, ¶164.)

e. 2[d]: "apply a transformation to the input image to generate an output image, the output image having a target aspect ratio different than the source aspect ratio, the output image including the pixels located at output positions defined along the first axis and the second axis,"

Obara's ***original image data A*** is an "input image" with a source aspect ratio of, *e.g.*, ***720×480 pixels***. (EX1006, [0053]; *see* IV.C.2.c.)

Figures 5 and 10 below show Obara ***applying a transformation*** to the ***input image*** to generate an ***output image***: "[t]he non-linear scaling module 215 ***horizontally reduces*** image blocks 6 and 7 which belong to the central area ***[of image data A]***. Further, the non-linear scaling module 215 ***horizontally alters*** the sizes of the other image blocks with enlargement ratios." (EX1006, [0053], [0082], [0084].) This leads to image data (B) (EX1006, [0052]), which is enlarged in the horizontal and vertical directions. (EX[1006], [0057].) "Thereby, ***image data (C) of 1440×900 pixels***, which is equal in size to the display screen of the LCD 17, ***is generated***."[5] (EX1006, [0057], Fig. 6, [0061]-[0065]; EX1002,

[5] Although Obara's disclosures of "enlarged 1.5 times" and "enlarged 1.2 times" are inconsistent with the output image data being "1440×900," Obara still teaches element 2[d], including the "target aspect ratio [being] different than the source

¶¶166-171.)

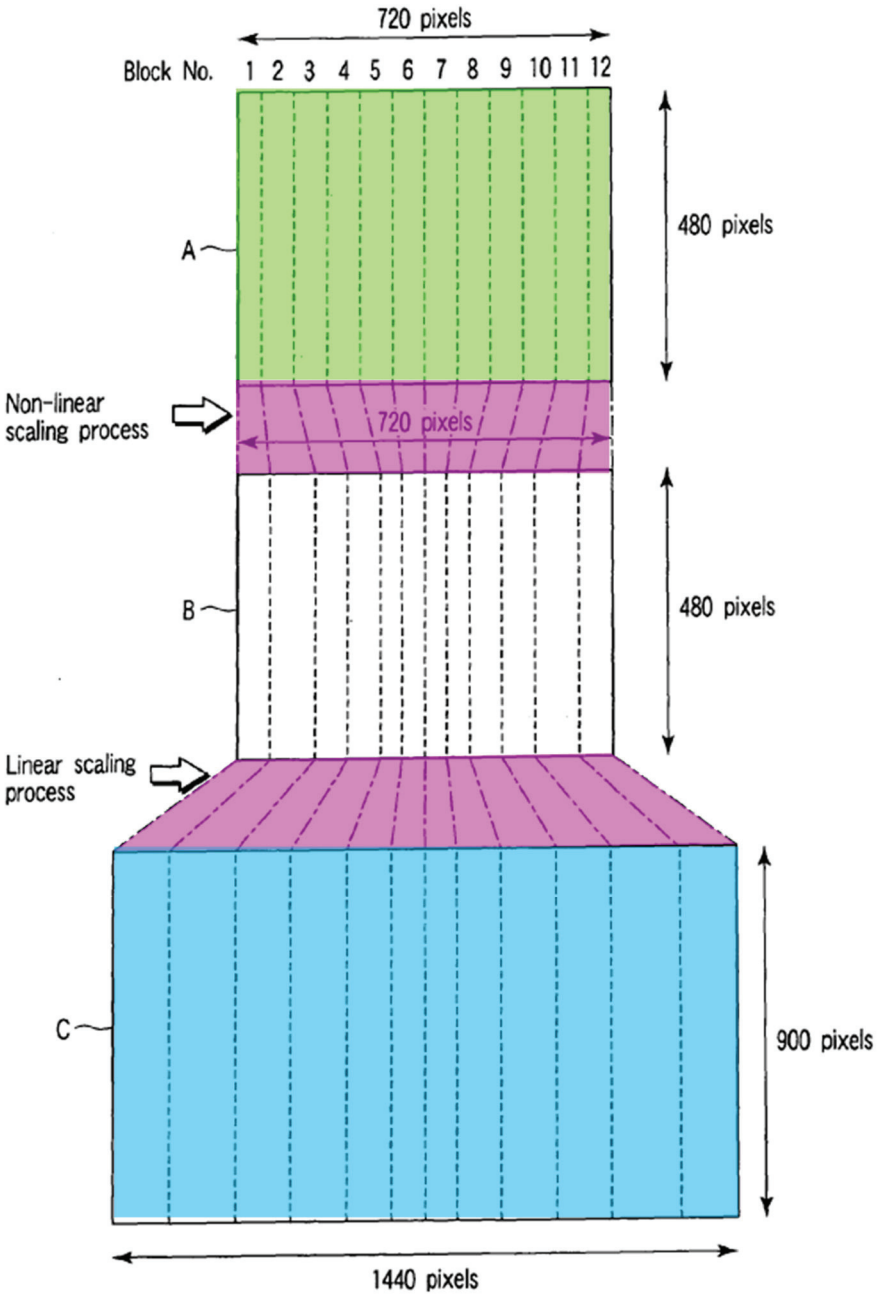


FIG. 5

aspect ratio." (EX1002, ¶169.)

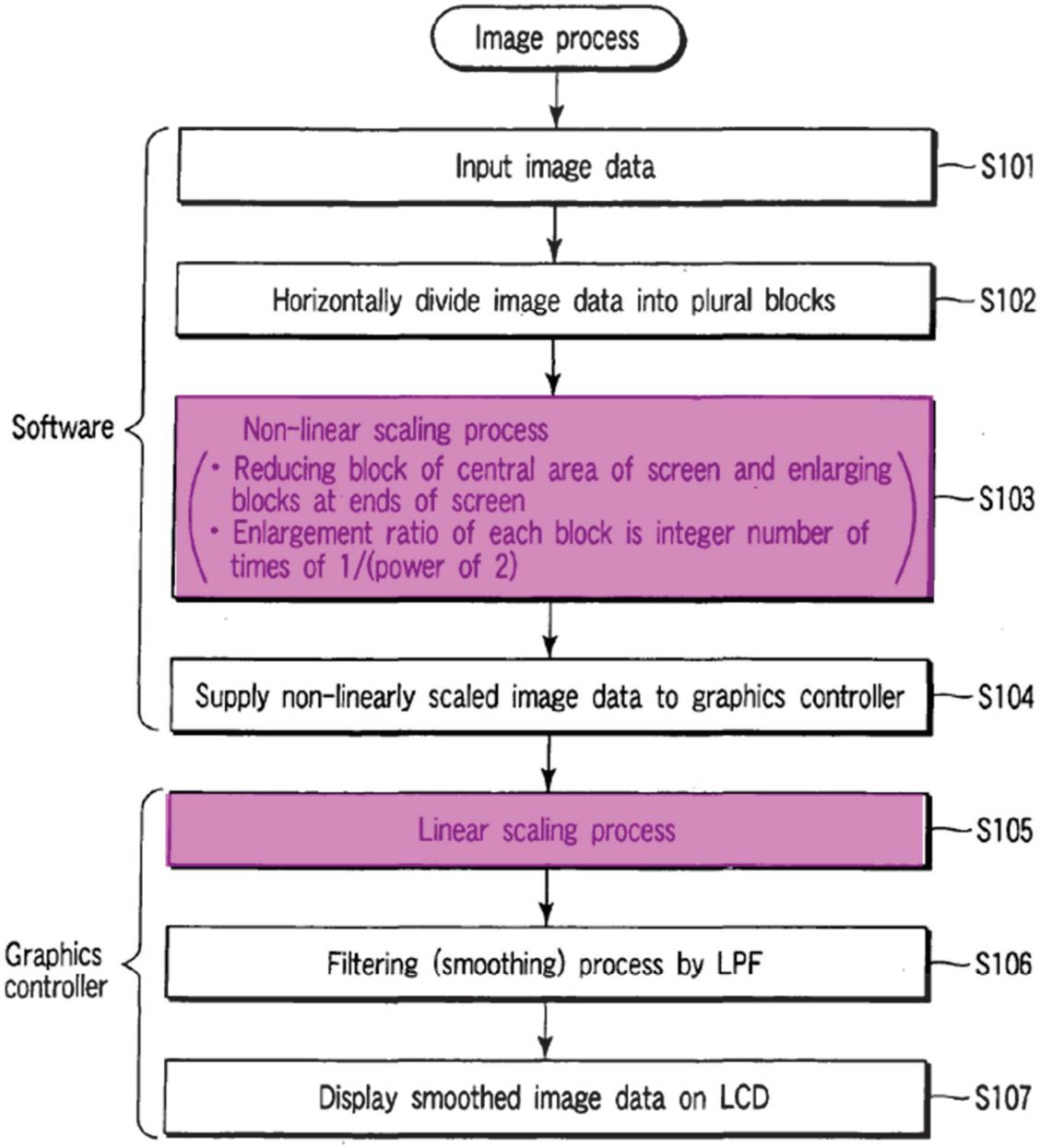


FIG. 10

A POSITA would have understood that 1440 pixels refers to the number of pixels in the horizontal direction, and 900 pixels refers to the number of pixels in the vertical direction, where pixels are located at output positions defined along the

vertical and horizontal directions. (EX1002, ¶168.)

Figure 6 shows, and its corresponding descriptions disclose applying a transformation to the original image data A (input image) to generate image data C (output image). (EX1006, [0061]-[0064], Fig. 6; EX1002, ¶¶172-174.)

f. 2[e]: "wherein: the transformation non-uniformly shifts the pixels from the input positions to the output positions based on (1) the input positions along the first axis, and (2) the input positions along the second axis; and"

Obara's original image data A is an "input image" with input positions, and image data C is an "output image" with output positions. (*See* IV.C.2.c, IV.C.2.e.) "***[N]on-linear scaling module 215 horizontally reduces*** image blocks 6 and 7 which belong to the central area ***[of image data A]***. Further, the ***non-linear scaling module 215 horizontally alters*** the sizes of the other image blocks with enlargement ratios." (EX1006, [0053].) The pixels of the blocks are located at certain input positions along the first and second axes. (*See* IV.C.2.c.) Obara's non-linear scaling horizontally retains the same number of pixels, but reduces the sizes of the blocks. (EX1006, Figs. 5, 6.) It would have been obvious to retain the number of pixels while reducing the sizes of the blocks by non-uniformly shifting from the input to output positions of the pixels. Shown above, the non-linear scaling involves horizontal shifts, and is based on the input positions along the horizontal axis. Each pixel has an input position along the vertical axis. Hence,

the non-linear scaling is further based on the input positions along the vertical axis. (EX1002, ¶¶175-177.)

To the extent that Obara does not disclose the transformation non-uniformly shifting input positions based on the input positions along the vertical axis, it would have been obvious to a POSITA at the time of the invention. Liu discloses "the distribution direction of the main objects in the source image is determined, and the source image is scaled to the target image through a proper nonlinear scaling method according to the distribution direction of the main objects in the source image." (EX1005, 2:25-32.) "When the main objects in ***the image are distributed horizontally, the image is scaled according to a vertical nonlinear scaling method***." (EX1005, 3:67-4:4:3; EX1002, ¶¶178-179.)

This concept of scaling according to the distribution direction of the main objects helps "prevent distortion of the target area in the important area to which human eyes are sensitive, and reduce the distortion of the scaled image." (EX1005, 2:30-34.) A POSITA would have been motivated to reduce the distortion of the scaled image, and would have employed methods (*e.g.*, Liu's method) in order to achieve better image quality, particularly since "the audience is sensitive to such distortion." (EX1005, 1:66-67.) Liu provides a teaching/suggestion/motivation that applies a known technique to improve similar and/or known methods/devices that would have led to the combination, and there

would have been a reasonable expectation of success. (EX1002, ¶¶179-180.)

g. 2[f]: "the transformation non-uniformly shifts the pixels such that differences between the input positions and the output positions of the subset of the pixels within the portion are less than differences between the input positions and the output positions of others of the pixels."

Obara's central area of the original image data A includes a "subset of the pixels within the portion." (*See* IV.C.2.d; Ex. 1006, [0061]-[0062], [0066], Figs. 6, 7.)

"The size of original image data (A) . . . is altered such that ***a central area of the original image data (A) is horizontally reduced*** while the size of the original image data (A) is horizontally altered with ***enlargement ratios that gradually increase toward both ends*** of the image data." (EX1006, [0052], [0061]-[0066].) It would have been obvious to a POSITA that the enlargement ratio corresponds to the "differences between the input and output positions." Since the enlargement ratio increases from the central area towards both ends, it would have been obvious to a POSITA that the enlargement ratio ("differences") of the ***central area*** is less than an ***edge area*** (Figure 6 below). (EX1002, ¶¶181-183.)

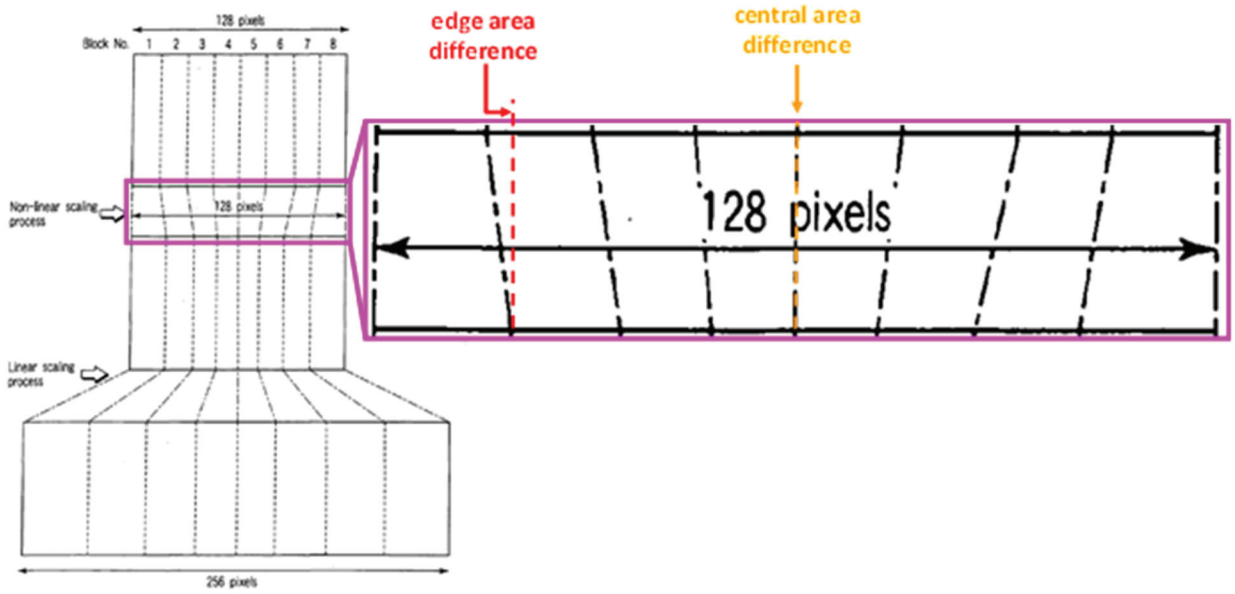


FIG. 6

Obara discloses the differences in the central area being less than the differences in the edge area. "The enlargement ratio of each of the ***blocks 3, 2 and 1***, which are positioned on the left side of the ***central blocks 4 and 5***, is greater than the enlargement ratio of each of the center blocks 4 and 5." (EX1006, [0066]; EX1002, ¶¶184-185.)

3. Claim 3

a. 3[a]: "The system of claim 2, wherein the transformation includes: a scaling function to uniformly stretch or compress the input image along the first axis; and"

Obara discloses "***enlarg[ing] 1.5 times*** in the horizontal direction and ***vertical direction by the linear scaling process***" (Figures 5 and 10 below). (EX1006, [0057]; Fig. 6, [0061], [0064].) A POSITA would have understood that

a linear scaling factor that does not equal 1 would uniformly stretch or compress. (EX1002, ¶¶186-188.)

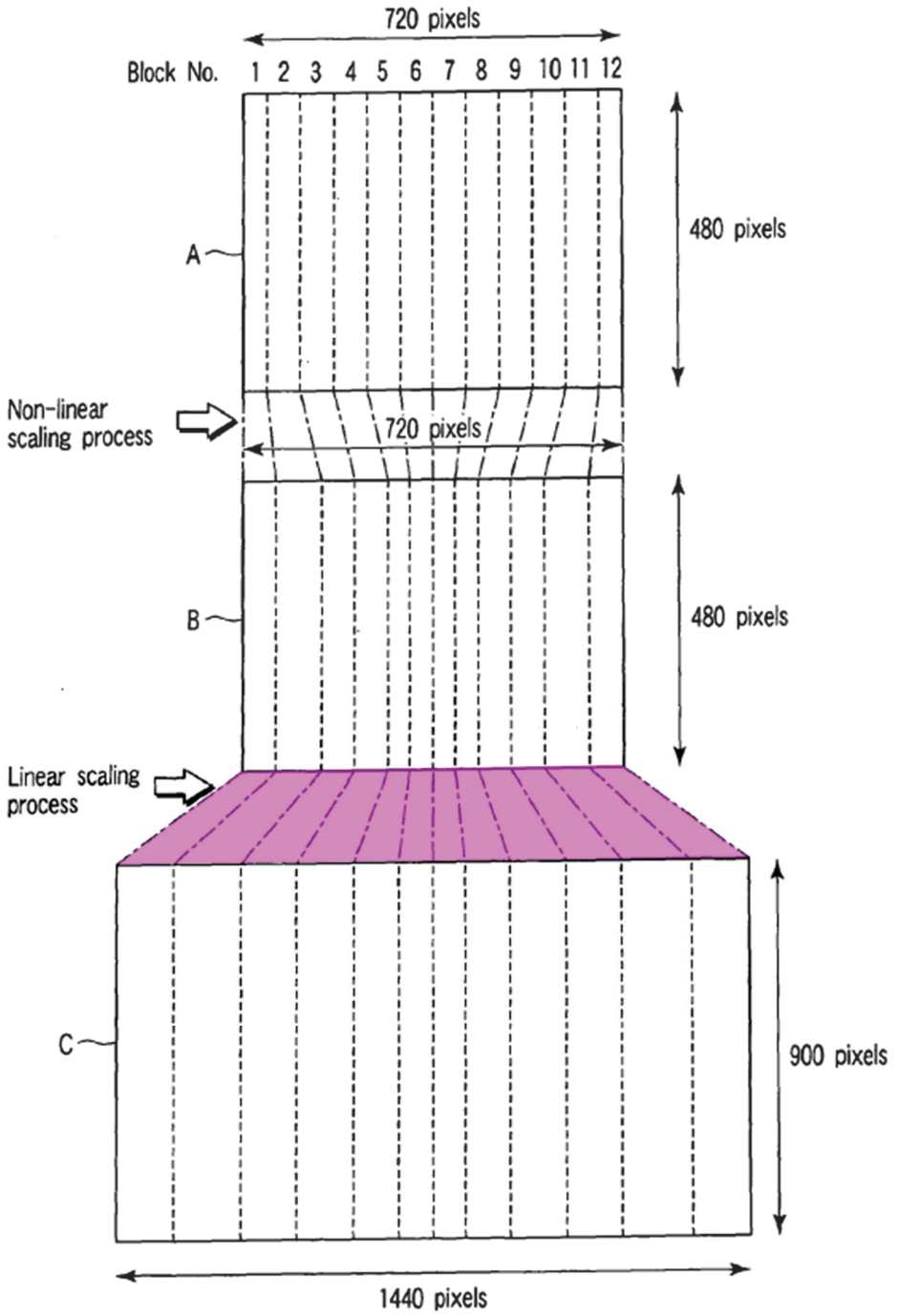


FIG. 5

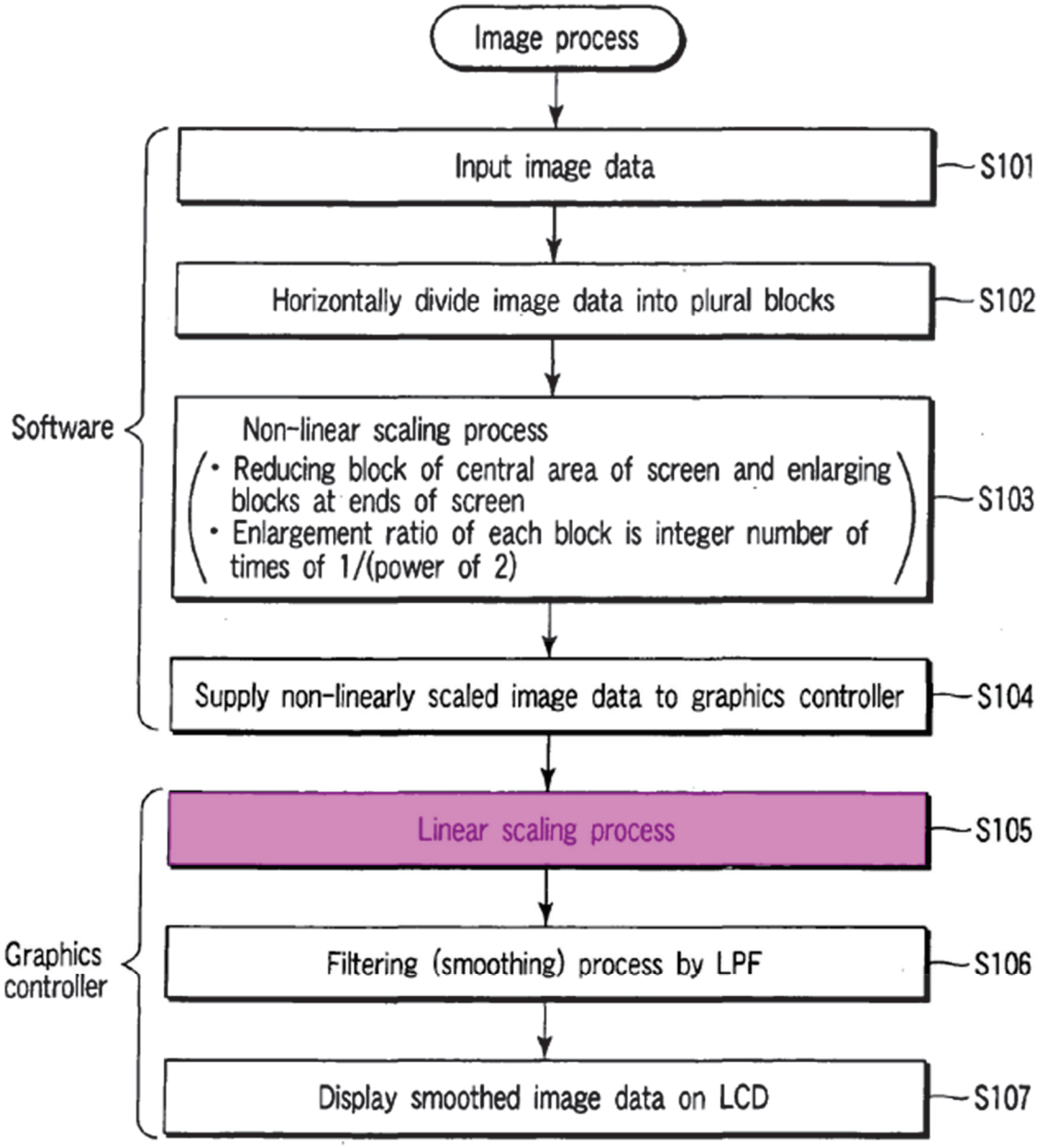


FIG. 10

b. 3[b]: "a warping function to non-uniformly warp the input image along the second axis."

Obara's original image data A is an "input image." (EX1006, [0053]; *see*

IV.C.2.c.)

"***[N]on-linear scaling module 215 horizontally reduces*** image blocks 6 and 7 which belong to the central area ***[of original image data A]***. Further, the ***non-linear scaling module 215 horizontally alters*** the sizes of the ***other image blocks*** with enlargement ratios." (EX1006, [0053]; Fig. 6, [0062]-[0064].) Figures 5 and 10 below show Obara's non-linear scaling process. (EX1002, ¶¶189-191.)

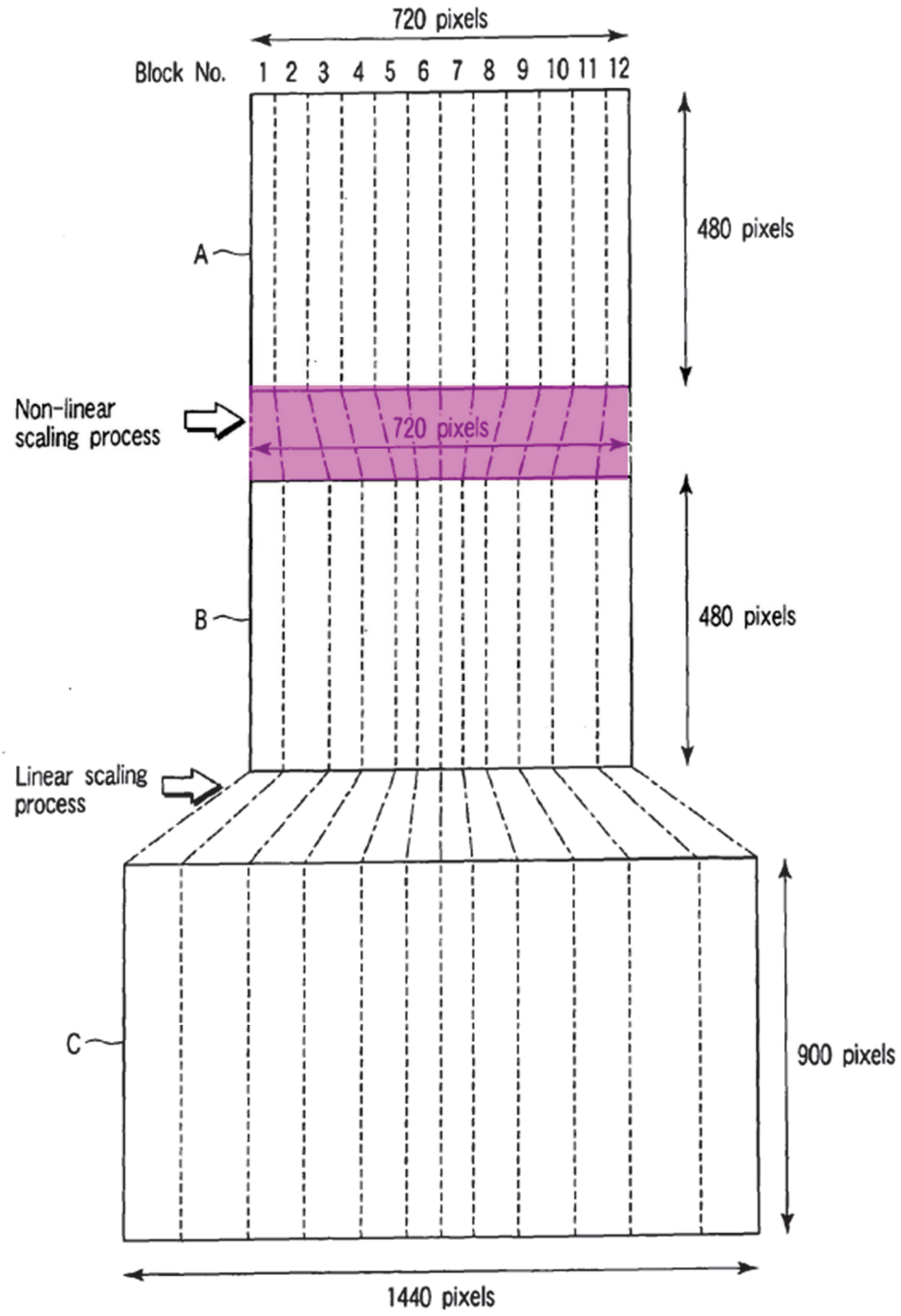

720 pixels
Block No. 1 2 3 4 5 6 7 8 9 10 11 12
A
480 pixels
Non-linear scaling process
720 pixels
B
480 pixels
Linear scaling process
C
900 pixels
1440 pixels

FIG. 5

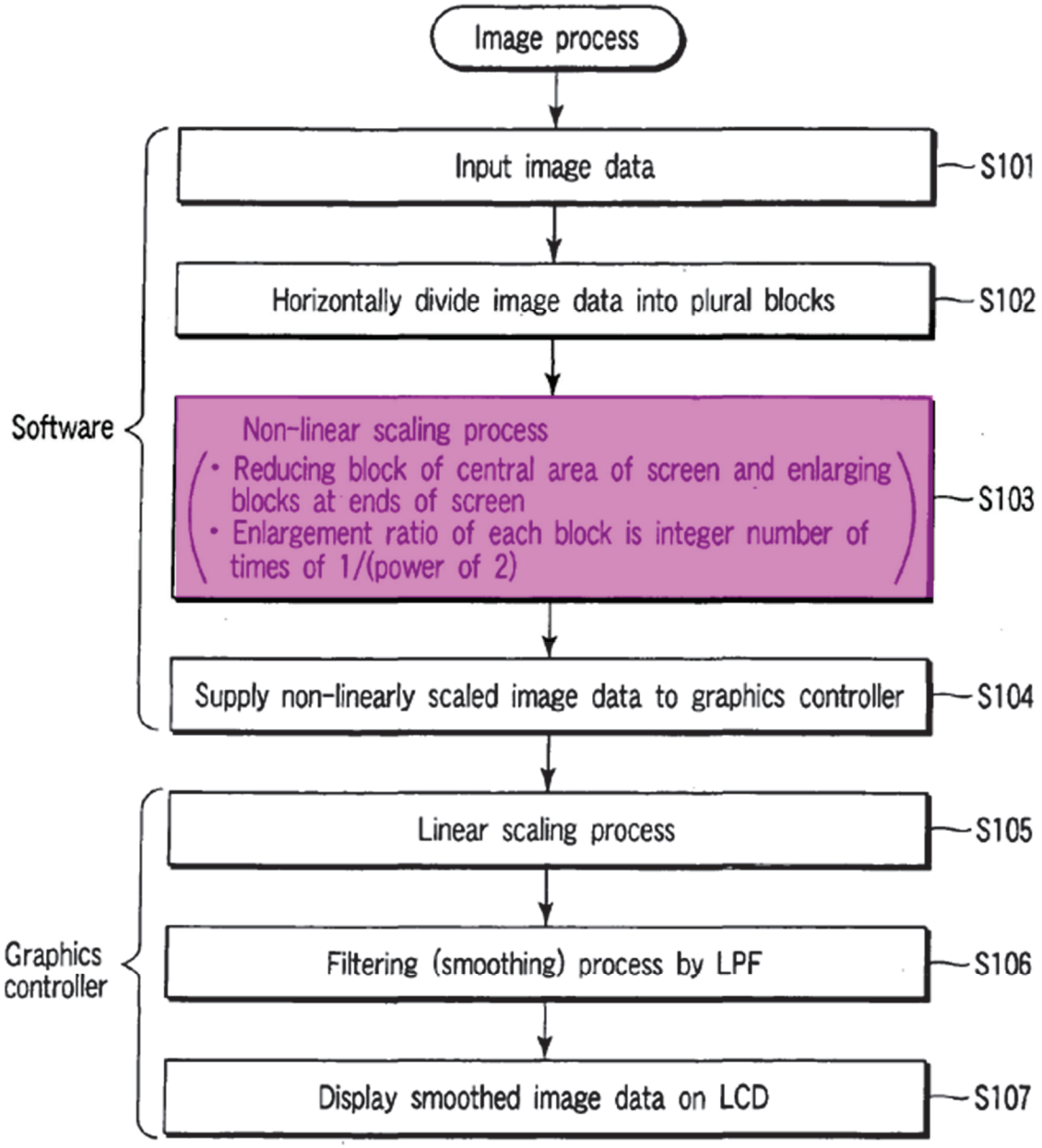


FIG. 10

Obara horizontally alters the central area of the original image data A (input image) differently than it horizontally alters the other image blocks, thereby non-uniformly warping along the second axis. (EX1002, ¶¶192-193.)

4. Claim 4: "The system of claim 3, wherein the scaling function and the warping function preserves the input positions of the subset of the pixels as the output positions of the subset of the pixels."

Obara discloses "[b]y the above process, image data with an aspect ratio of, e.g. 4:3 can be displayed on the entire wide screen of the LCD 17, which has an aspect ratio of, e.g. 16:9 or 16:10, ***without causing horizontal enlargement distortion of an image at the central area*** of the screen." (EX1006, [0049]; EX1002, ¶¶194-195.)

Obara's information processing apparatus performs a non-linear scaling process that horizontally reduces the central area, followed by a linear scaling process that horizontally enlarges the reduced central area. (*See* IV.C.2.e, IV.C.3.a.) It would have been obvious that the horizontal enlargement, after the horizontal reduction, would negate the compression/enlargement from the horizontal reduction, thereby not causing horizontal enlargement distortion of an image at the central area of the screen. (EX1002, ¶¶196-197.)

A POSITA would have been motivated to further prevent enlargement distortion of the image at the central area in the vertical direction. Obara provides a teaching/suggestion/motivation involving known techniques to improve similar and/or known methods/devices, thereby leading to the combination. Obara explains: "an image of motion video, which is displayed on a central part of the

screen, is important." (EX1006, [0008].) The central area is important because the image—the focus point of the viewer—is located in the central area. Obara explains: "the non-linear scaling is an effective technique for enlarging motion video," which a POSITA would have understood is because the non-linear scaling process does not distort the focus point in either the horizontal or the vertical direction. (EX1006, [0008].) Preventing distortion in both horizontal and vertical directions results in the output image data (C) preserving the input positions of the pixels in the central area as the output positions. (EX1002, ¶198.)

5. Claim 5: "The system of claim 3, wherein the scaling function changes the source aspect ratio to the target aspect ratio."

Obara's scaling function changes the input image having a first size (source aspect ratio) to the output image having a second size (target aspect ratio). (*See* IV.C.2.a, IV.C.3.a.) For example, "original image data (A) [has] e.g. 720×480 pixels." (EX1006, [0053].) And output "image data (C) [has] 1440×900 pixels." (EX1006, [0057]; EX1002, ¶199.)

6. Claim 6: "The system of claim 2, wherein the one or more physical processors are included within a camera."

Obara's image processing unit and CPU 111 are "one or more physical processors." (*See* IV.C.2.b.)

It would have been obvious for Obara's image processing unit and CPU 111 to be included within a camera. At the time of the invention in 2013, digital

cameras included processors for processing the image data captured by an image sensor. Digital cameras at this time included LCD displays (for viewing the captured image), some of which had a different aspect ratio than the captured image. Since the aspect ratio of the captured image was different than the aspect ratio of the LCD display included in the camera, it would have been obvious for the digital cameras to include data processing systems to transform the captured image into an output image (having the aspect ratio of the LCD display) to be presented on the display of the camera. A POSITA would have been motivated to have on-camera processing and display capabilities because it would have been less burdensome, cheaper, and saves time. (EX1002, ¶¶200-202.)

Digital cameras in 2013 captured images and videos whose output image had a 16:9 aspect ratio. Obara's process is suitable for outputting "an aspect ratio of, e.g. 16:9 or 16:10, without causing horizontal enlargement distortion of an image at the central area of the screen." (EX1006, [0049].) It would have been obvious to a POSITA to use Obara's 16:9 output aspect ratio in a digital camera (whose output image has a 16:9 aspect ratio). (EX1002, ¶202.)

7. Claim 7: "The system of claim 6, wherein the output image is presented on a display of the camera."

Figures 2 and 10 below show and Obara discloses "display[ing] the generated output image data on a ***display device***." (EX1006, [0023], [0025],

[0084].) It would have been obvious for Obara's output image to be presented on a display of the camera. (*See* IV.C.7; EX1002, ¶¶203-205.)

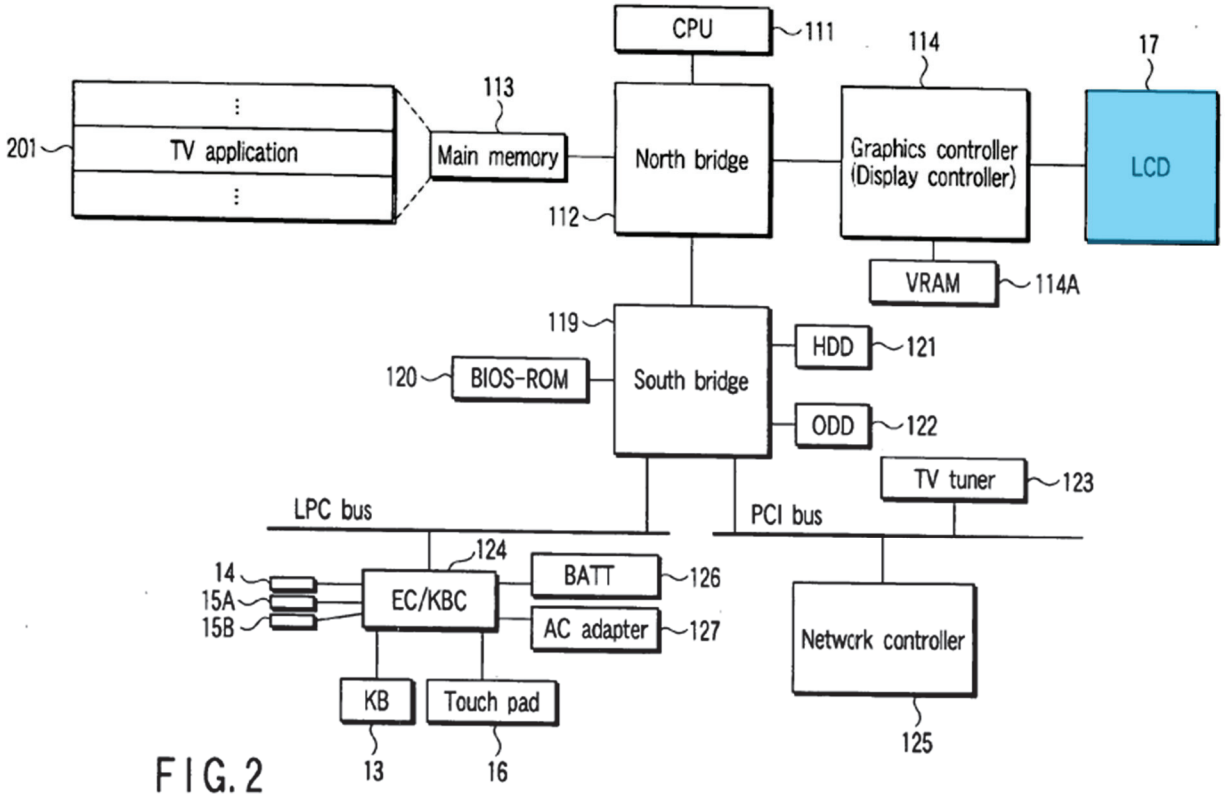


FIG. 2

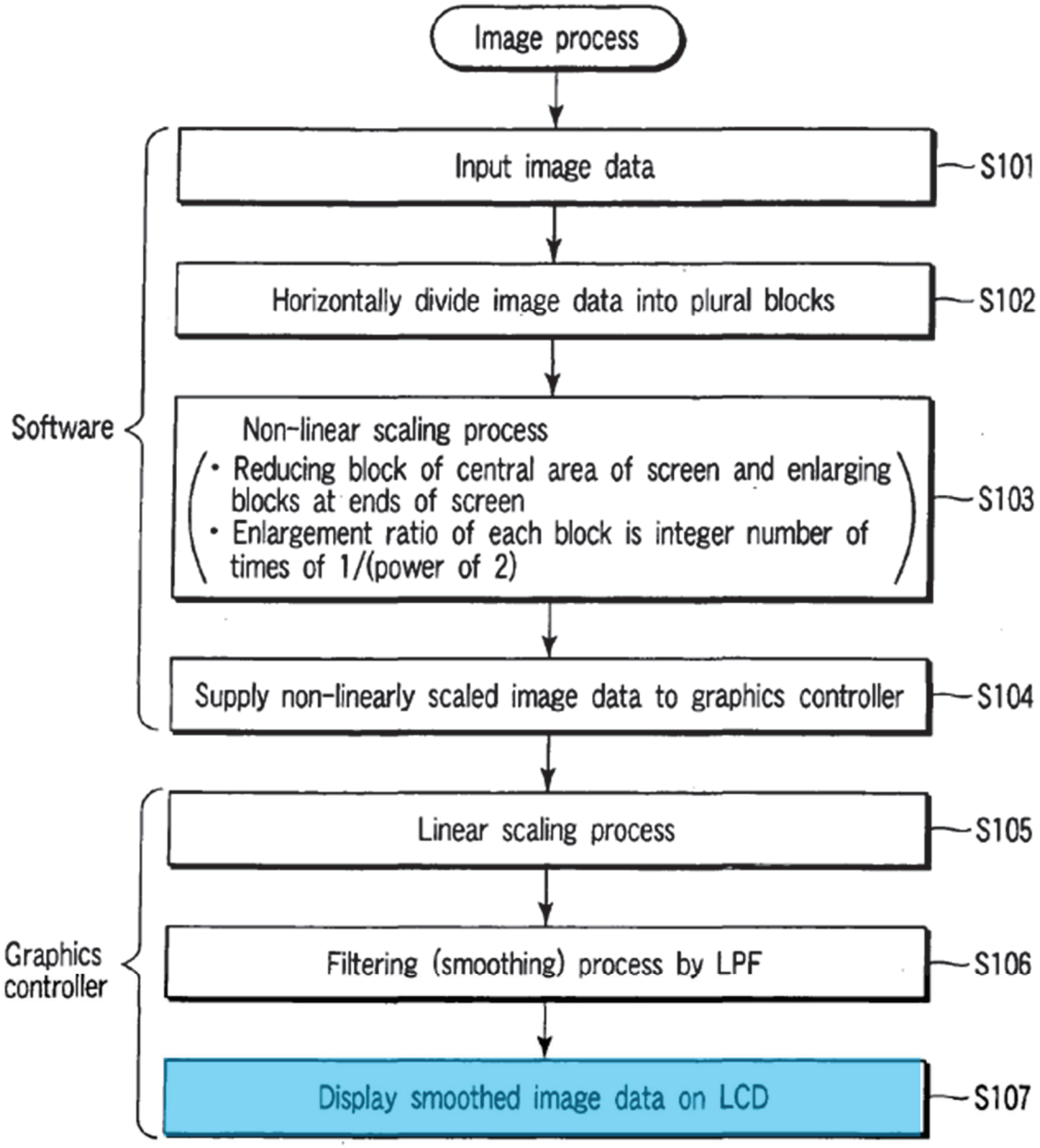


FIG. 10

8. Claim 8: "The system of claim 2, wherein the portion corresponds to a center portion of the input image."

Obara's blocks 6 and 7 of original image data (A) of Figure 5 is a "portion"

"which belong[s] to the central area." (*See* IV.C.2.d; EX1006, [0053], [0062].) Blocks 3-6 of Figure 6 are a "portion" "which belong[s] to the central area." (*See* IV.C.2.d; EX1006, [0062]; EX1002, ¶206.)

9. Claim 9: "The system of claim 2, wherein the portion corresponds to a non-center portion of the input image."

Liu discloses claim 9. (*See* IV.B.3.)

It would have been obvious to combine Obara and Liu. Liu discloses "[w]hen an image is scaled through a horizontal nonlinear scaling algorithm, if the main objects in image are in the middle of the image, the main object area is little distorted after the scaling, and the visual effect is good." (EX1005, 1:55-59.) In other words, horizontal non-scaling processes that preserve the center area have good results when the main object is located in the center area. Obara is one example horizontal non-linear scaling process. Obara states that "an image of motion video, which is displayed on a central part of the screen, is important." (EX1006, [0008].) A POSITA would have understood Obara as suggesting that it important to consider the location of the main object in a motion video when performing a scaling process. And a POSITA would have understood that there are situations where a main object of the motion video is not displayed on a central part of the screen; Obara provides a teaching, suggestion, or motivation for these situations. In Liu's Figures 6a and 6b (below) example, the ***circle*** is a main object

located in the lower part of the target image. "The comparison between FIG. 6a and FIG. 6b shows that in the scaled image, the ***main objects are scarcely distorted*** in the middle part and the ***lower part***, to which the human eyes are sensitive, and that the trivial objects in the upper part are distorted greatly." (EX1005, 8:20-24; EX1002, ¶¶207-208.)

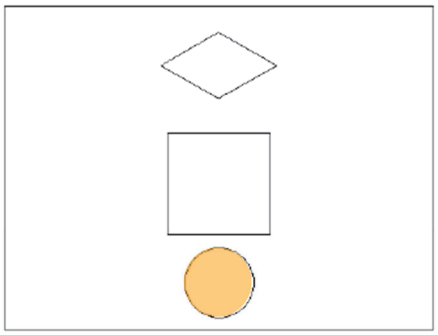


FIG. 6a

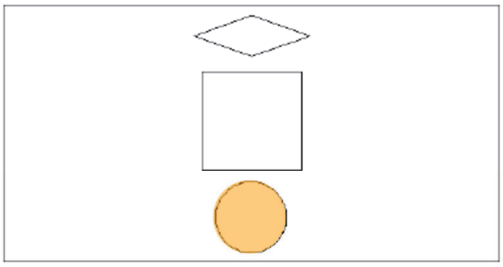


FIG. 6b

A POSITA would have been motivated to apply the teachings of Liu (known technique) when the main object is not located in the central part of the screen, in order to achieve an improvement, *e.g.*, good image quality. (EX1005, 1:59-62; EX1002, ¶209.)

10. Claim 10: "The system of claim 2, wherein the transformation non-uniformly shifts the pixels from the input positions to the output positions further based on distances between the input positions and the portion."

Obara's central area is the "portion." (*See* IV.C.2.d.)

"[C]entral area of the original image data (A) is horizontally reduced while

the size of the original image data (A) is ***horizontally altered with enlargement ratios that gradually increase toward both ends*** of the image data." (EX1006, [0052], Fig. 5.) A POSITA would have understood that, as approaching the "ends" of the image data to the central area, the distances between the input positions and the central area gets larger. (EX1002, ¶¶210-212.)

Figure 6 below shows this gradual increase in enlargement ratios (shifts from the input to output positions). The ***central area shift*** from the input to output positions is small (little to no shift). The shift increases towards the ends (edges), where the ***edge area shift (in the direction of red arrow)*** from the input position (left side of red arrow) to the output position (right side of red arrow) is large. (EX1006, Fig. 6; EX1002, ¶213.)

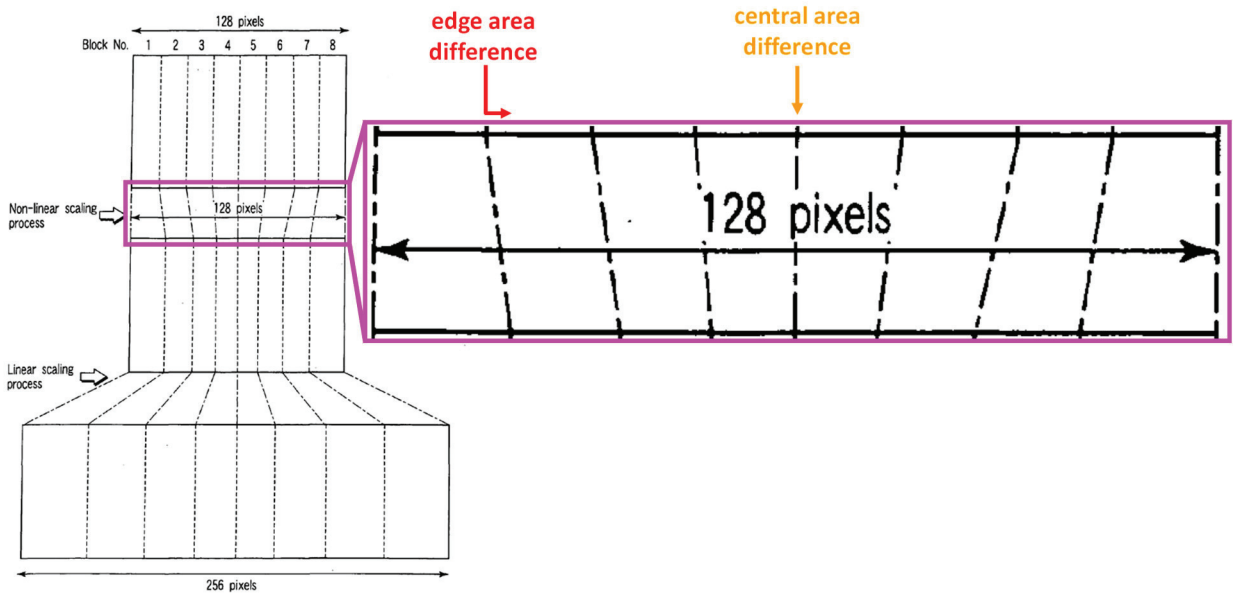


FIG. 6

11. Claim 11: "The system of claim 2, wherein the one or more physical processors are further configured by machine-readable instructions to determine the portion based on a location of an object within the input image such that the portion includes the object."

Liu teaches claim 11. (*See* IV.B.2.)

It would have been obvious to combine Obara and Liu. (*See* IV.C.9; EX1002, ¶214.)

12. Claim 12: "The system of claim 2, wherein the input image includes a video frame of a video."

Obara's original image data A is a 720×480 pixels "input image." (*See* IV.C.2.c.) The "[i]mage data (720×480 pixels) . . . is written in the ***video*** memory 114A." (EX1006, [0037].) Obara refers to the "image data" as "motion video data," which means it includes a video frame of a video. (EX1006, [0008], [0034]; EX1002, ¶215.)

13. Claim 1

a. Preamble: "An image capture apparatus, comprising:"

It would have been obvious for Obara's data processing system to be included within a digital camera (image capture apparatus). (*See* IV.C.6; EX1002, ¶216.)

b. 1[a]: "an image sensor configured to capture an input image having a source aspect ratio, the input image including pixels located at input positions defined

along a first axis and a second axis, the first axis perpendicular to the second axis;"

Element 1[a] recites limitations similar to element 2[b], except it requires "an image sensor [be] configured to capture" the input image. It would have been obvious for Obara's information processing apparatus to be a digital camera. (*See* IV.C.6.) Digital cameras comprise an image sensor configured to capture an input image. (EX1002, ¶¶217-218.)

c. 1[b]: "a display coupled to one or more physical processors; and"

It would have been obvious for Obara's information processing apparatus to be a digital camera, which includes a display and physical processor(s). (*See* IV.C.6, IV.C.7.) The information processing apparatus transforms the captured image into an output image, where it would have been obvious for the output image to be presented on the display of the camera. (*See* IV.C.6, IV.C.7.) Hence, it would have been obvious that the display is coupled to the physical processor(s). (EX1002, ¶219.)

d. Elements 1[c]-1[i]

Elements 1[c]-1[h] mirror elements 2[a]-2[f], respectively.

Element 1[i] recites a limitation similar to a portion of claim 7. (EX1002, ¶¶220-226.)

14. Claim 13

a. 13[pre]: "A method for converting between aspect ratios, the method performed by a computing system including one or more physical processors, the method comprising:"

Element 13[pre] is similar to elements 2[pre] and 2[a], except it requires the system be a "computing system." (EX1002, ¶227.)

Obara discloses "information processing apparatus such as a personal computer, and an image processing method for use in the apparatus." (EX1006, [0003]; EX1002, ¶228.)

b. 13[a]: "obtaining, by the computing system, an input image, the input image having a source aspect ratio, the input image including pixels located at input positions defined along a first axis and a second axis, the first axis perpendicular to the second axis;"

Element 13[a] is similar to element 2[b], except it requires the "obtaining" be performed "by the computing system," which Obara discloses. (*See* IV.C.14.a; EX1002, ¶¶229-230.)

c. 13[b]: "determining a portion within the input image, the portion including a subset of the pixels; and"

Element 13[b] mirrors element 2[c]. (EX1002, ¶231.)

d. 13[c]: "applying, by the computing system, a transformation to the input image to generate an output image, the output image having a target aspect ratio different than the source aspect ratio, the output image including the pixels located at output positions defined along the first axis and the second axis,"

Element 13[c] is similar to element 2[d], except it requires the "applying" be

performed "by the computing system," which Obara discloses. (*See* IV.C.14.a; EX1002, ¶¶232-233.)

e. Elements 13[d], 13[e]

Elements 13[d] and 13[e] mirror elements 2[e] and 2[f], respectively. (EX1002, ¶¶234-235.)

15. Claims 14-18

Claims 14-18 mirror claims 3, 4, and 8-10, respectively. (EX1002, ¶¶236-240.)

16. Claim 19: "The method of claim 13, further comprising determining the portion based on a location of an object within the input image such that the portion includes the object."

Claim 19 mirrors a subset of claim 11. (EX1002, ¶241.)

17. Claim 20

Claim 20 mirrors claim 12. (EX1002, ¶242.)

D. Ground 4: Meulen-Chao Renders Obvious Claims 1-20

1. Summary of Meulen

Meulen was filed on June 5, 2006, published on December 20, 2007, and issued on April 6, 2010, qualifying as prior art at least under §§ 102(a)(1), 102(a)(2). The Examiner never found, and Applicant never cited, Meulen during prosecution.

Meulen's wireless device (Figure 1 (below)) applies image compression

and/or scaling to media content having an aspect ratio and/or resolution that is different from the aspect ratio and/or resolution of the ***display***. (EX1007, Abstract, 1:55-58; EX1002, ¶¶243-244.)

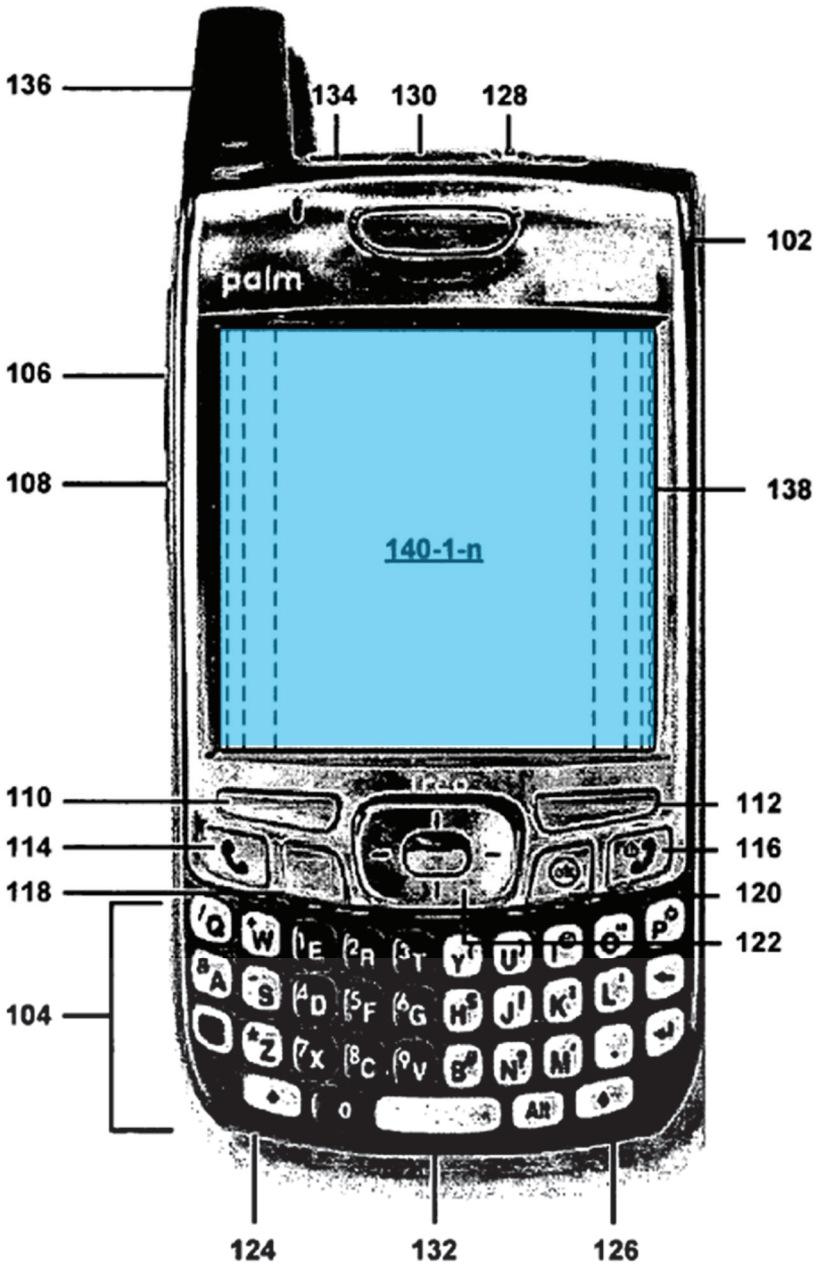


FIG. 1

Meulen applies different amounts of compression/scaling to the display image, such as ***no compression/scaling in the central region 140-3*** (Table 1 below), and ***more compression/scaling in the lateral regions 140-1, 140-2, 140-4, and 140-5***. (EX1007, 6:4-37.)

TABLE 1

	Region					
	1	2	3	4	5	Total
Pixels/Region	10	50	200	50	10	320
Compression Ratio	4:1	2:1	none	2:1	4:1	
Source Pixels	40	100	200	100	40	480

2. Summary of Chao

Chao was filed on October 23, 2006, and published on April 24, 2008, qualifying as prior art at least under §§ 102(a)(1), 102(a)(2). The Examiner never found, and Applicant never cited Chao during prosecution.

Chao discloses resizing an original image by "separating the foreground elements from the background elements." (EX1008, Abstract.) Chao "create[s] resized foreground elements by scaling the foreground elements while maintaining the original aspect ratio. The method further comprises creating resized background elements by stretching or shrinking the background elements to fit the

dimensions of the resized image." (EX1008, Abstract; EX1002, ¶245.)

Figure 14 below shows, "***page 30h"*** is taller than ***page 30h***, but the same width." (EX1008, [0091].) As shown, the ***ducks*** on ***page 30h" are the same size*** as the ***ducks*** on ***page 30h***. (EX1002, ¶246.)

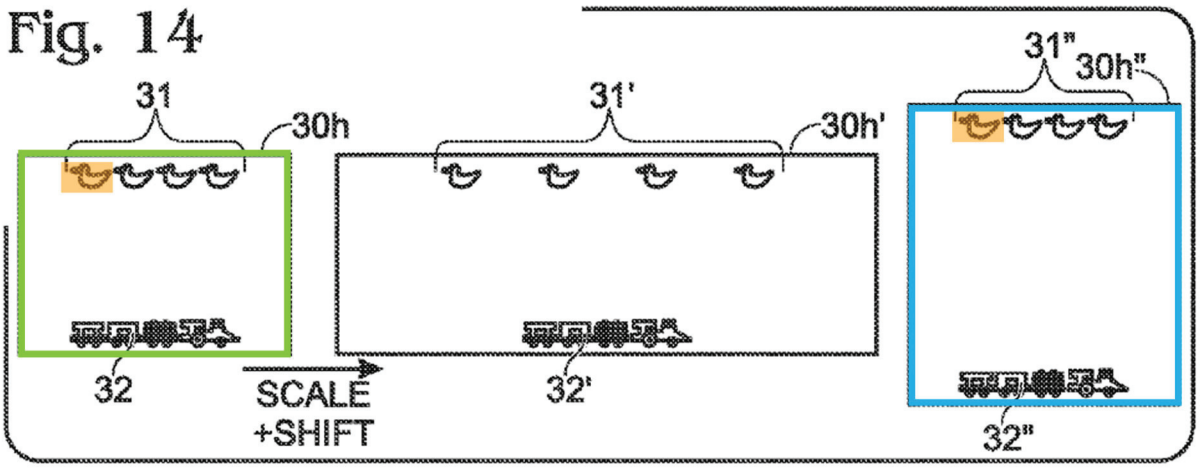
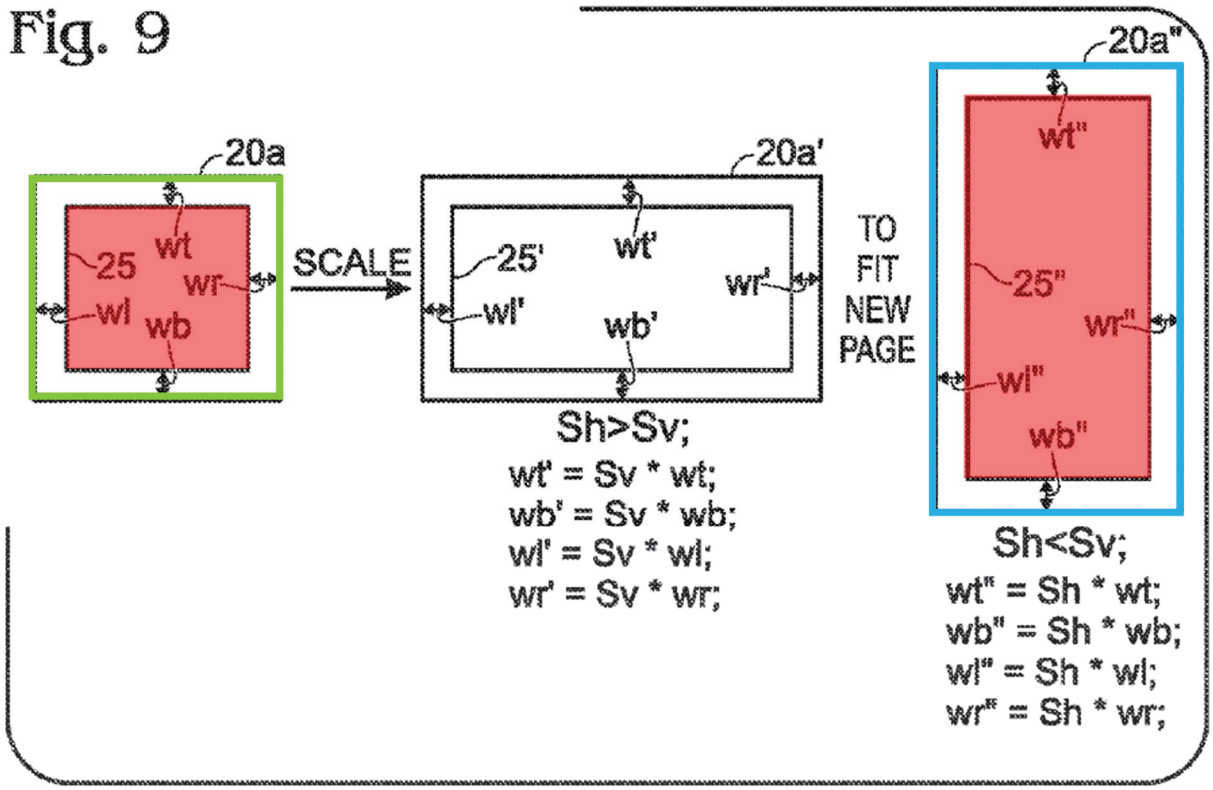


Figure 9 below shows "***page 20a" [(output image)]*** is taller than ***page 20a [(input image)]***, but the same width. Accordingly area ***element 25"*** has been scaled to be taller than ***element 25***, but, again, is ***centered*** within page 20a"." (EX1008, [0075]; EX1002, ¶247.)



3. Claim 2

a. Preamble: "A system that converts between aspect ratios, the system comprising:"

To the extent the preamble is limiting (Petitioner does not concede), Meulen discloses the preamble.

Meulen's wireless device 100 (Figure 1 below) applies "image compression and/or scaling . . . to media content having ***an aspect ratio and/or resolution that is different from the aspect ratio and/or resolution*** of the ***display***." (EX1007, 1:55-58; EX1002, ¶248.)

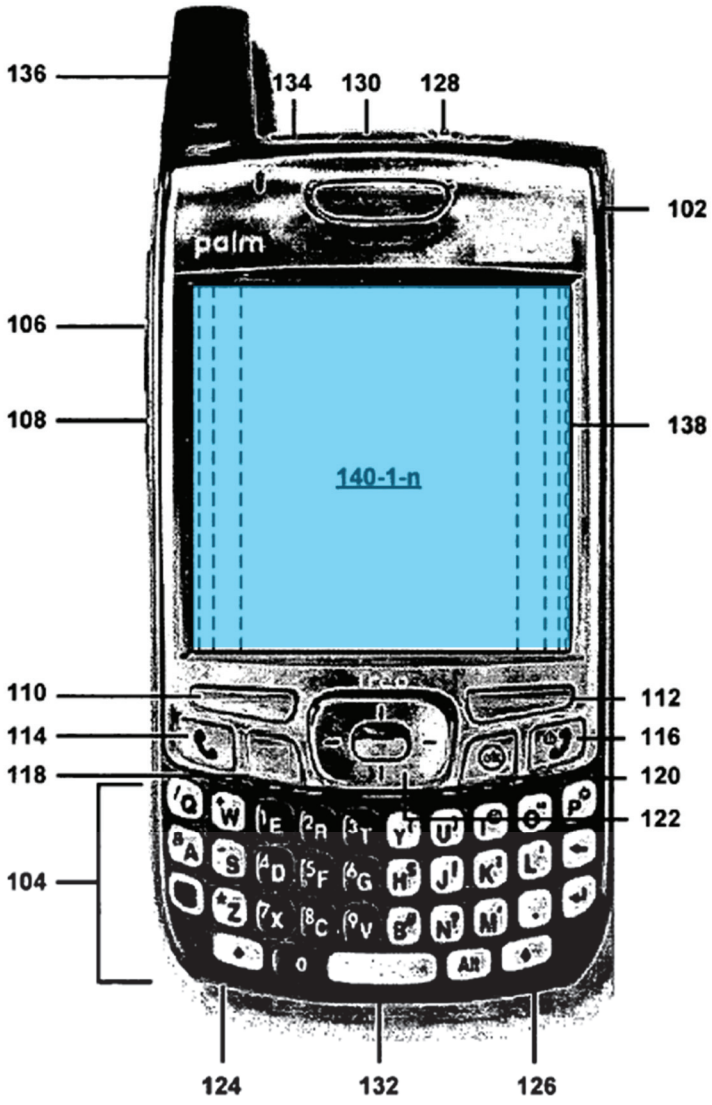


FIG. 1

b. 2[a]: "one or more physical processors configured by machine-readable instructions to:"

Meulen's "image compression and/or scaling may be applied to the media source content using various physical or logical elements implemented as hardware, software, or any combination thereof." (EX1007, 4:50-53.) "[T]he wireless device 100 may comprise display control hardware implemented by ***one***

or more processors, controllers, encoder devices, . . ." (EX1007, 4:55-60; EX1002, ¶249.)

Meulen's "wireless device 100 may comprise display control software implemented by ***one or more applications, drivers, programs, modules, subroutines, instruction sets, instructions, computing codes, or combination thereof***." (EX1007, 4:62-66; EX1002, ¶250.)

c. 2[b]: "obtain an input image, the input image having a source aspect ratio, the input image including pixels located at input positions defined along a first axis and a second axis, the first axis perpendicular to the second axis;"

Meulen's "media source content [is] received by the wireless device 100." (EX1007, 3:26-27.) The "media source content may have an aspect ratio of 3:2 with a resolution of 480×320," or "an aspect ratio of 2:1 with a resolution of 640×320." (EX1007, 4:16-21; EX1002, ¶251.)

Meulen explains: the "resolution or aspect ratio of a display screen generally refers to the number of pixels that can be displayed, typically expressed as a product of the number of columns and the number of rows." (EX1007, 1:13-16.) It would have been obvious that the media source content being transformed into an image for display would have pixels located at input positions defined along columns and rows. (EX1007, 1:55-58.) A POSITA would have understood that columns are perpendicular to rows. (EX1002, ¶251.)

d. 2[c]: "determine a portion within the input image, the portion including a subset of the pixels; and"

Meulen's media source content is an "input image." (*See* IV.D.3.c.)

"[C]entral display region 140-3 may comprise 200 pixels and require the media source content to undergo no image compression (e.g., 200 source pixels to 200 display pixels)." (EX1007, 6:27-31.) A POSITA would have understood that the central region within the media source content has a corresponding central display region, which includes a subset of the source pixels. (EX1002, ¶¶252-253.)

e. 2[d]: "apply a transformation to the input image to generate an output image, the output image having a target aspect ratio different than the source aspect ratio, the output image including the pixels located at output positions defined along the first axis and the second axis,"

Meulen's media source content is an "input image" having a source aspect ratio (*e.g.*, "3:2 with a resolution of 480×320," or "2:1 with a resolution of 640×320."). (EX1007, 4:16-21; *see* IV.D.3.c.)

"[I]mage compression and/or scaling may be applied to media content having an aspect ratio and/or resolution that is different from the aspect ratio and/or resolution of the display." (EX1007, 1:55-58.) The "wireless device 100 may be arranged to process a line of source pixels to generate a compressed and/or scaled line of display pixels" (Figure 2 below). (EX1007, 5:5-7; EX1002,

¶¶254-255.)

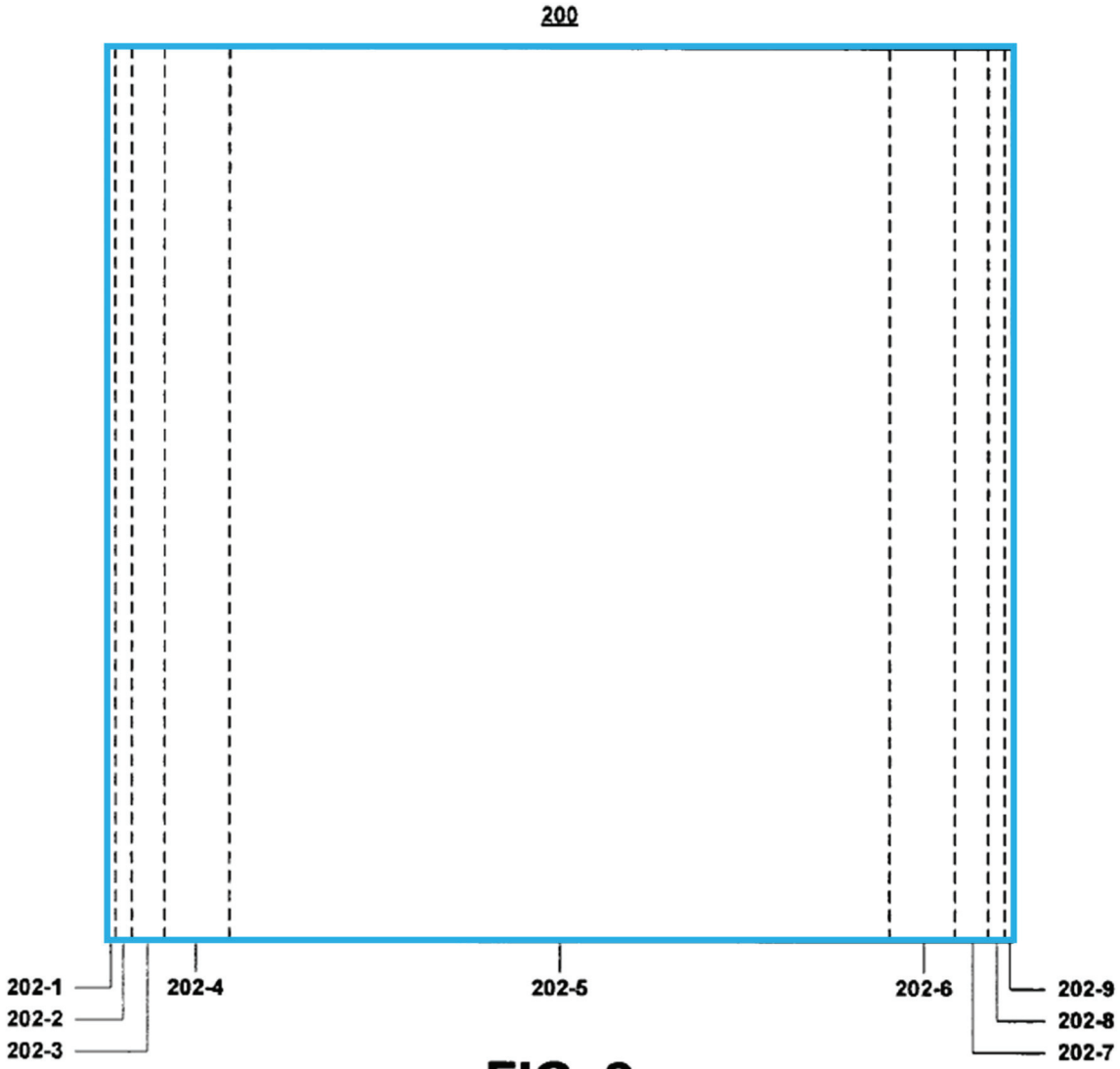


FIG. 2

The "display may have an aspect ratio of 1:1 with a resolution of 320×320," or "an aspect ratio of 3:2 with a resolution of 480×320." (EX1007, 4:16-22; EX1002, ¶256.)

Table 1 below shows "central display region 140-3 may comprise 200 pixels and require the media source content to undergo ***no image compression*** (e.g., 200

source pixels to 200 display pixels). The lateral display regions 140-1 and 140-5 each may [undergo] . . . a ***4:1 image compression ratio***. . . . The lateral display regions 140-2 and 140-4 each may [undergo] . . . a ***2:1 image compression ratio***." (EX1007, 6:27-37, Tables 2-4.) Hence, Meulen applies a transformation to the media source content to generate the display image. (EX1002, ¶¶257-258.)

TABLE 1

	Region					
	1	2	3	4	5	Total
Pixels/Region	10	50	200	50	10	320
Compression Ratio	4:1	2:1	none	2:1	4:1	
Source Pixels	40	100	200	100	40	480

Meulen explains: the "resolution or aspect ratio of a display screen generally refers to the number of pixels that can be displayed, typically expressed as a product of the number of columns and the number of rows." (EX1007, 1:13-16.) The display image includes pixels located at output positions defined along columns and rows. (EX1007, 1:55-58; EX1002, ¶259.)

f. 2[e]: "wherein: the transformation non-uniformly shifts the pixels from the input positions to the output positions based on (1) the input positions along the first axis, and (2) the input positions along the second axis; and"

Meulen's media source content is an "input image" with input positions, and display image is an "output image" with output positions. (*See* IV.D.3.c, IV.D.3.e.)

Non-uniform "image compression and/or scaling may be applied to media content." (EX1007, 1:55-56; *see* IV.D.3.e.) Compression/scaling "may be applied in a horizontal direction and/or a in a vertical direction" to "create a magnified effect." (EX1007, 10:19-26.) It would have been obvious that when performing image scaling, pixels from the input to output positions are shifted based on a scaling factor. A POSITA would have known about shifting pixel positions in order to scale the image by scaling factor(s) at the time of the '413 invention. (EX1002, ¶¶260-262.)

Meulen mentions scaling, but does not disclose the details of how to perform scaling. To the extent that Meulen does not teach shifting pixel positions, it would have been obvious. Hence, a POSITA would have been motivated to turn to a prior art reference that discloses the details of scaling (known technique). (EX1002, ¶262.)

Chao discloses non-uniform scaling that scales the foreground and background elements differently. "[T]he [foreground] element is re-sized to fit the new page size, while maintaining the original aspect ratio of the element." (EX1008, [0030].) "[T]he background element is re-sized, by stretching or

shrinking, as necessary, to fit the new page size." (EX1008, [0028].) Chao explains: "the terms 'stretch' and 'shrink' are intended to mean the resizing of an element without regard to the original aspect ratio of the image. Accordingly, a 'stretched' element may be elongated in only one direction, i.e. may be resized such that it is wider than the original element in the horizontal direction." (EX1008, [0063].) A POSITA would understand that stretching/shrinking means shifting the pixels' positions. (EX1002, ¶263.)

A POSITA would have understood that Meulen's rows are along a horizontal direction. Meulen-Chao involves combining prior art elements and known techniques, resulting in shifting the pixels based on input positions along the horizontal axis. (EX1002, ¶263.)

Meulen discloses "scaling, i.e. enlargement in the vertical direction." A POSITA would have understood that Meulen's columns are along a vertical direction. The combination teaches shifting the pixels based on input positions along the vertical axis. As the prior art shows, there would have been a reasonable expectation of success. (EX1002, ¶264.)

g. 2[f]: "the transformation non-uniformly shifts the pixels such that differences between the input positions and the output positions of the subset of the pixels within the portion are less than differences between the input positions and the output positions of others of the pixels."

Source pixels in the central region within the media source content include a "subset of the pixels within the portion." (*See* IV.D.3.d.)

Table 1 below shows, and Meulen discloses "the ***central display region 140-3*** may comprise 200 pixels and require the media source content to undergo ***no image compression*** (e.g., 200 source pixels to 200 display pixels). The ***lateral display regions 140-1 and 140-5*** each may [undergo] . . . a ***4:1 image compression ratio***. . . . The ***lateral display regions 140-2 and 140-4*** each may [undergo] . . . a ***2:1 image compression ratio***." (EX1007, 6:27-37, Tables 2-4; EX1002, ¶¶265-269.)

TABLE 1

	Region					
	1	2	3	4	5	Total
Pixels/Region	10	50	200	50	10	320
Compression Ratio	4:1	2:1	none	2:1	4:1	
Source Pixels	40	100	200	100	40	480

Meulen discloses the "differences" relationship, specifically for compression. The compression factor is the lowest in the ***central region***, and is higher (progressively increases) in the lateral regions. (EX1007, 10:32-36, Fig. 4A; EX1002, ¶270.)

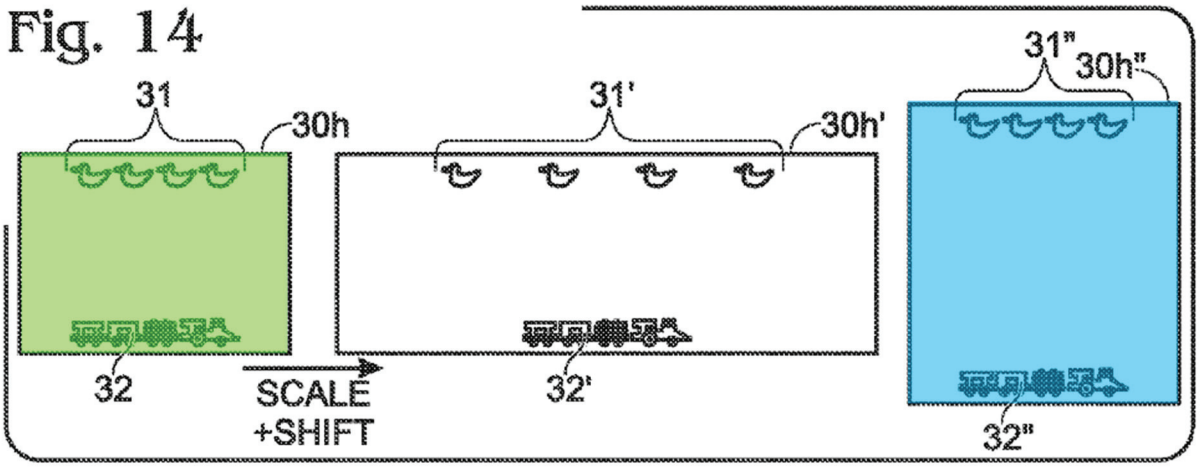
It would have been obvious that when scaling an image, applying scaling factor(s), such as disclosed in Chao, results in pixels that shift according to the "differences between the input and output positions" of element 2[f]. As taught by Meulen, the combination leads to the amount of re-sizing at the central region (no scaling or zero scaling factor) being less than at lateral regions (2:1 or 4:1). It would have been obvious to a POSITA that the "differences" of the ***central region*** is less than the ***lateral region***. (EX1002, ¶271.)

4. Claim 3

a. 3[a]: "The system of claim 2, wherein the transformation includes: a scaling function to uniformly stretch or compress the input image along the first axis; and"

Meulen's "image compression and/or scaling may be applied in a horizontal direction and/or in a vertical direction" to "create a magnified effect." (EX1007, 10:19-26; EX1002, ¶272.)

Chao discloses applying a "uniform scaling factor." (EX1008, [0090].) Figure 14 below shows "***page 30h"*** is taller than ***page 30h***, but the same width. Accordingly, the scaling factor is [] 1, which reflects the horizontal scaling factor." Figure 14 below shows the transformation lengthening to page 30h." Since the transformation involves lengthening to page 30h", a POSITA would have understood that a scaling factor greater than 1 is applied to uniformly stretch the image along the vertical direction. (EX1002, ¶273.)



It would have been obvious to combine Meulen and Chao. (*See* IV.D.3.g; EX1002, ¶274.)

b. 3[b]: "a warping function to non-uniformly warp the input image along the second axis."

Meulen discloses non-uniformly scaling the media source content (input image) along the horizontal axis. (*See* IV.D.3.g.) Chao discloses non-uniformly scaling by scaling the foreground and background elements differently, *e.g.*, non-uniformly scaling along the horizontal direction. (*See* IV.D.3.g; EX1008, [0028], [0030].) Hence, the combination discloses a "warping function." (EX1002, ¶¶275-277.)

5. Claim 4: "The system of claim 3, wherein the scaling function and the warping function preserves the input positions of the subset of the pixels as the output positions of the subset of the pixels."

Meulen's source pixels in the central region within the media source content

include a "subset of the pixels within the portion." (*See* IV.D.3.d.)

Table 1 below shows, and Meulen discloses "the ***central display region 140-3*** may comprise 200 pixels and require the media source content to undergo ***no image compression*** (e.g., 200 source pixels to 200 display pixels)." (EX1007, 6:27-37, Tables 2-4.) A POSITA would have understood that no image compression means the input positions are preserved as the output positions. (EX1002, ¶¶278-282.)

TABLE 1

	Region					
	1	2	3	4	5	Total
Pixels/Region	10	50	200	50	10	320
Compression Ratio	4:1	2:1	none	2:1	4:1	
Source Pixels	40	100	200	100	40	480

Chao discloses "the [foreground] element is re-sized to fit the new page size, while maintaining the original aspect ratio of the element." (EX1008, [0030].) It would have been obvious to a POSITA that the original aspect ratio may be maintained by preserving input positions as output positions. (EX1002, ¶283.)

It would have been obvious to combine Meulen and Chao. (*See* IV.D.3.g; EX1002, ¶284.)

6. Claim 5: "The system of claim 3, wherein the scaling function changes the source aspect ratio to the target aspect ratio."

Meulen's scaling function changes the aspect ratio of the media source content to the aspect ratio of the display. (*See* IV.D.3.a, IV.D.4.a.) For example, the media source content has an aspect ratio of 3:2 with a resolution of 480×320, or an aspect ratio of 2:1 with a resolution of 640×320. (EX1007, 4:16-21.) The display has an aspect ratio of 1:1 with a resolution of 320×320, or an aspect ratio of 3:2 with a resolution of 480×320. (EX1007, 4:16-22; EX1002, ¶¶285-286.)

Chao discloses "[t]he new image size may be bigger or smaller than the original image in one or more directions. Accordingly, ***the new image . . . may not retain the aspect ratio of the original image***." (EX1008, [0024]; EX1002, ¶287.)

It would have been obvious to combine Meulen and Chao. (*See* IV.D.3.g; EX1002, ¶288.)

7. Claim 6: "The system of claim 2, wherein the one or more physical processors are included within a camera."

Meulen's wireless device 100 includes "one or more processors [or] controllers" and "may comprise . . . a camera." (EX1007, 4:55-60, 3:29-31, 12:62-13:1; *see* IV.D.3.b; EX1002, ¶¶289-290.)

Chao discloses "[t]he image may be output by displaying the image on or as part of: a display screen such as a . . . . camera screen." (EX1008, [0032]; EX1002, ¶291.)

It would have been obvious to combine Meulen and Chao. (*See* IV.D.3.g; EX1002, ¶292.)

8. Claim 7: "The system of claim 6, wherein the output image is presented on a display of the camera."

Meulen's "wireless device may include a display." (EX1007, Abstract.) Meulen discloses "improv[ing] the performance of a wireless device to display content from a media source." (EX1007, 1:44-46.) "[W]ireless device 100 may comprise . . . a camera." (EX1007, 3:29-31, 12:62-13:1; EX1002, ¶293.)

Chao discloses the output image is presented on a display of the camera. (*See* IV.D.7; EX1002, ¶¶294-295.)

9. Claim 8: "The system of claim 2, wherein the portion corresponds to a center portion of the input image."

The central region within Meulen's media source content is a "portion of the input image" and corresponds to the central display region 140-3. (*See* IV.D.3.d; EX1002, ¶296.)

10. Claim 9: "The system of claim 2, wherein the portion corresponds to a non-center portion of the input image."

Meulen's "image compression and/or scaling may be applied to the left lateral display regions 202-1-5 and the right lateral display regions 202-9-6 asymmetrically." (EX1007, 9:1-3.) The "center of linearity and/or center of compression for the panoramic display 200 may be shifted to the left and/or to the right . . . to provide a shifted or magnified effect. . . . [F]or example, the

panoramic display 200 may be shifted to the left such that the left lateral display regions 202-1-4 include fewer display pixels and subject the media source content to higher compression and/or scaling than the right lateral display regions 202-6-9." (EX1007, 9:4-12; EX1002, ¶¶297-298.)

"[P]anoramic display 200 may be shifted to the right such that the right lateral display regions 202-6-9 include fewer display pixels and subject the media source content to higher compression and/or scaling and than the left lateral display regions 202-1-4." (EX1007, 9:4-16.) Meulen discloses a "portion" (having "differences . . . within the portion are less than differences . . . of others of the pixels" of element 2[f]) is a ***non-central region***. (EX1002, ¶¶297-298.)

Chao discloses scaling a non-center portion less than others of the pixels. "[I]f an element is determined to be a background element, . . . the background element is re-sized, by stretching or shrinking." (EX1008, [0028].) "[I]f an element is determined to be a foreground element, . . . the element is re-sized to fit the new page size, while maintaining the original aspect ratio of the element." (EX1008, [0030]; EX1002, ¶299.)

Figure 14 (below) shows the foreground element 31 includes images of ducks. (EX1008, [0027].) "***[P]age 30h'' [(output image)]*** is taller than ***page 30h [(input image)]***, but the same width. Accordingly, the scaling factor is still 1, which reflects the horizontal scaling factor. Moreover, because the width of page

30h" is the same as that of page 30h, the ducks occupy the same position relative to each other that they had on page 30h." (EX1008, [0091].) As shown, the ***ducks*** on ***page 30h"*** are non-centered and the same size as the ***ducks*** on ***page 30h (input image)***, which a POSITA would have understood means that there is little to no scaling. (EX1002, ¶300.)

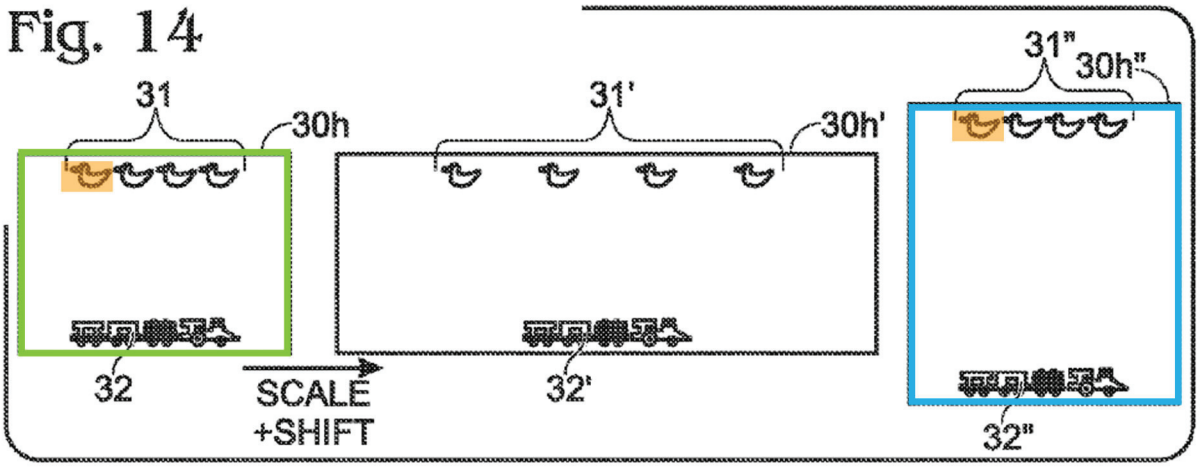
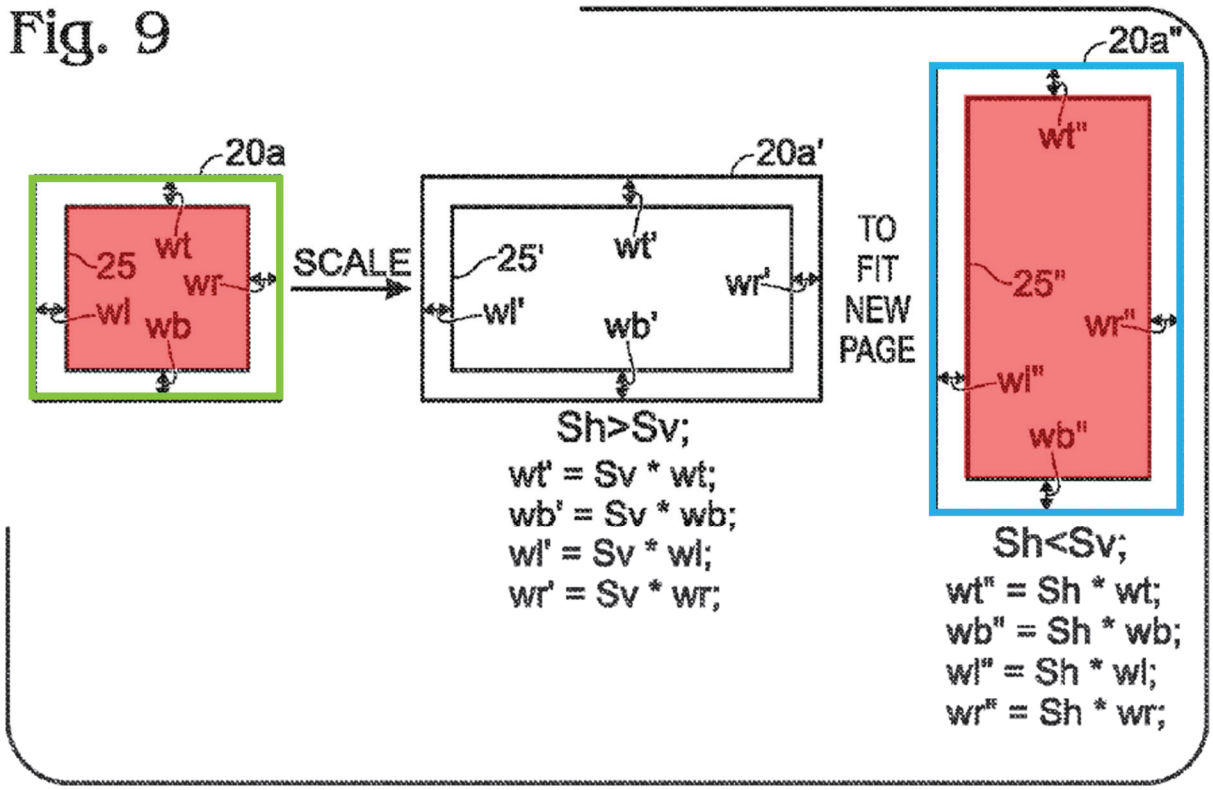


Figure 9 below shows "***page 20a" [(output image)]*** is taller than ***page 20a [(input image)]***, but the same width. Accordingly area ***element 25"*** has been scaled to be taller than ***element 25***, but, again, is ***centered*** within page 20a"." (EX1008, [0074].) ***Element 25"*** is a background element. (EX1008, [0027].) Hence, Chao's foreground element ("portion") has less distortion ("differences" of element 2[f]) than the background element. (EX1002, ¶301.)



11. Claim 10: "The system of claim 2, wherein the transformation non-uniformly shifts the pixels from the input positions to the output positions further based on distances between the input positions and the portion."

Meulen's central region within the media source content is the "portion." (*See* IV.D.3.d.)

"[I]mage compression and/or scaling may be applied ***progressively***. For example, more image compression and/or scaling may be applied to the media source content for the lateral display regions 140-1 and 140-5, which are closer to edges of the display 138, than to the media source content for the lateral regions 140-2 and 140-4." (EX1007, 6:7-13.) More compression/scaling is applied for

regions further from the central region (portion), and thus based on distances between the input positions and the portion. For example, ***region 4*** is located closer to the ***central region 3*** and has a ***compression ratio of 2:1***. (EX1007, 6:27-37.) ***Region 5*** is located further from the ***central region 3*** and has a ***compression ratio of 4:1***. (EX1007, 6:27-37; EX1002, ¶¶302-303.)

TABLE 1

	Region					
	1	2	3	4	5	Total
Pixels/Region	10	50	200	50	10	320
Compression Ratio	4:1	2:1	none	2:1	4:1	
Source Pixels	40	100	200	100	40	480

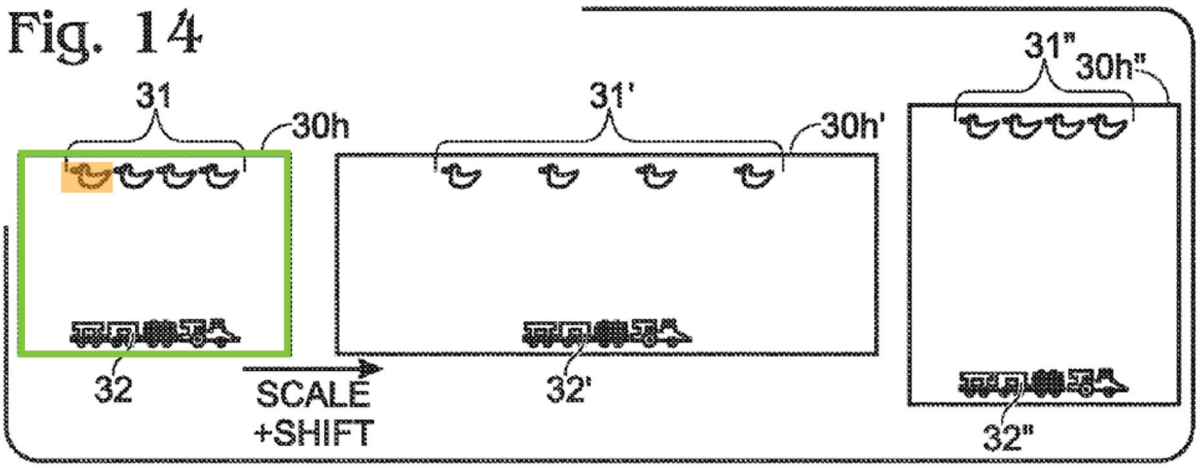
It would have been obvious to combine Meulen and Chao, and apply Chao's teachings of shifting pixels. (*See* IV.D.3.f; EX1002, ¶304.)

12. Claim 11: "The system of claim 2, wherein the one or more physical processors are further configured by machine-readable instructions to determine the portion based on a location of an object within the input image such that the portion includes the object."

Chao's foreground element 31 is a "portion." (*See* IV.D.10.)

Chao discloses determining a portion based on a location of an object within the ***page 30h (input image)***: "foreground elements are separated from background

elements." (EX1008, [0025].) "[E]lements can be determined to be foreground or background elements based on their position . . ." (EX1008, [0025].) The foreground element 31 includes at least one ***duck (object)*** (Figure 14 below). (EX1002, ¶305.)



It would have been obvious to combine Meulen and Chao. (*See* IV.D.3.g; EX1002, ¶306.)

13. Claim 12: "The system of claim 2, wherein the input image includes a video frame of a video."

Meulen's media source content is an "input image." (*See* IV.D.3.c.)

"[M]edia source content may comprise data derived from or associated with one or more images . . . ***videos, video clips, video files, video sequences, video feeds, video stream, movies***, . . ." (EX1007, 3:36-43.) The "media source content . . . may comprise pixels derived from or associated with one or more ***static or video images***." (EX1007, 3:44-46; EX1002, ¶¶307-308.)

14. Claim 1

a. Preamble: "An image capture apparatus, comprising:"

Meulen's wireless device comprises a digital camera. (*See* IV.D.7, IV.D.8.) Chao discloses a "camera screen," which is included in a camera. (EX1008, [0032]; EX1002, ¶¶309-310.)

b. 1[a]: "an image sensor configured to capture an input image having a source aspect ratio, the input image including pixels located at input positions defined along a first axis and a second axis, the first axis perpendicular to the second axis;"

Element 1[a] recites limitations similar to element 2[b], except it requires "an image sensor [be] configured to capture" the input image. Digital cameras comprise an image sensor configured to capture an input image. (EX1002, ¶¶311-312.)

c. 1[b]: "a display coupled to one or more physical processors; and"

Meulen's wireless device comprises a display and physical processor(s). (*See* IV.D.3.a, IV.D.7, IV.D.8.) The processor transforms the captured image into the displayed image. (*Id*.) It would have been obvious for the display to be coupled to the physical processor(s). (EX1002, ¶313.)

d. Elements 1[c]-1[i]

Elements 1[c]-1[h] mirror elements 2[a]-2[f], respectively. (EX1002, ¶¶314-319.)

Element 1[i] recites a limitation similar to a portion of claim 7. (EX1002, ¶320.)

15. Claim 13

a. 13[pre]: "A method for converting between aspect ratios, the method performed by a computing system including one or more physical processors, the method comprising:"

Element 13[pre] is similar to elements 2[pre] and 2[a], except it requires the system be a "computing system." (EX1002, ¶321.)

Meulen's "wireless device 100 may comprise, or be implemented as, a handheld computer." (EX1007, 2:16-17; EX1002, ¶322.)

b. 13[a]: "obtaining, by the computing system, an input image, the input image having a source aspect ratio, the input image including pixels located at input positions defined along a first axis and a second axis, the first axis perpendicular to the second axis;"

Element 13[a] is similar to element 2[b], except it requires the "obtaining" be performed "by the computing system," which Meulen discloses. (*See* IV.D.15.a; EX1002, ¶¶323-324.)

c. 13[b]: "determining a portion within the input image, the portion including a subset of the pixels; and"

Element 13[b] mirrors element 2[c]. (EX1002, ¶325.)

d. 13[c]: "applying, by the computing system, a transformation to the input image to generate an output image, the output image having a target aspect ratio different than the source aspect ratio, the output

image including the pixels located at output positions defined along the first axis and the second axis,"

Element 13[c] is similar to element 2[d], except it requires the "applying" be performed "by the computing system," which Meulen discloses. (*See* IV.D.15.a; EX1002, ¶¶326-327.)

e. Elements 13[d], 13[e]

Elements 13[d] and 13[e] mirror elements 2[e] and 2[f], respectively. (EX1002, ¶¶328-329.)

16. Claims 14-18

Claims 14-18 mirror claims 3, 4, and 8-10, respectively. (EX1002, ¶¶330-334.)

17. Claim 19: "The method of claim 13, further comprising determining the portion based on a location of an object within the input image such that the portion includes the object."

Claim 19 mirrors a subset of claim 11. (EX1002, ¶335.)

18. Claim 20

Claim 20 mirrors claim 12. (EX1002, ¶336.)

V. THE BOARD SHOULD NOT DENY INSTITUTION UNDER *FINTIV*

The USPTO Interim Procedure for Discretionary Denials stated, "[t]he plain language of the *Fintiv* factors is directed to district court litigation and does not apply to parallel U.S. International Trade Commission (ITC) proceedings, as the ITC lacks authority to invalidate a patent and the ITC's invalidity rulings are not

binding on the Office or on the district courts." USPTO Interim Procedure for Discretionary Denials, 2-3. Accordingly, the Board should not exercise its discretion to deny institution.

VI. THE BOARD SHOULD NOT DENY INSTUTITION UNDER § 325(D)

The Petition does not raise the same or substantially the same art previously presented to the Office, nor does it raise the same or substantially the same arguments previously presented to the Office in the examination of the '413 patent. *Advanced Bionics, LLC v. MED-EL Elektromedizinische Gerate GmbH*, IPR2019-01469, Paper 6 (P.T.A.B. Feb. 13, 2020) (precedential).

The Examiner identified references, Gleicher and Oosawa, during prosecution as the closest art to the independent claims, and noted that neither reference discloses the "differences" relationship of elements 1[h], 2[f], and 13[e]. (*See* II.C.) Unlike Gleicher and Oosawa, the Petition's prior art teaches the "differences" relationship of elements 1[h], 2[f], and 13[e], and thus is not cumulative. (EX1002, ¶26.) The Board should not deny institution under § 325(d).

VII. NOTICES AND STATEMENTS

Pursuant to 37 C.F.R. § 42.8(b)(1), Arashi Vision Inc. (d/b/a Insta360) is the real party-in-interest for Petitioner.

Pursuant to 37 C.F.R. § 42.8(b)(2), Petitioner identifies the following related

matters:

- *In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith*, Inv. No. 337-TA-1400 (USITC)
- *GoPro, Inc. v. Arashi Vision Inc. et al.*, No. 8:24-cv-00681-HDE-JCV (C.D. Cal.).

Pursuant to 37 C.F.R. § 42.8(b)(3), Petitioner identifies the following counsel (and a power of attorney accompanies this Petition).

Lead Counsel	First Backup Counsel
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Pursuant to 37 C.F.R. § 42.8(b)(4), service information for lead and back-up counsel is provided above. Petitioner consents to electronic service by email to MoFo_Insta360-IPRs@mofo.com.

Pursuant to 37 C.F.R. § 42.104(a), Petitioner certifies that the '413 patent is available for *inter partes* review and that Petitioner is not barred or estopped from requesting an *inter partes* review challenging the patent claims on the grounds identified in this Petition.

The USPTO is authorized to charge any required fees, including the fee as set forth in 37 C.F.R. § 42.15(a) and any excess claim fees, to Deposit Account No. **03-1952** referencing Docket No. **33316-00000.02.**

Dated: June 20, 2024

Respectfully submitted,

By */s/ Alex S. Yap*

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Certification of Word Count (37 C.F.R. § 42.24)

I hereby certify that this Petition for *Inter Partes* Review has 13,965 words (as counted by the "Word Count" feature of the Microsoft Word™ word-processing system), exclusive of "a table of contents, a table of authorities, mandatory notices under § 42.8, a certificate of service or word count, or appendix of exhibits or claim listing."

Dated: June 20, 2024

By */s/ Alex S. Yap*
Alex S. Yap

Certificate of Service (37 C.F.R. § 42.6(e)(4) and 42.205(a))

I hereby certify that the attached Petition for *Inter Partes* Review and supporting materials were served as of the below date by UPS, which is a means at least as fast and reliable as U.S. Express Mail, on the Patent Owner at the correspondence addresses indicated for U.S. Patent No. 10,015,413:

GoPro Issuance
3025 Clearview Way
San Mateo, CA 94402

Esplin & Associates (GoPro)
6225 Buckhorn Ridge Place
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Dated: June 20, 2024

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