

IPR2024-00984 (U.S. Patent No. 10,015,413)

Arashi Vision (U.S.) LLC (D/B/A Insta360) (Petitioner)

v.

GoPro, Inc. (Patent Owner)

October 7, 2025

Roadmap

- 1. The '413 Patent**
- 2. Claim Construction**
- 3. Meulen-Chao**
- 4. Fleming**
- 5. Obara-Liu**
- 6. Secondary Considerations**

The '413 Patent

'413 Patent

FIG. 2A illustrates an example embodiment of a process for converting from a source aspect ratio to a target aspect ratio in a camera system. In the process of FIG. 2A, an input image is obtained 202 in the source aspect ratio (e.g., a 4:3 aspect ratio). The image is then scaled 204 from the source

'413 Patent (EX1001), 3:61-65

direction as the frame boundary is approached. Thus, in image 216, the center circle is fully corrected so that it maintains the original circular shape of the corresponding circle in the input image 212. In the vertical direction, the

'413 Patent (EX1001), 4:22-25

and right edges. As a result, the circles in the corners exhibit the most distortion, because they have the highest amount of both vertical compression and horizontal stretching. In other

'413 Patent (EX1001), 4:30-32



US010015413B1

(12) **United States Patent**
Woodman et al.

(10) Patent No.: US 10,015,413 B1
(45) Date of Patent: Jul. 3, 2018

(54) **CONVERSION BETWEEN ASPECT RATIOS IN CAMERA**

(71) Applicant: GoPro, Inc., San Mateo, CA (US)

(72) Inventors: Nicholas D. Woodman, Woodside, CA (US); Sumit Chawla, San Carlos, CA (US); Iain Snappell, Oakland, CA (US); Scott Patrick Campbell, Belmont, CA (US)

(73) Assignee: GoPro, Inc., San Mateo, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: 15/492,728

(22) Filed: Apr. 20, 2017

Related U.S. Application Data

(63) Continuation of application No. 15/044,253, filed on Jan. 29, 2016, now Pat. No. 9,674,429, which is a continuation of application No. 14/536,315, filed on Nov. 7, 2014, now Pat. No. 9,294,671, which is a continuation of application No. 14/180,887, filed on Feb. 14, 2014, now Pat. No. 8,917,329.
(Continued)

(31) Int. Cl.
H04N 5/262 (2006.01)
G06T 3/00 (2006.01)
G06T 3/40 (2006.01)
G06K 9/36 (2006.01)
G06T 3/20 (2006.01)

(52) U.S. Cl.
CPC H04N 5/262 (2013.01); G06T 3/0093 (2013.01); G06T 3/4069 (2013.01); G06T 3/20 (2013.01); G06T 3/40 (2013.01); G06T 3/4061 (2013.01)

(58) **Field of Classification Search**
CPC H04N 5/262; G06T 3/0093; G06T 3/20; G06T 3/40; G06T 3/4069; G06T 3/4061
See application file for complete search history.

(56) **References Cited**
U.S. PATENT DOCUMENTS
5,790,698 A 8/1998 Takahashi
6,757,448 B1 8/2004 Li
(Continued)

FOREIGN PATENT DOCUMENTS
EP 2334098 9/2016
WO 2010073192 7/2010

OTHER PUBLICATIONS
Office Action for U.S. Appl. No. 14/536,315 dated Jan. 19, 2015, 5 pages.
(Continued)

Primary Examiner — Ngoc-Yen Vu
(74) **Attorney, Agent, or Firm** — Sheppard Mullin Richter & Hampton LLP

(57) **ABSTRACT**
A camera system captures an image in a source aspect ratio and applies a transformation to the input image to scale and warp the image to generate an output image having a target aspect ratio different than the source aspect ratio. The output image has the same field of view as the input image, maintains image resolution, and limits distortion to levels that do not substantially affect the viewing experience. In one embodiment, the output image is non-linearly warped relative to the input image such that a distortion in the output image relative to the input image is greater in a corner region of the output image than a center region of the output image.

20 Claims, 6 Drawing Sheets





Original image 16:9
Cropped image 16:9
Non-linearly warped image 16:9

Insta360
Exhibit 1001 Page 1

'413 Patent, Claim 1

1. An image capture apparatus, comprising 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;

an image sensor configured to capture an input image having a source aspect ratio, the input image including

a display coupled to one or more physical processors, the one or more physical processors configured by machine-readable instructions to:

the one or more physical processors configured by machine-readable instructions to:
obtain the input image;

obtain the input image;

determine a portion within the input image including a subset of the pixels; and

apply a transformation to the input image to

determine a portion within the input image, the portion including a subset of the pixels; and

output image, the output image having a target aspect

ratio different than the source aspect ratio;

the input image including the pixels located at input positions defined along the first axis and the second axis;

wherein:

the transformation non-uniformly shifts the pixels

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;

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

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

present the output image on the display.

'413 Patent, Claim 2

2. A system that converts between system comprising:

one or more physical processors configured by machine-readable instructions to:

obtain an input image, the input image having a source aspect ratio, the input image including a subset of the pixels at input positions defined along a first axis and a second axis, the first axis perpendicular to the second axis;

determine a portion within the input image, the portion including a subset of the pixels; and

apply a transformation to the input image to produce 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 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

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

the transformation non-uniformly shifts the pixels from the input positions to the output positions 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.

one or more physical processors configured by machine-readable instructions to:

obtain an input image, the input image having a source aspect ratio;

determine a portion within the input image, the portion including a subset of the pixels; and

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;

'413 Patent, Claim 6 And Claim 7

Claim 6

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

Claim 7

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

Claim Construction

Roadmap

1. The '413 Patent

2. **Claim Construction** → { • **“non-uniform[]”**
• “determine a portion”

3. Meulen-Chao

4. Fleming

5. Obara-Liu

6. Secondary Considerations

'413 Patent, Elements 1[g] And 2[e]: “non-uniform[]”

Claim 1

1[g]

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;

Claim 2

2[e]

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;

Proposed Constructions Of “non-uniform[]”

Petitioner’s Construction	Patent Owner’s Construction
ordinary and customary (“not the same in all parts or areas”)	“non-linear” (“[n]o two pixels will have the same shift”)

Reply (Paper 32), 1

Patent Owner Response (POR) (Paper 25), 6, 27-28

Proposed Constructions Of “non-uniform[]”

Petitioner’s Construction	Patent Owner’s Construction
ordinary and customary (“not the same in all parts or areas”)	“non-linear” (“[n]o two pixels will have the same shift”)

Reply (Paper 32), 1

POR (Paper 25), 6, 27-28

Patent Owner’s Sur-reply

the entire image. POR 26-27 (citing EX1001, 6:65-7:5). For example, a non-linear transformation applied to a part of the image would still meet the claims.

Sur-reply (Paper 37), 4

Patent Owner's Sur-reply

Finally, Petitioner's argument that non-uniform shifting can be accomplished by linear scaling alone improperly nullifies the inventive aspect of the claims as described in the specification. The '413 Patent sought to improve on "[c]onventional conversion techniques such as cropping, *linearly scaling*, and padding," since they "result in a perceivable reduction in the quality of the image or video"—in the case of linear scaling, it "introduces perceivable distortion into the image." EX1001, 1:12-18. Dr. Katsaggelos

Sur-reply (Paper 37), 6

Petitioner's Expert

7 Q Turning back to the limitation about the
8 non-uniform shifting of pixels, would you agree that in
9 order to accomplish a non-uniform shifting, you need to
10 apply a non-linear transformation?

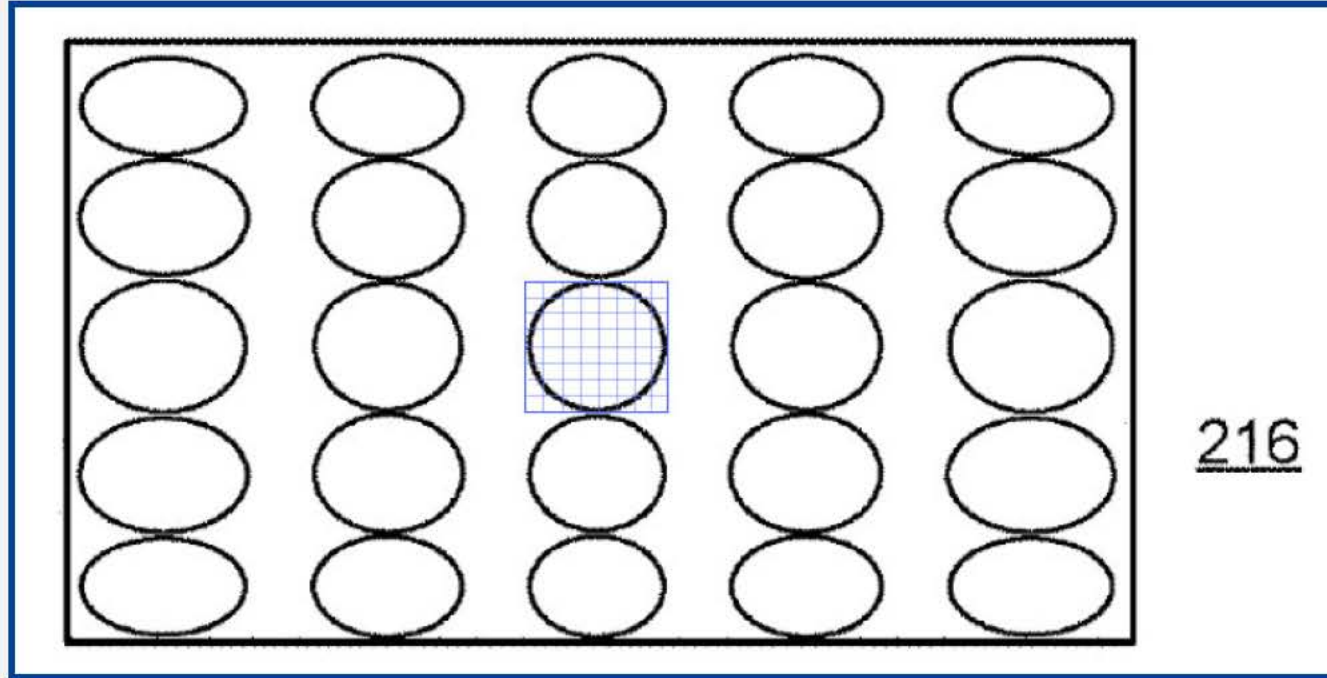
11 A Yeah, the application of a non-linear
12 transformation results in the non-vertical shifting of
13 the pixels.

*Katsaggelos
Depo Tr.
(EX2026),
34:7-13*

linear transformation, but I disagree. (EX2027, ¶68.) And I did not agree in my deposition that “non-uniform[] shifting” requires a non-linear transformation, or that the two terms have the same meaning. (EX2027, ¶68 (citing EX2026, 34:7-13).) Instead, my testimony that Dr. Foroosh cites was that “the application of a non-linear transformation results in the non-[uniform] shifting of the pixels.” (EX2026, 34:7-13.) In other words, a non-linear transformation is a type of, but is not the same as, non-uniform shifting.

*Katsaggelos
Reply Decl.
(EX1014), ¶8*

“non-uniform[]”

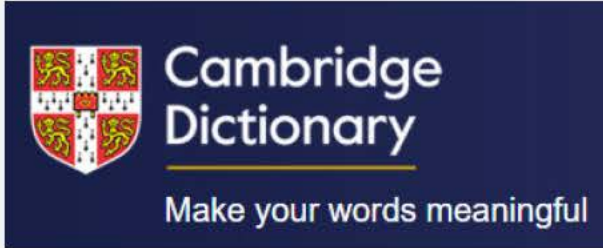


'413 Patent (EX1001), Fig. 2B

direction as the frame boundary is approached. Thus, in image **216**, the center circle is fully corrected so that it maintains the original circular shape of the corresponding circle in the input image **212**. In the vertical direction, the

'413 Patent (EX1001), 4:22-25

Cambridge Dictionary



non-uniform

adjective (also **nonuniform**)

UK  /,nɒnˈjuː.nɪ.fɔːm/ US  /,nɑːnˈjuː.nə.fɔːrm/

non-uniform adjective (NOT SAME)

Add to word list 

not the same in all parts or areas:

Cambridge Dictionary (EX1016)

'413 Specification

(57)

ABSTRACT

A camera system captures an image in a source aspect ratio and applies a transformation to the input image to scale and warp the image to generate an output image having a target aspect ratio different than the source aspect ratio. The output image has the same field of view as the input image, maintains image resolution, and limits distortion to levels that do not substantially affect the viewing experience. In one embodiment, **the output image is non-linearly warped relative to the input image** such that a distortion in the output image relative to the input image is greater in a corner region of the output image than a center region of the output image.

'413 Patent (EX1001), Abstract

'413 Patent, Claim 3

3. 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

a warping function to non-uniformly warp the input image along the second axis.

'413 Patent (EX1001), 9:56-61

'413 Specification

'413 Specification

As explained above, the horizontal warp distortion in one embodiment is a function of the horizontal position only. It

* * *

$$\Delta h/H = 0.1107h^6 + 0.534h^5 - 1.7813h^4 + 1.3167h^3 - 0.0722h^2 - 0.1073h$$

'413 Patent (EX1001), 6:65-7:5

The vertical warp distortion, in one embodiment, is a function of both the horizontal and vertical positions. There-

* * *

$$\Delta v/V_0 = -0.0749v^6 - 0.3167v^5 + 1.0939v^4 - 0.8113v^3 + 0.0408v^2 + 0.0678v$$

* * *

$$\Delta v/V_{100} = -0.0749v^6 - 0.3167v^5 + 1.0939v^4 - 0.8113v^3 + 0.0408v^2 + 0.0678v$$

'413 Patent (EX1001), 7:6-43

Patent Owner's Expert

A. As I said, they're not just these specific equations. Because the inventors, they say that intermediate horizontal coordinates can be inter-polated from the example equations given below.

It's examples. So, I mean, the patent is not limited to only these equations.

Foroosh Depo Tr. (EX1015), 41:19-25

Roadmap

1. The '413 Patent

2. **Claim Construction** → {
• “non-uniform[]”
• **“determine a portion”**

3. Meulen-Chao

4. Fleming

5. Obara-Liu

6. Secondary Considerations

'413 Patent, Claim 1: “obtain” (1[d]), “determine” (1[e]), and “apply” (1[f])

1[d]

1[e]

1[f]

the one or more physical processors configured by machine-readable instructions to:

obtain the input image;

determine a portion within the input image, the portion including a subset of the pixels; and

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,

'413 Patent (EX1001), 9:5-14

'413 Patent, Claim 2: “obtain” (2[b]), “determine” (2[c]), and “apply” (2[d])

one or more physical processors configured by machine-readable instructions to:

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;

2[c]

determine a portion within the input image, the portion including a subset of the pixels; and

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,

'413 Patent (EX1001), 9:30-43

Proposed Constructions

Petitioner's Construction	Patent Owner's Construction
ordinary and customary	“determine a portion within the input image” (1[e] / 2[c]) after “obtain the[/an] input image” (1[d] / 2[b]) but prior to “apply a transformation to the input image” (1[f] / 2[d])

Reply (Paper 32), 3-4

POR (Paper 25), 17

'413 Specification

The vertical warp distortion, in one embodiment, is a function of both the horizontal and vertical positions. Therefore, the vertical warp distortion can be represented as a family of equations $\Delta v/V_n$, where “n” is the horizontal coordinate expressed as a percent of the total horizontal image size. Intermediate horizontal coordinates can be interpolated from the example equations given below, or equations substantially similar to these:

$$\Delta v/V_0 = -0.0749v^6 - 0.3167v^5 + 1.0939v^4 - 0.8113v^3 + 0.0408v^2 + 0.0678v$$

$$\Delta v/V_{10} = -0.0658v^6 - 0.2785v^5 + 0.9617v^4 - 0.7132v^3 + 0.0359v^2 + 0.0596v$$

$$\Delta v/V_{20} = -0.0568v^6 - 0.2402v^5 + 0.8294v^4 - 0.6152v^3 + 0.0309v^2 + 0.0514v$$

$$\Delta v/V_{30} = -0.0444v^6 - 0.188v^5 + 0.6491v^4 - 0.4814v^3 + 0.0242v^2 + 0.0403v$$

'413 Patent
(EX1001),
7:6-23

Prosecution History

Applicant's Remarks

In pertinent parts, the amended independent claim 21 recites:

... determine a **portion within the input image**, the portion **including a subset of the pixels**; and

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, wherein:

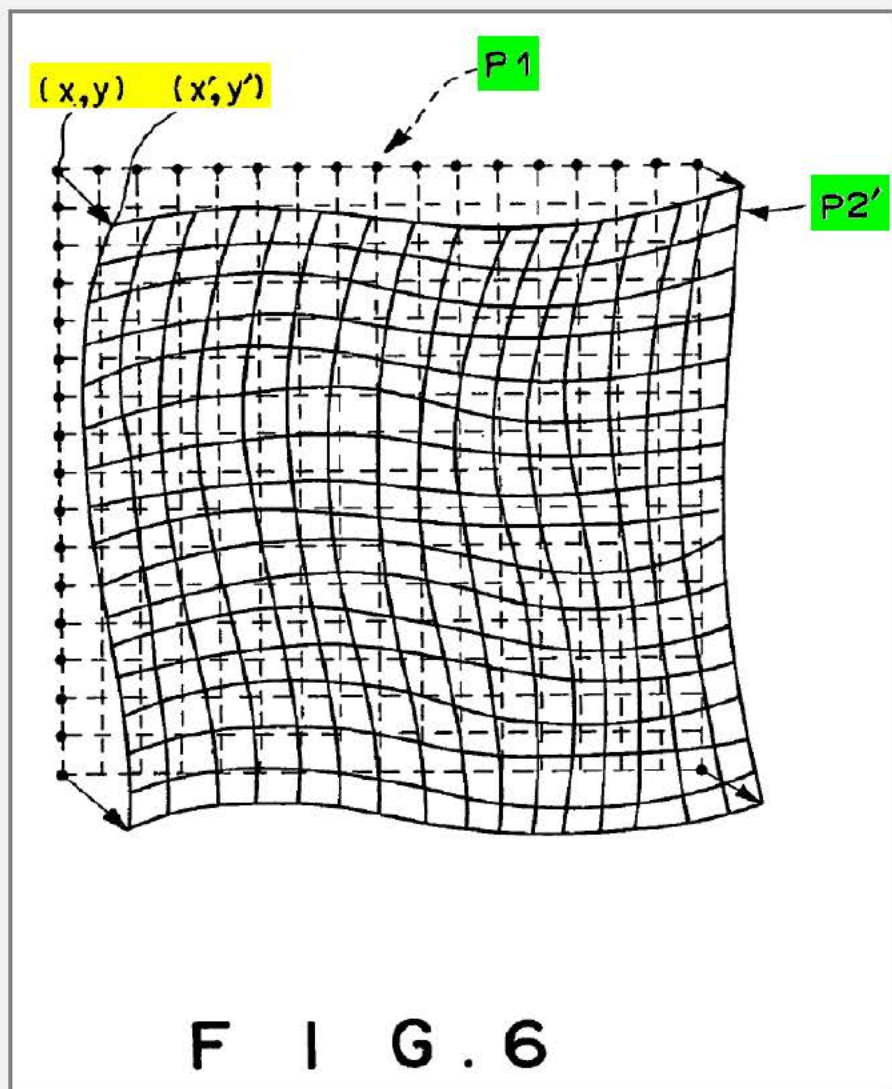
the transformation non-uniformly shifts the pixels from the input positions to the output positions based on (1) the input positions along the first axis, and (2) the input positions along the second axis; and

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.

At best, Oosawa describes facilitating comparison of multiple (e.g., two) images of an identical object by performing a global matching operation between the images and determining the shifting amount of corresponding pixels between the images. (Oosawa, Abstract, col. 6:6-47) **To the extent Oosawa shows the amount of shifting to be applied to the center of the image is smaller than the peripheral of the image, this is merely the result of the visuals captured within two images being compared and is not result of a transformation that creates less differences between input positions and output positions of the subset of the pixels than the differences between input positions and output positions of other pixels in the input image.** Thus, Oosawa fails to disclose determining a portion (including a subset of pixels) within an input image and non-uniformly shifting the pixels of the input image such that differences between input positions and output positions are less for the subset of the pixels than other pixels of the input image.

Prosecution History (EX1003), 38-39

Oosawa



Illustrated in FIG. 6 is the amount of shift $(\Delta x, \Delta y)$ (wherein $\Delta x = x' - x$ and $\Delta y = y' - y$) between the two images P1 and P2' derived for each pixel (x, y) in the center of an ROI in the manner described above. Then, approximation is carried out using a two-dimensional tenth-order polynomial to re-calculate the amount of shift $(\Delta x, \Delta y)$ to be applied to each pixel in the second image P2' from each amount of shift $(\Delta x, \Delta y)$ for each pixel (x, y) derived above based on local matching. A non-linear warping transform operation (hereinafter, referred to simply as the warping operation) is then applied to the second image P2' to shift the position of each pixel (x, y) in the second image P2' in accordance with the re-calculated amount of shift $(\Delta x, \Delta y)$ for the pixel.

Oosawa (EX1010), 6:35-47

Oosawa
(EX1010),
Fig. 6

Instituted Grounds

Instituted Grounds For The '413 Patent

Ground	Claim(s) Challenged	35 U.S.C. § ²	Reference(s)/Basis
1	1, 6, 7	103	Fleming
2	1, 6, 7	103	Obara, Liu
3	1, 6, 7	103	Meulen, Chao

Roadmap

1. The '413 Patent
2. Claim Construction
- 3. Meulen-Chao**
4. Fleming
5. Obara-Liu
6. Secondary Considerations



Meulen

Meulen

In various implementations, image 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. Image compression may be

Meulen (EX1007), 1:55-58

the aspect ratio and/or the resolution of the display 138. In one embodiment, for example, the media source content may have an aspect ratio of 3:2 with a resolution of 480×320, and the display may have an aspect ratio of 1:1 with a resolution of 320×320. In another embodiment, for example, the media

Meulen (EX1007), 4:15-19

As shown, the wireless device 100 may be implemented as a combination handheld computer and mobile telephone or smartphone. Examples of smartphones include, for example, Palm® products such as Palm® Treo™ smartphones.

Meulen (EX1007), 2:9-12

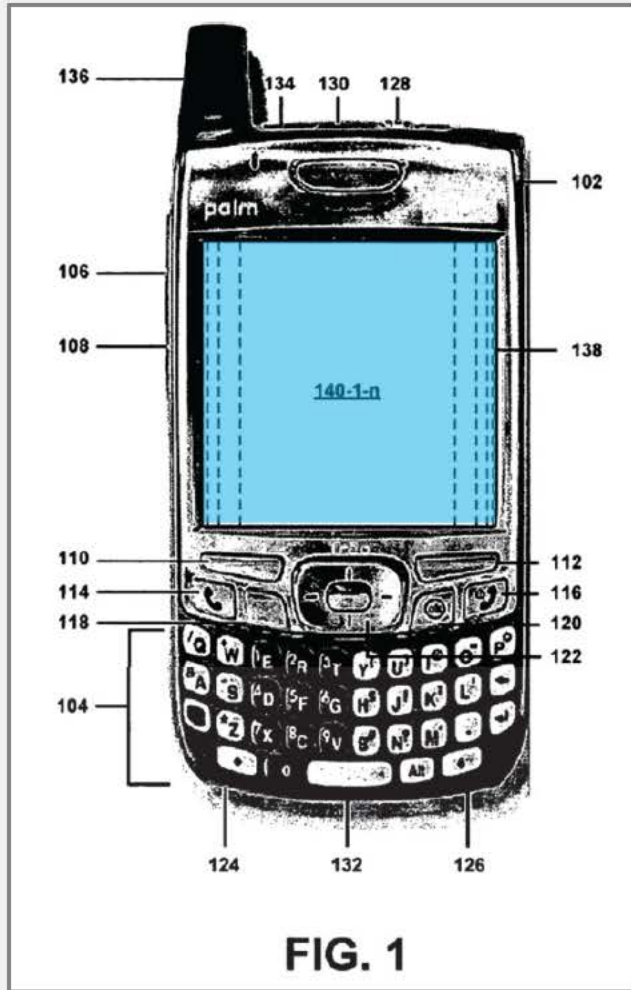


FIG. 1

Meulen (EX1007), Fig. 1

Meulen

TABLE 1						
	Region					Total
	1	2	3	4	5	
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

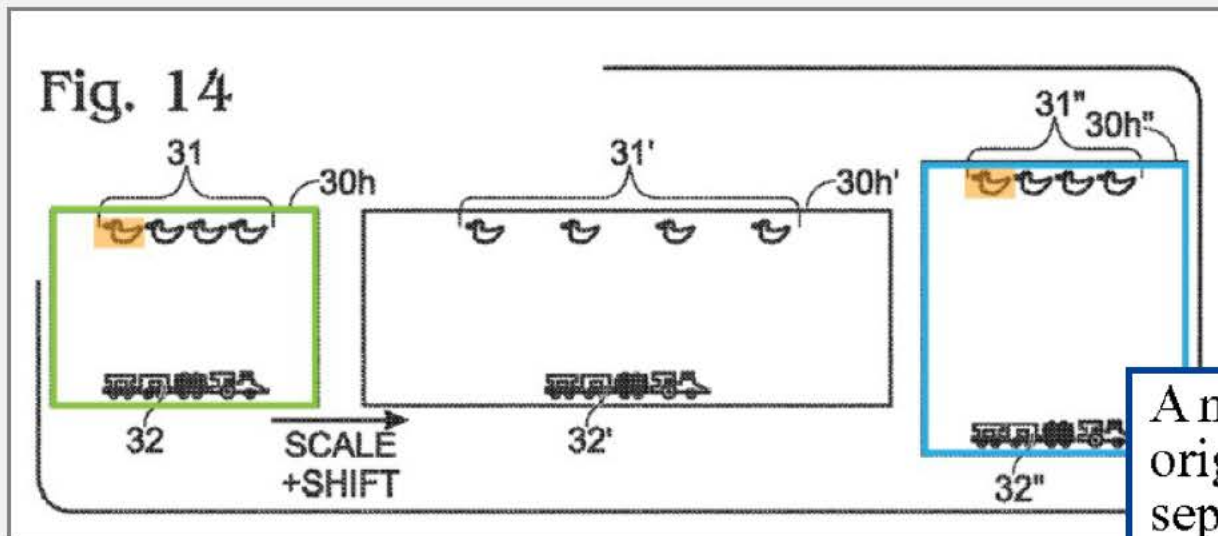
Meulen (EX1007), 5:52-60

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.

Meulen (EX1007), 6:9-13

Chao

Chao



Chao (EX1008), Fig. 14

A method for auto-resizing an original digital image from an original image to a resized image. The method comprises separating the foreground elements from the background elements, determining an original aspect ratio of the foreground elements and creating 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 and repositioning the resized foreground and background elements on the resized image while maintaining the design intention of the original image.

Chao (EX1008), Abstract

Roadmap

1. The '413 Patent

2. Claim Construction

3. **Meulen-Chao** →

4. Fleming

5. Obara-Liu

6. Secondary Considerations

- **“input image” (1[a] / 2[b])**
- “determine a portion” (1[e] / 2[c])
- “non-uniform[]” (1[g] / 2[e])
- “shifts” (1[g] / 2[e])
- non-uniformly shifts “based on (1) the input positions along the first axis, and (2) the input positions along the second axis” (1[g] / 2[e])
- motivation to combine

'413 Patent, Claims 1 And 2

Claim 1

1[a]

an image sensor configured to capture an input image having a source aspect ratio, the input image including

1[c], 1[d]

the one or more physical processors configured by machine-readable instructions to:
obtain the input image;

'413 Patent (EX1001), 8:66-9:7

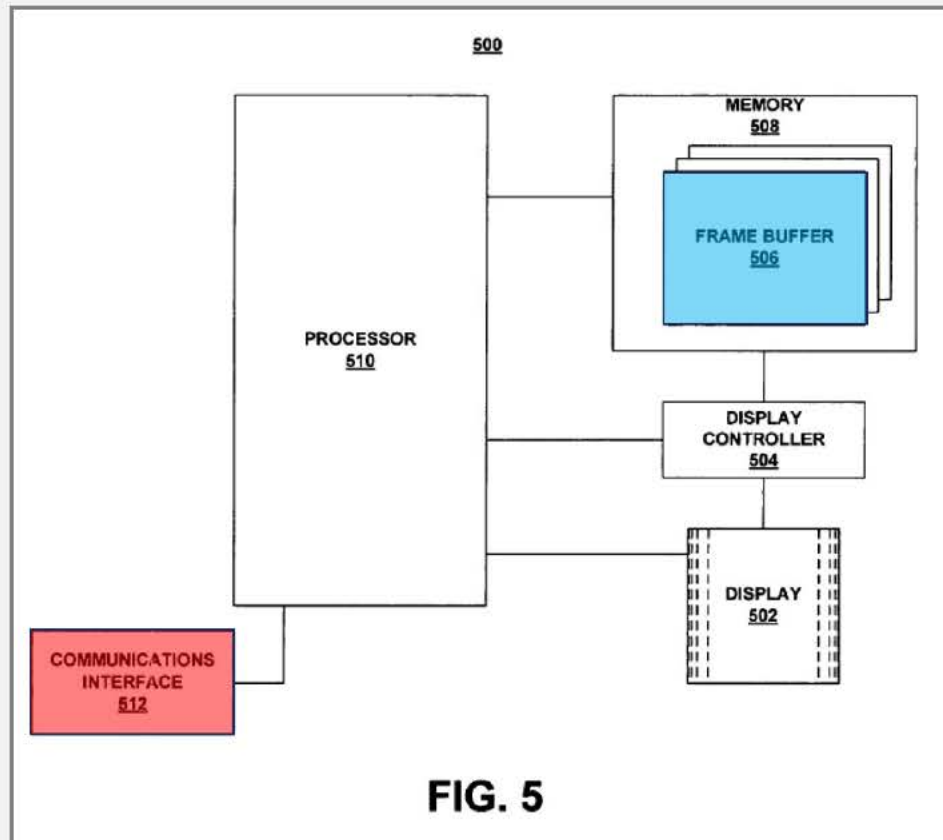
Claim 2

2[a], 2[b]

one or more physical processors configured by machine-readable instructions to:
obtain an input image, the input image having a source

'413 Patent (EX1001), 9:30-32

Meulen Teaches Capturing And Obtaining An “input image”



Meulen (EX1007), Fig. 5

In various embodiments, the display controller 504 may be arranged to apply image compression and/or scaling to the media source content stored in the frame buffer 506. For example, the display controller 504 may be arranged to retrieve and process a line of source pixels from the display buffer 506 to generate a compressed and/or scaled line of display pixels. In some embodiments, the display controller

Meulen (EX1007), 11:66-12:5

In various embodiments, the processor 510 may be arranged to run an operating system (OS) and various mobile applications. Examples of an OS include, for example, a proprietary or open source OS. Examples of mobile applications include, for example, a telephone application, a camera (e.g., digital camera, video camera) application, a browser applica-

Meulen (EX1007), 12:62-13:4

Meulen's Media Source Content

Meulen

The media source generally may comprise any source capable of delivering media source content to the wireless device 100. An example of a media source may include a

Meulen (EX1007), 3:51-53

deliver verb

de·liv·er (di-'li-vər) dē-

delivered; delivering (di-'li-v(ə-)rɪŋ) dē- ; **delivers**

[Synonyms of deliver >](#)

transitive verb

* * *

c : to send, provide, or make accessible to someone electronically

| *deliver* an email/text message

| Have the information *delivered* to you via e-mail, cell phone, pager, instant messaging, or just on a Web page that you set up.

— Irene B. McDermott

| When Netflix entered the European market in 2012, some national telecom companies forced it to pay "tolls" to *deliver* content to customers.

— Liz Alderman and Amie Tsang



EX1017

Meulen's Aspect Ratios

In various embodiments, the media source content may comprise an aspect ratio and/or a resolution that differs from the aspect ratio and/or the resolution of the display 138. In one embodiment, for example, the media source content may have an aspect ratio of 3:2 with a resolution of 480×320, and the display may have an aspect ratio of 1:1 with a resolution of 320×320. In another embodiment, for example, the media source content may have an aspect ratio of 2:1 with a resolu-

Meulen (EX1007), 4:13-19

Meulen's Processing

another. In some implementations, the panoramic display may employ software to perform the sample-rate conversion at the expense of more memory and processing power. When performed by software, the sample-rate conversion may be implemented in registers rather than random access memory (RAM) to minimize the number of accesses or taps and to reduce processing expense. The embodiments are not limited

Meulen (EX1007), 10:48-54

Meulen's Palm Treo

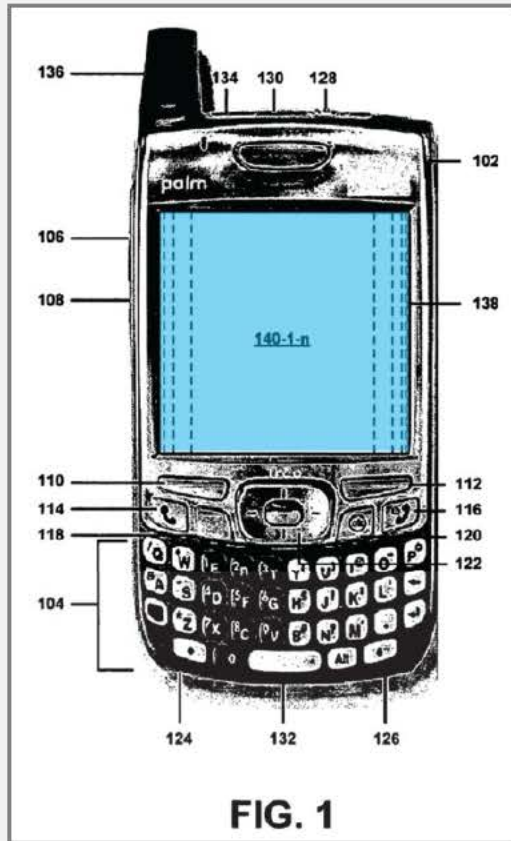


FIG. 1

Meulen (EX1007), Fig. 1

FIG. 1 illustrates one embodiment of a wireless device 100. As shown, the wireless device 100 may be implemented as a combination handheld computer and mobile telephone or smartphone. Examples of smartphones include, for example, Palm® products such as Palm® Treo™ smartphones.

Meulen (EX1007), 2:8-12



using your
Treo™ 600
smartphone
by palmOne

Your Treo comes with an easy-to-use built-in camera, which allows you to instantly take, view, and share pictures with friends and family. To add a personal touch to your

Palm Treo 600 User Manual (EX1018), 63

Roadmap

1. The '413 Patent
 2. Claim Construction
 3. **Meulen-Chao** →
 4. Fleming
 5. Obara-Liu
 6. Secondary Considerations
- “input image” (1[a] / 2[b])
 - **“determine a portion” (1[e] / 2[c])**
 - “non-uniform[]” (1[g] / 2[e])
 - “shifts” (1[g] / 2[e])
 - non-uniformly shifts “based on (1) the input positions along the first axis, and (2) the input positions along the second axis” (1[g] / 2[e])
 - motivation to combine

'413 Patent, Claims 1 And 2

Claim 1

1[e]

determine a portion within the input image, the portion including a subset of the pixels; and

'413 Patent (EX1001), 9:8-9

Claim 2

2[c]

determine a portion within the input image, the portion including a subset of the pixels; and

'413 Patent (EX1001), 9:37-38

Meulen Teaches “determin[ing] a portion”

Meulen

As shown in Table 1, for example, 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

Meulen (EX1007), 6:27-30

TABLE 1

	Region					Total
	1	2	3	4	5	
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 (EX1007), 5:52-60

Decision on Institution

is to be displayed in the lateral display regions.”) By identifying a central region of 200 pixels, Meulen determines a portion of the input image including a subset of pixels that is to be displayed in the central region of Meulen’s display.

We determine that Petitioner has sufficiently shown that Meulen teaches this limitation, by disclosing that the display region of wireless device 100 is divided into various lateral display regions before an application of the transformation to the input image. See Ex. 1007, 4:24–39

*DI (Paper 13),
16*

Meulen Teaches “determin[ing] a portion”

TABLE 2

	Region									Total
	1	2	3	4	5	6	7	8	9	
Pixels/Region	4	8	16	32	200	32	16	8	4	320
Compression Ratio	7:1	4:1	2:1	3:2	none	3:2	2:1	4:1	7:1	
Source Pixels	28	32	32	48	200	48	32	32	28	480

Meulen (EX1007), 7:37-44

TABLE 4

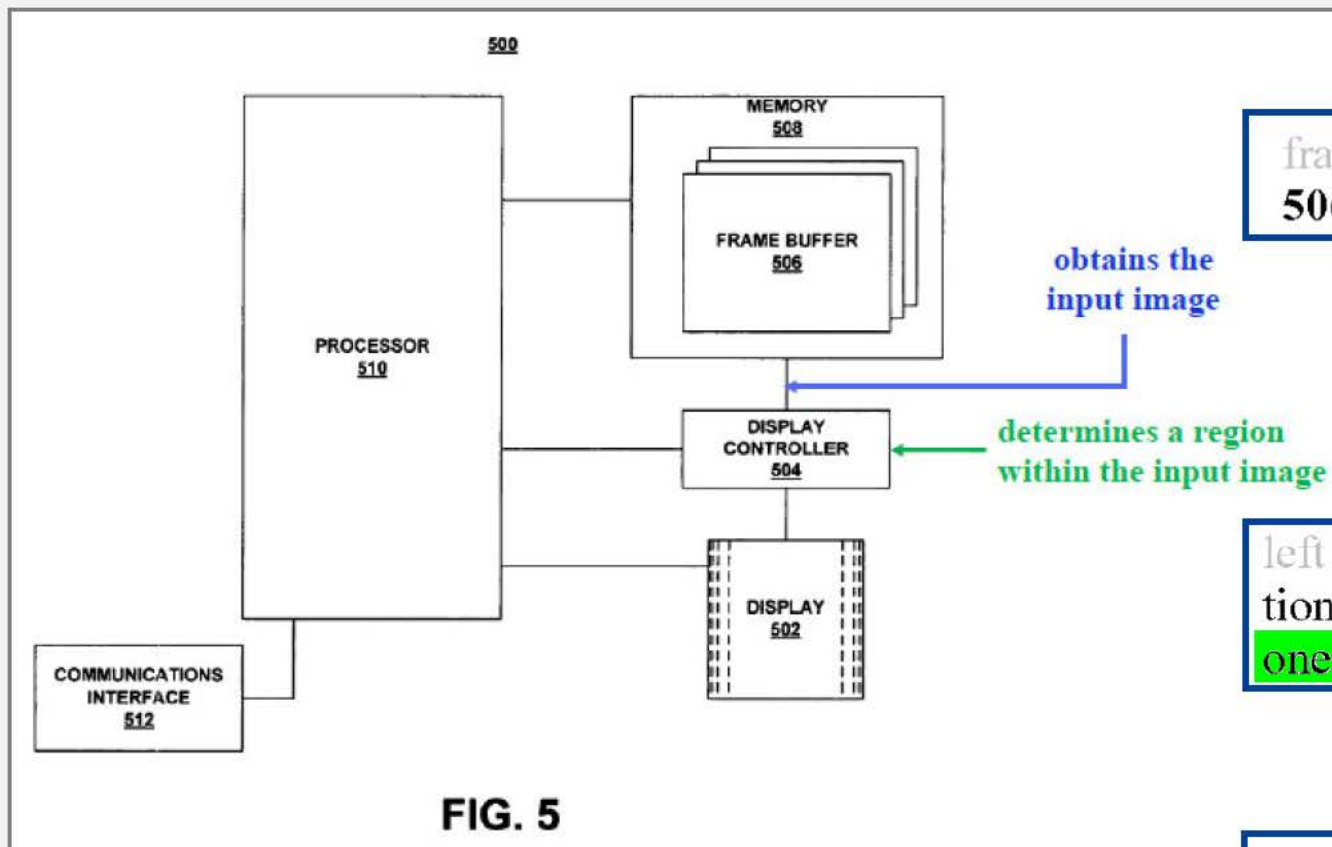
	Region									Total
	1	2	3	4	5	6	7	8	9	
Pixels/Region	2	4	8	16	230	32	16	8	4	320
Compression Ratio	14:1	8:1	4:1	3:1	none	3:2	2:1	4:1	7:1	
Source Pixels	28	32	32	48	230	48	32	32	28	480

Meulen (EX1007), 9:21-29

In various embodiments, 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.

Meulen (EX1007), 9:1-3

Meulen Teaches Patent Owner's Required Order Of Steps



Meulen (EX1007), Fig. 5

frame buffer 506. In various embodiments, the frame buffer 506 may be arranged to store media source content. The

Meulen (EX1007), 11:45-46

left or the right lateral display regions. In other implementations, the display controller 504 may be arranged to expand one or more display regions to create a magnified effect.

Meulen (EX1007), 12:23-25

In various embodiments, the display controller 504 may be arranged to apply image compression and/or scaling to the media source content stored in the frame buffer 506. For

Meulen (EX1007), 11:65-12:1

Roadmap

1. The '413 Patent
 2. Claim Construction
 3. **Meulen-Chao** →
 4. Fleming
 5. Obara-Liu
 6. Secondary Considerations
- “input image” (1[a] / 2[b])
 - “determine a portion” (1[e] / 2[c])
 - **“non-uniform[]” (1[g] / 2[e])**
 - “shifts” (1[g] / 2[e])
 - non-uniformly shifts “based on (1) the input positions along the first axis, and (2) the input positions along the second axis” (1[g] / 2[e])
 - motivation to combine

'413 Patent, Claims 1 And 2

Claim 1

1[g]

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;

'413 Patent (EX1001), 9:16-19

Claim 2

2[e]

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;

'413 Patent (EX1001), 9:45-48

Meulen Teaches “non-uniform[]”

TABLE 1

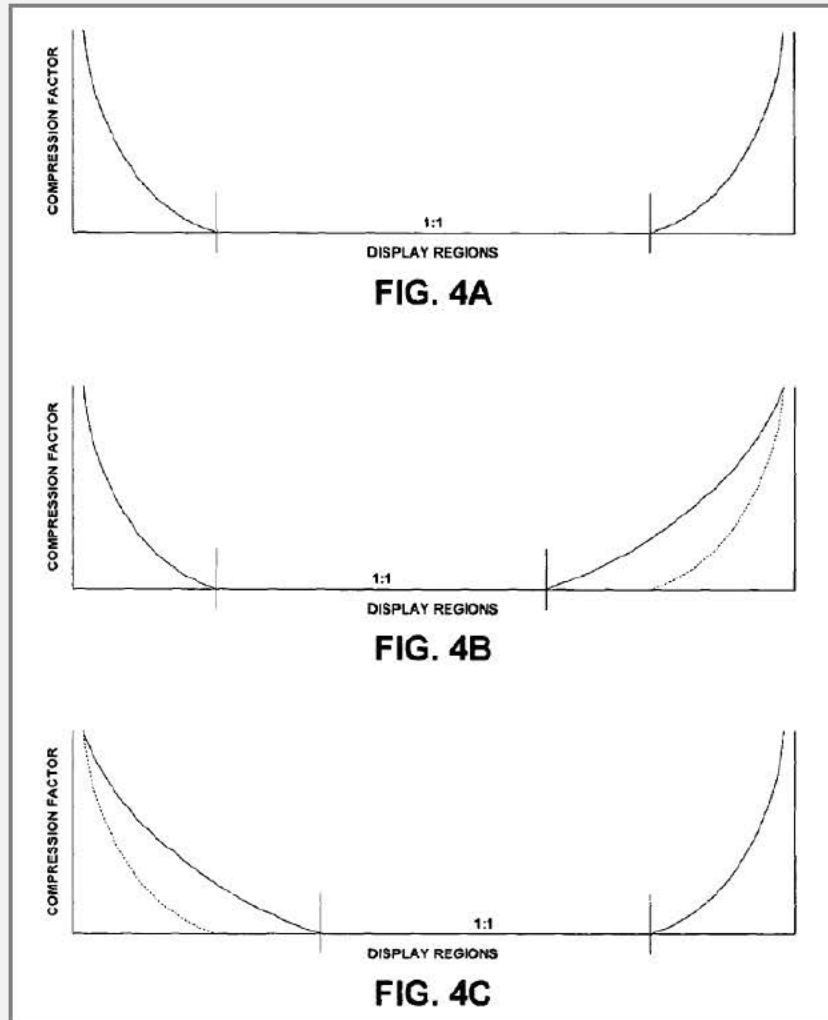
	Region					Total
	1	2	3	4	5	
Pixels/Region	10	50	200	50	10	320
Compression Ratio	4:1	2:1	none	2:1	4:1	
Source Pixels	40	100	200	100	40	480

Meulen (EX1007), 5:52-60

As shown in Table 1, for example, 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 comprise 10 pixels and subject media source content to a **4:1 image compression** ratio (e.g., 40 source pixels to 10 display pixels). The lateral display regions **140-2** and **140-4** each may comprise 50 pixels and subject media source content to a **2:1 image compression** ratio (e.g., 100 source pixels to 50 display pixels).

Meulen (EX1007), 6:27-37

Meulen Teaches “non-uniform[]” Under PO’s Construction

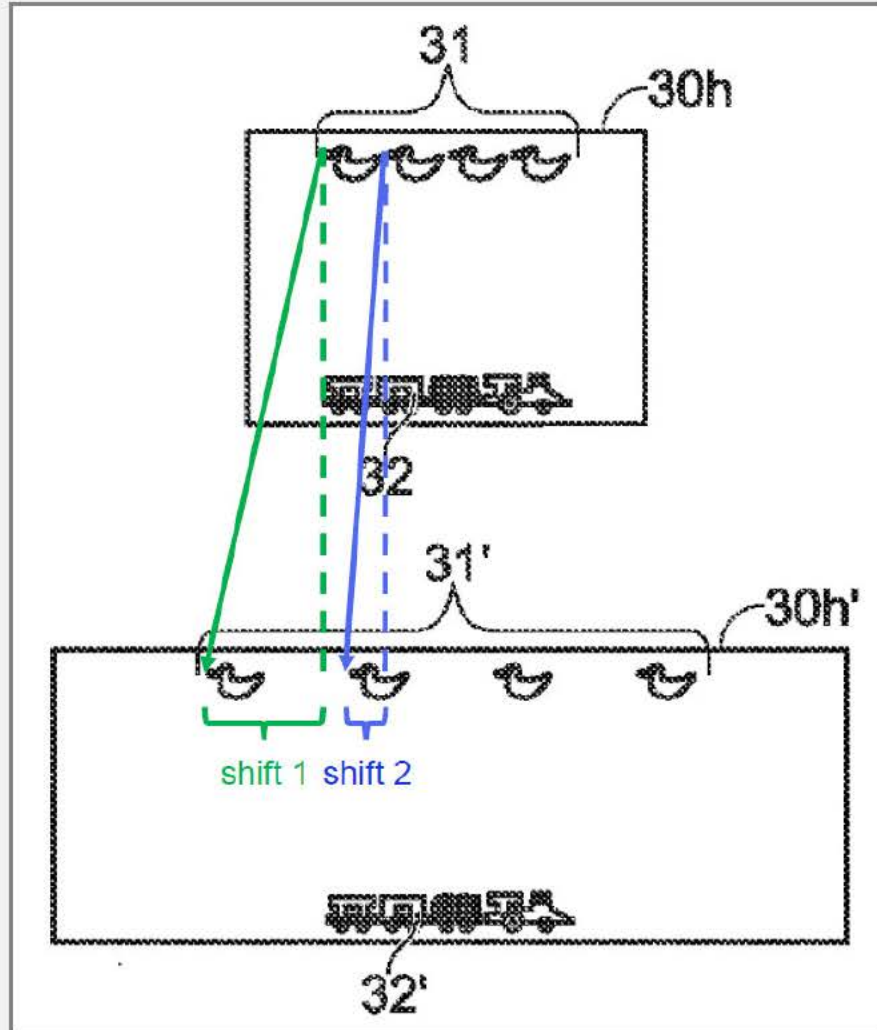


Meulen
(EX1007),
Figs. 4A,
4B, 4C

As shown in FIG. 4A, the image compression and/or scaling may be applied progressively, and the image compression ratios for left lateral display regions may be symmetric with the image compression ratios for right lateral display regions. As shown in FIG. 4B, the image compression and/or scaling may be shifted to the left such that left lateral display regions and subject media source content to higher compression and/or scaling than right lateral display regions. As shown in FIG. 4C, the image compression and/or scaling may be shifted to right such that right lateral display regions subject media source content to higher compression and/or scaling than left lateral display regions.

In this embodiment, a panoramic display may be implemented by employing significantly more display regions (e.g., >30) and hardware-based sample-rate converters to smooth the visual transitions from one display region to another. In some implementations, the panoramic display

Chao Teaches “non-uniform[]”



Katsaggelos Reply Decl. (EX1014), ¶61

[0028] Returning to FIG. 2, if an element is determined to be a background element, the method proceeds to block 106, where the background element is re-sized, by stretching or shrinking, as necessary, to fit the new page size. It should be

Chao (EX1008), [0028]

[0063] For the purposes of the present disclosure, it should be understood that 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

Chao (EX1008), [0063]

[0030] Returning to block 104, if an element is determined to be a foreground element, the method proceeds to block 110, where the element is re-sized to fit the new page size, while maintaining the original aspect ratio of the element.

Chao (EX1008), [0030]

Roadmap

1. The '413 Patent
 2. Claim Construction
 3. **Meulen-Chao** →
 4. Fleming
 5. Obara-Liu
 6. Secondary Considerations
- “input image” (1[a] / 2[b])
 - “determine a portion” (1[e] / 2[c])
 - “non-uniform[]” (1[g] / 2[e])
 - **“shifts” (1[g] / 2[e])**
 - non-uniformly shifts “based on (1) the input positions along the first axis, and (2) the input positions along the second axis” (1[g] / 2[e])
 - motivation to combine

'413 Patent, Claims 1 And 2

Claim 1

1[g]

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;

'413 Patent (EX1001), 9:16-19

Claim 2

2[e]

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;

'413 Patent (EX1001), 9:45-49

Meulen Teaches “shift[ing]”

Meulen

In some embodiments, for example, the wireless device 100 may comprise sample-rate conversion software to perform sample-rate conversion, such as polyphase filtering. In some

Meulen (EX1007), 5:24-27

Decision on Institution

Meulen and Chao teaches non-uniform pixel shifting. Contrary to Patent Owner’s argument, we agree with Petitioner that by teaching image scaling, Meulen teaches that pixels are shifted based on a scaling factor from the input to output positions. Further, we also agree that by disclosing

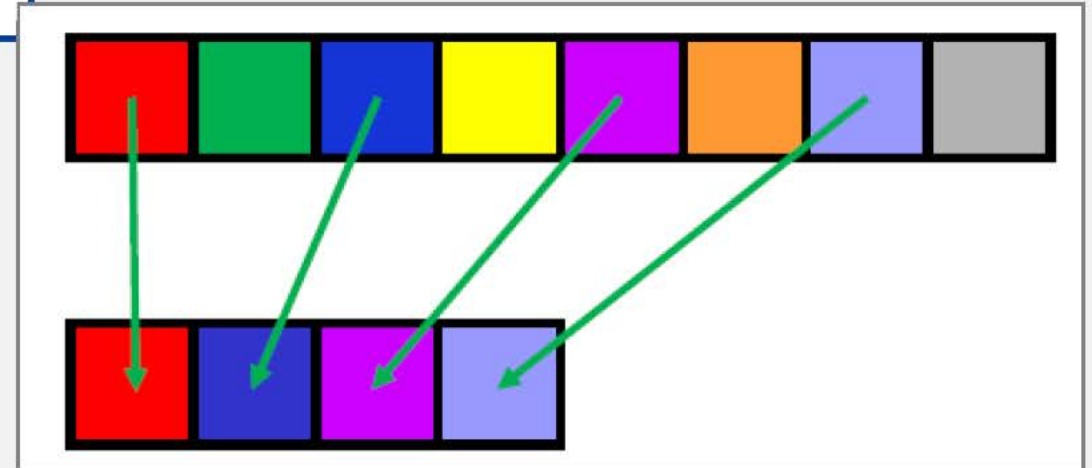
DI (Paper 13), 19

Meulen Teaches “shift[ing]”

Petitioner's Expert

sample-rate conversion. (EX2007, 5:15-29, 6:37-49.) Polyphase filters is one example type of sample-rate conversion. Sub-sampling is another type of sample-rate conversion, where a subset of the pixels of the input image are sampled. (EX1025.) For example, for a 2:1 compression, every other pixel may be sampled, which results in the position of every other pixel being shifted to a different position. This is shown in the figure below of a simplified example. The top part

Katsaggelos Reply Decl. (EX1014), ¶56



Katsaggelos Reply Decl. (EX1014), ¶56

Chao Teaches “shift[ing]”

Chao

[0028] Returning to FIG. 2, if an element is determined to be a background element, the method proceeds to block 106, where the background element is re-sized, by stretching or shrinking, as necessary, to fit the new page size. It should be

Chao (EX1008), [0028]

[0063] For the purposes of the present disclosure, it should be understood that 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, but the same size as the original in the vertical direction. If Sh is not greater than Sv ,

Chao (EX1008), [0063]

Decision on Institution

input to output positions. Further, we also agree that by disclosing stretching or shrinking of its background elements Chao also teaches pixel shifting.

DI (Paper 13), 19

Chao Teaches “shift[ing]”

Patent Owner Response

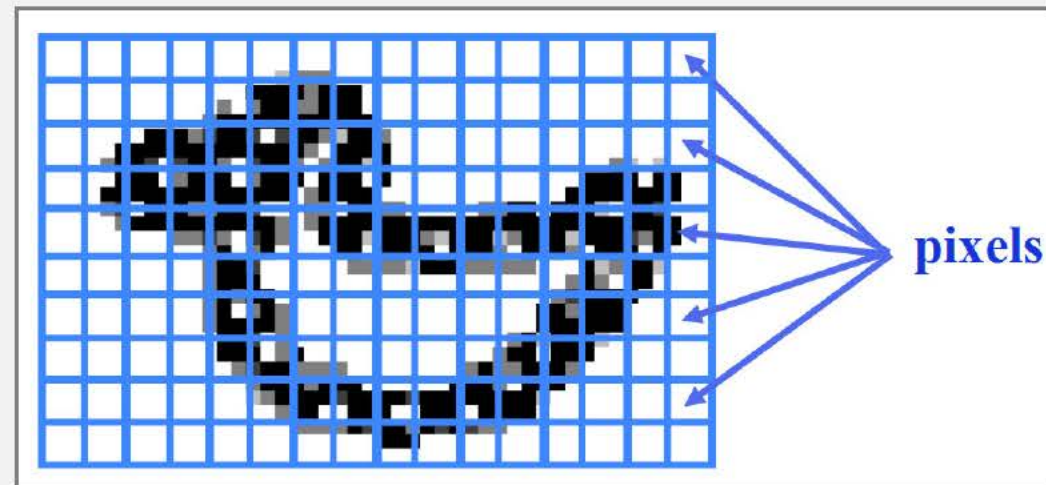
The only “shifting” Chao describes is the shifting of *foreground* objects in conjunction with the stretching of the background. Ex. 2027, ¶86. For

POR (Paper 25), 32

Yet Chao makes clear that while the foreground objects may be shifted, this does not involve a non-uniform transformation. Ex. 2027, ¶88.

POR (Paper 25), 34

Petitioner’s Expert



shifts objects, not pixels. (EX2027, ¶83.) However, as shown in the example figure below, the image of an object is made up of pixels. As a result, shifting the object means shifting the pixels. A plurality of pixels collectively forms an image of a duck in the example below. To shift the duck would require shifting the pixels that form the duck. I note that although the figure below has 160 pixels, the object

Katsaggelos Reply Decl. (EX1014), ¶60

Roadmap

1. The '413 Patent
 2. Claim Construction
 3. **Meulen-Chao** →
 4. Fleming
 5. Obara-Liu
 6. Secondary Considerations
- “input image” (1[a] / 2[b])
 - “determine a portion” (1[e] / 2[c])
 - “non-uniform[]” (1[g] / 2[e])
 - “shifts” (1[g] / 2[e])
 - **non-uniformly shifts “based on (1) the input positions along the first axis, and (2) the input positions along the second axis” (1[g] / 2[e])**
 - motivation to combine

'413 Patent, Claims 1 And 2

Claim 1

1[g]

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;

'413 Patent (EX1001), 9:16-19

Claim 2

2[e]

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;

'413 Patent (EX1001), 9:45-48

Meulen Teaches “based on (1) the input positions along the first axis, and (2) the input positions along the second axis”

In some embodiments, image compression and/or scaling may be applied in a horizontal direction and/or in a vertical direction. When applied in both the horizontal and vertical direction, the image compression and/or scaling may allow expansion of the lateral display regions 202-1-4 and 202-6-9 to create a magnified effect or to simulate a video graphics array (VGA) having a resolution of 640×480 with a display having a resolution of 320×320.

Meulen (EX1007), 10:19-26

8. The wireless device of claim 4, said display controller to apply compression in at least one of a horizontal direction a vertical direction.

Meulen (EX1007), 15:26-28

Meulen's Non-uniform Shifting

138. Because the media source content has a different aspect ratio and/or resolution than the display **138**, **image compression and/or scaling** may be applied to the media source that is to be displayed in **one or more of the display regions 140-1-5.**

Meulen (EX1007), 5:67-6:3

Roadmap

1. The '413 Patent
 2. Claim Construction
 3. **Meulen-Chao** →
 4. Fleming
 5. Obara-Liu
 6. Secondary Considerations
- “input image” (1[a] / 2[b])
 - “determine a portion” (1[e] / 2[c])
 - “non-uniform[]” (1[g] / 2[e])
 - “shifts” (1[g] / 2[e])
 - non-uniformly shifts “based on (1) the input positions along the first axis, and (2) the input positions along the second axis” (1[g] / 2[e])
 - **motivation to combine**

Motivation To Combine Meulen And Chao

262. It would have been obvious and known at the time of the '413 invention to a POSITA that scaling is performed by shifting the pixels from the input positions to the output positions. Meulen mentions “compression and/or scaling,” and provides details on how to perform compression. But Meulen does not disclose the details of how to perform scaling. A POSITA when faced with Meulen and having the knowledge about scaling would have been motivated to turn to a prior art reference that discloses the details of scaling.

263. Like Meulen, Chao discloses non-uniform scaling (prior art elements and known techniques applied to similar methods and devices). (EX1008, [0025].)

Katsaggelos Opening Decl. (EX1002), ¶¶ 262-263

271. As shown for element 2[f], it would have been obvious at the time of the '413 patent that when scaling an image, such as Chao teaches, the pixels positions shift from the input positions to the output positions. Meulen teaches that the amount of re-sizing at the central region is less than at the lateral regions. Thus, the combination of Meulen and Chao leads to the less shifting and “differences” in the central region compared to the lateral regions.

Katsaggelos Opening Decl. (EX1002), ¶271

Motivation To Combine Meulen And Chao

Decision on Institution

Petitioner argues that because Meulen mentions scaling of images without providing the details of how to perform scaling, a person of ordinary skill would have turned to Chao to learn these details. Pet. 91 (citing Ex. 1002 ¶ 262). Based on the teachings of these references and the similarity of the references' technology, we determine **Petitioner has established a reason to combine Meulen and Chao with a reasonable expectation of success in doing so.**

DI (Paper 13), 19-20



Fleming

Fleming

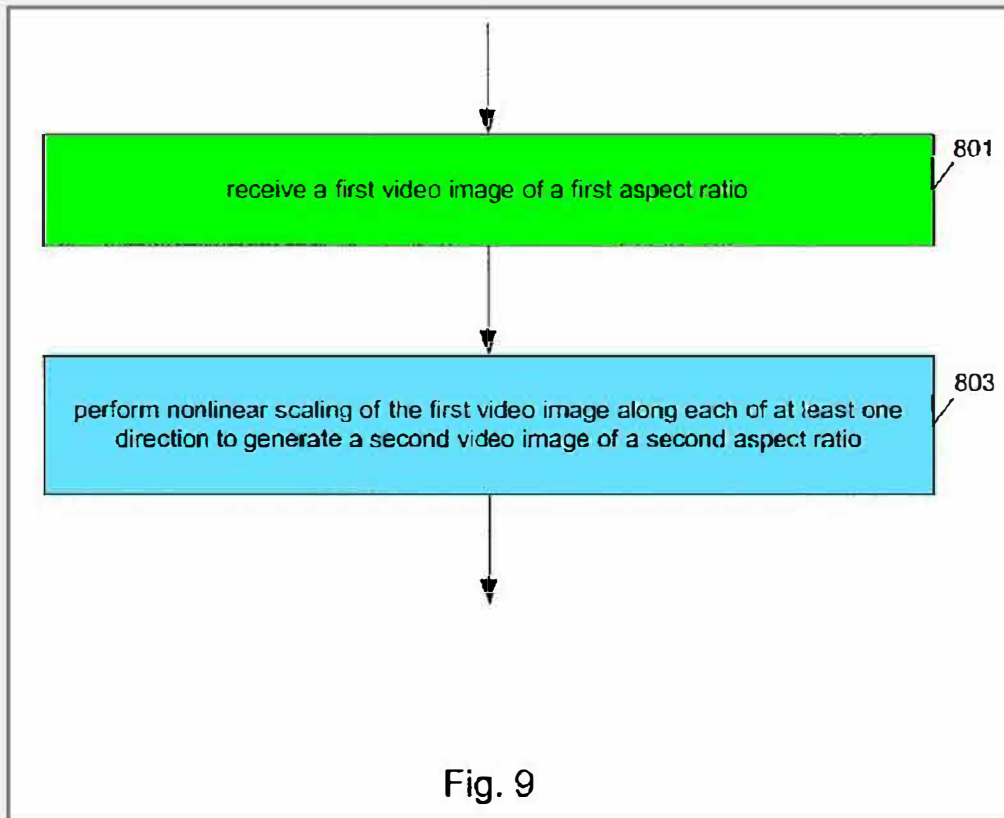


Fig. 9

Fleming (EX1004), Fig. 9

FIG. 9 shows a method to scale video images according to one embodiment of the present invention. After operation 801 receives a first video image of a first aspect ratio, operation 803 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. In one embodi-

Fleming (EX1004), 8:35-40

vertical direction. In one embodiment, the nonlinear functions are such that the original aspect ratio of the video image is preserved near the center region (or strip) of the image and the image is gradually stretched (or compressed) as it is mapped to the edges. In one example, the scaling is

Fleming (EX1004), Abstract

Roadmap

1. The '413 Patent
2. Claim Construction
3. Meulen-Chao
4. **Fleming** → {
 - **Obviousness**
 - “determine a portion” (1[e] / 2[c])
5. Obara-Liu
6. Secondary Considerations

Obviousness For Fleming

100. It would have been obvious at the time of the '413 patent for Fleming's data processing system (including its GPU, CPU, and microprocessor 103) to be included within a camera. Fleming discloses its data processing system connecting to a "video camera," which, at the time of the invention (2013), included image sensors, processors, memory, and software for capturing and processing the image data captured by an image sensor. (EX1004, 3:31.) The aspect ratios of images captured by an image sensor were, e.g., 3:2 or 4:3. However, the files that stored the captured images may be in a format for a different aspect ratio, such as 16:9 (e.g., for landscape orientation), or the LCD displays within the camera may have a different aspect ratio, such as 16:10 (for viewing the captured image). Hence, the aspect ratio of the image captured by the image sensor (3:2 or 4:3, for example) may be different from the aspect ratio of the image stored in memory or displayed on the display (16:9 or 16:10, for example).

the camera can have this processing capability. It would have been obvious at the time of the '413 patent for the camera to also include a display for displaying the captured image. Without this on-camera processing and display capability, the data captured by the image sensor would need to be transferred to, e.g., a separate computer for further processing. A POSITA would be motivated to have this on-camera processing capability because it would be burdensome, expensive, and time consuming to require a separate computer to perform the processing and to display the captured image. Processing and displaying of images or videos on the camera was a known technique at the time of the '413 patent. These on-camera capabilities improve devices that are similar and/or ready for improvement.

Katsaggelos Opening Decl. (EX1002), ¶100

Cameras At The Time Of The '413 Patent

Canon

PowerShot G15

CMOS Sensor (Megapixels):	13.30
CMOS Size (inches):	1/1.7"
Focal Length Multiplier:	n/a
Aspect Ratio:	16:9, 4:3

PowerShot G15 Specs (EX1029), 2

Image Customization Features

Still Images

Changing the Aspect Ratio

Change the image aspect ratio (ratio of width to height) as follows.



Configure the setting.

- Press the **<FUNC SET>** button, choose **[4:3]** in the menu, and choose the desired option (see 47).
- Once the setting is complete, the screen aspect ratio will be updated.
- To restore the original setting, repeat this process but choose **[4:3]**.

- 16:9** Used for display on widescreen HDTVs or similar display devices.
- 3:2** Same aspect ratio as 35mm film, used for printing images at 5 x 7-inch or postcard sizes.
- 4:3** Native aspect ratio of the camera screen, also used for display on standard-definition televisions or similar display devices, or for printing images at 3.5 x 5-inch or A-series sizes.
- 1:1** Square aspect ratio.
- 4:5** Aspect ratio commonly used for portraits.

PowerShot G15 User Manual (EX1028), 80

Fleming And Cameras At The Time Of The '413 Patent

89. Fleming itself disclosed a nonlinear scaling that applies a transformation using a simple math equation: $Y=y(A+(B-A)\times(y/H)^2)$ as an example. (EX1004, 6:18-27.) This math is simple because it involves basic math operations of addition, subtraction, and multiplication. “A” and “B” are linear scaling factors (constant values), H is half the height of the video image (also a constant value). These are math operations that a processor included in a camera in 2013 would be able to easily perform. This math equation is simpler than other image processing functions (e.g., interpolations) performed by the processors included within the camera at the time.

*Katsaggelos
Reply Decl.
(EX1014), ¶89*

Katsaggelos Reply Declaration

Canon PowerShot G15

Canon G15 Review- Performance

In this section I'll go over area's of the G15's performance that I feel are noteworthy. Obviously there will be areas I don't cover but I'll try to prioritize the most important ones. That said, the Canon G15 is equipped with a new Digic V processor, that helps the G15 process complex equations faster than previous cameras.

*Reply (Paper 32), 25;
Katsaggelos Reply Decl. (EX1014), ¶90
(cited at Reply (Paper 32), 24)*

Canon PowerShot G15 Article (EX1026), 2

Conventional Aspect Ratio Conversion Techniques

'413 Patent

image to the display. Conventional conversion techniques such as cropping, linearly scaling, and padding each result in a perceivable reduction in the quality of the image or video. For example, cropping removes content from the image and reduces the field of view of the image. Linear scaling maintains the full field of view but introduces perceivable distortion into the image. For example, if an image is vertically compressed and/or horizontally stretched to convert from a 4:3 to a 16:9 aspect ratio, features in scene will appear “short and fat” relative to the original image. Padding maintains the full field of view without distortion, but results in unused display space around the sides and/or top of the image, thus rendering an image that appears too small relative to the display.

'413 Patent (EX1001), 1:12-25

and OM-D, which I'm find increasingly useful and missing on my Nikons. Sadly though, the LCD on the two smaller cameras remains as a 3", 16:9 aspect ratio unit, which is great for video but leaves a lot of unused real estate in the form of black bars when you're shooting in the native 4:3 aspect ratio of the sensor. Useable area is probably closer to 2.5".

Canon PowerShot G15



Images supported for cropping will have the same aspect ratio after cropping.

Cropped images will have a smaller resolution than uncropped images.

PowerShot G15 User Manual (EX1028), 208

Olympus PEN E-PL5

Roadmap

1. The '413 Patent
2. Claim Construction
3. Meulen-Chao
4. **Fleming** → {
 - Obviousness
 - “determine a portion” (1[e] / 2[c])
5. Obara-Liu
6. Secondary Considerations

'413 Patent, Claims 1 And 2

Claim 1

1[e]

determine a portion within the input image, the portion including a subset of the pixels; and

'413 Patent (EX1001), 9:8-9

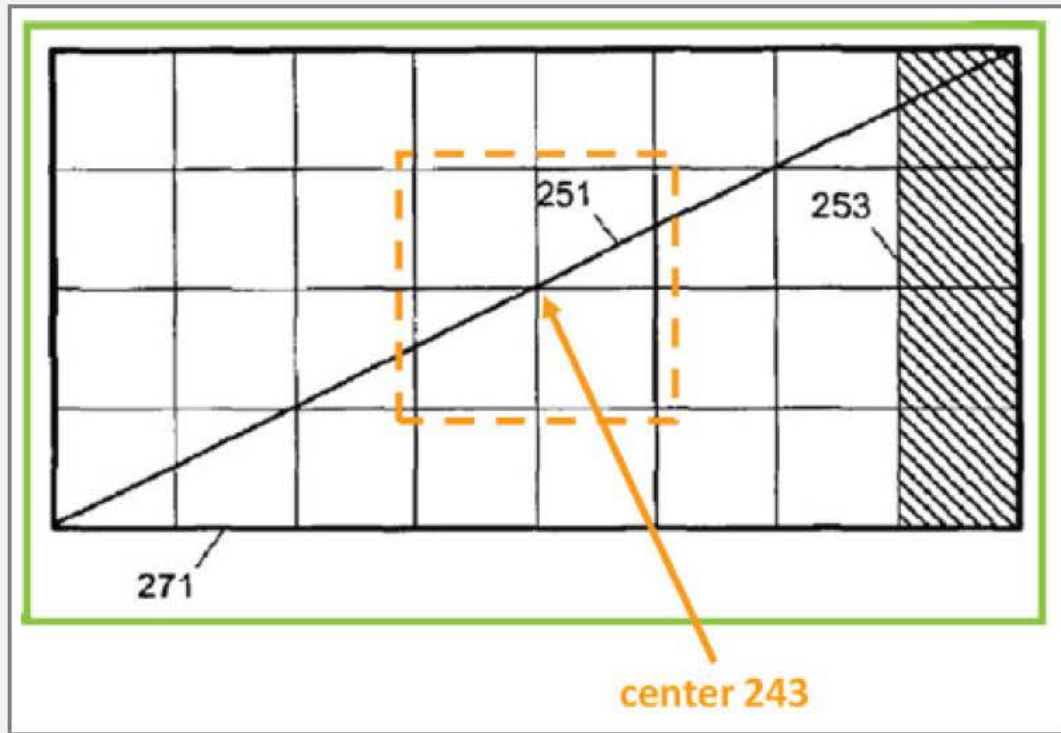
Claim 2

2[c]

determine a portion within the input image, the portion including a subset of the pixels; and

'413 Patent (EX1001), 9:37-38

Fleming Teaches “determin[ing] a portion”



Fleming (EX1004), Fig. 2

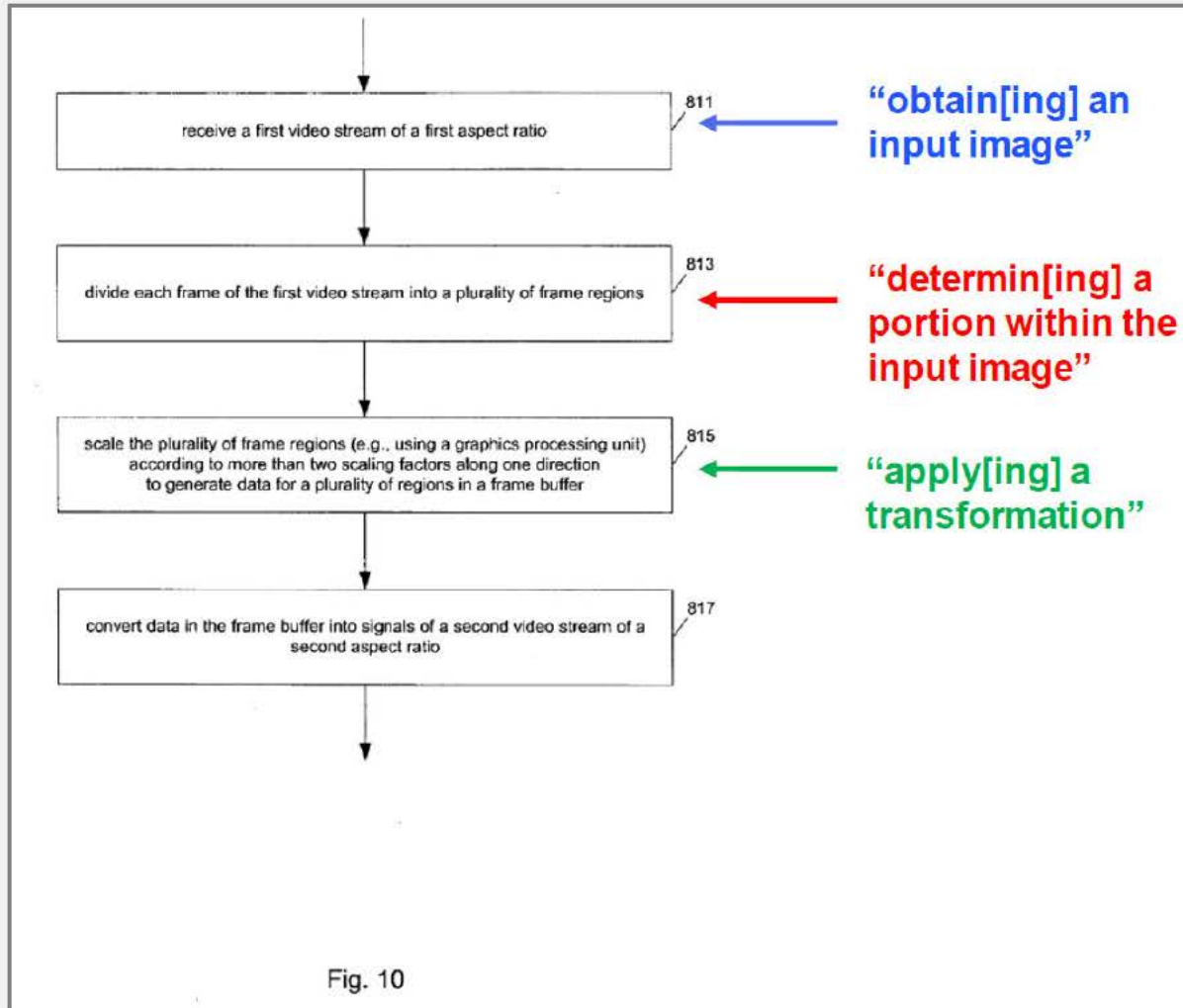
According to one embodiment of the present invention, it is desirable to maintain the original aspect ratio in an area of interest (e.g., at the center of the image) and gradually stretch the image in other areas. Thus, the image in the area of interest is presented in the target display area with reduced distortion (or with no distortion), while other areas are distorted. Nonlinear scaling is used according to one embodiment of the present invention to achieve such results.

Fleming (EX1004), 4:38-45

Different schemes can be used in determining the strips and coordinates for instructing the graphics hardware to perform the scaling. For example, the original video image can be divided into evenly spaced strips so that the graphics hardware can scale them into strips of different widths for the frame buffer. Alternatively, the original video image may

Fleming (EX1004), 7:3-12

Fleming Teaches “determin[ing] a portion” Under PO’s Construction



Fleming (EX1004), Fig. 10

invention. Operation 811 receives a first video stream of a first aspect ratio. Operation 813 divides each frame of the

Fleming (EX1004), 8:48-49

first aspect ratio. Operation 813 divides each frame of the first video stream into a plurality of frame regions. Operation

Fleming (EX1004), 8:49-50

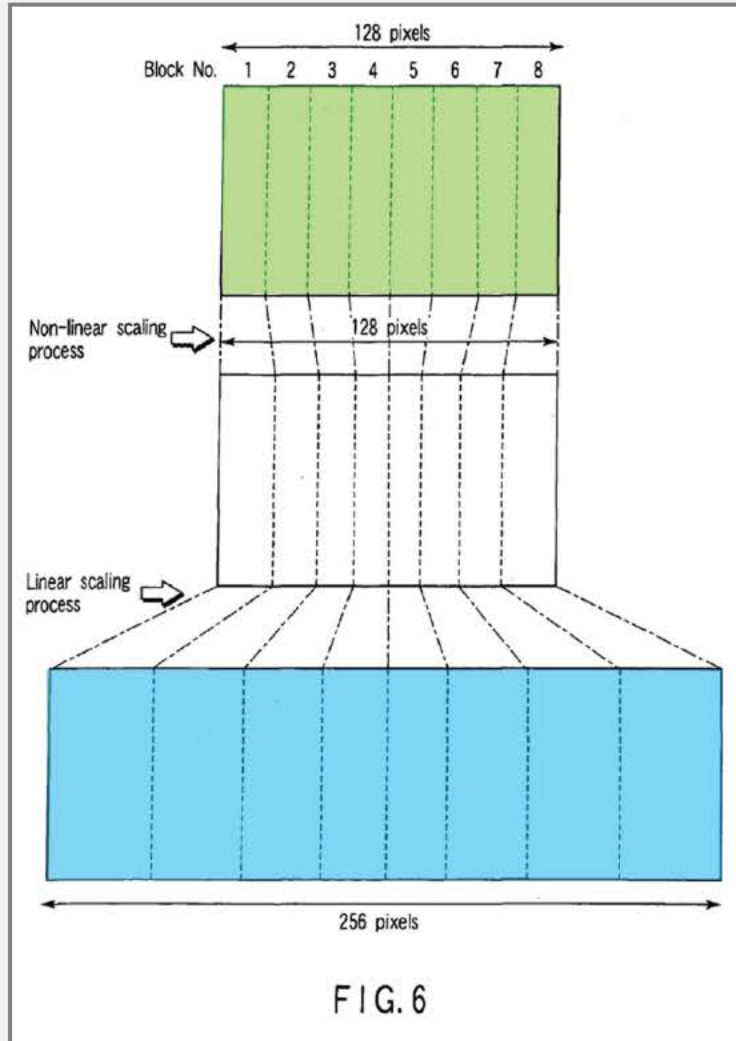
first video stream into a plurality of frame regions. Operation 815 scales the plurality of frame regions (e.g., using a graphics processing unit) according to more than two scaling factors along one direction to generate data for a plurality of regions in a frame buffer. Operation 817 converts data in the

Fleming (EX1004), 8:50-54



Obara

Obara



Obara (EX1006), Fig. 6

According to one embodiment, an information processing apparatus includes an image processing unit which executes a non-linear scaling process of vertically dividing input image data having a first size into a plurality of image blocks

* * *

which is subjected to the non-linear scaling process, by linear scaling, generates output image data having a second size greater than the first size, and displays the generated output image data on a display device.

Obara
(EX1006),
Abstract

[0052] The size of original image data (A) with 720×480 pixels 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, with the total number of pixels being unchanged in the horizontal and vertical directions. Thereby, image data (B) is

Obara
(EX1006),
[0052]

Roadmap

1. The '413 Patent
2. Claim Construction
3. Meulen-Chao
4. Fleming
5. **Obara-Liu** —————→ {
 - **Obviousness**
 - “determine a portion” (1[e] / 2[c])
6. Secondary Considerations

Obviousness for Obara-Liu

201. It would have been obvious at the time of the '413 patent 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 image sensors, processors, memory, and software for capturing and processing the image data captured by an image sensor. The aspect ratios of images captured by an image sensor were, e.g., 3:2 or 4:3, which may be different from the aspect ratios of files that stored the captured images. Digital cameras at this time also included LCD displays (for viewing the captured image). The aspect ratios of the images captured by an image sensor may also be different from the LCD displays within the camera. Due to differences in aspect ratios, it would have been obvious to convert from the aspect ratio of the images captured by the image sensor to the aspect ratio of the stored files and/or LCD display. As Obara explains, "a scaling technology is used in

Katsaggelos Opening Decl. (EX1002), ¶201

(EX1006, [0049].) It would have been obvious at the time of the '413 patent for the processors and display to be included within a camera, so that the camera can have this processing capability and ability to display the image data on a screen having an aspect ratio of 16:9 or 16:10. Without this on-camera processing and display capability, the data captured by the image sensor would need to be transferred to, e.g., a separate computer for further processing. A POSITA would be motivated to have this processing and display capability on the camera because it would be burdensome, expensive, and time consuming to require a separate computer to perform the processing and to display the captured image.

Katsaggelos Opening Decl. (EX1002), ¶202

Obara

to reduce the load on the CPU 111. In the present embodiment, in order to realize a size altering process (enlargement/reduction) of image data, which is necessary for a non-linear scaling process, by an arithmetic process with a relatively light load, the size altering process is executed with enlargement ratios each corresponding to an integer number of times of $1/(a \text{ power of } 2)$, i.e. an integral multiple of $1/2^n$ (n is an integer). Thereby, a pixel interpolation process for altering the size of an image in the horizontal direction can be realized by only an arithmetic process including bit shift and multiplication of integers, and the load on the CPU 111, which is necessary for the size altering process, can greatly be reduced.

Obara (EX1006), [0047]

[0086] In the non-linear scaling process of the present embodiment, the enlargement ratio of each image block is an integral multiple of $1/2^n$. Hence, the pixel interpolation process for enlargement/reduction is realized by multiplication of integers and bit shift, and there is no need to execute a floating point arithmetic operation with a heavy load. Therefore, the non-linear scaling process can be executed by software without causing an increase of the load on the CPU 111.

Obara (EX1006), [0086]

Roadmap

1. The '413 Patent
2. Claim Construction
3. Meulen-Chao
4. Fleming
5. **Obara-Liu** —————→ {
 - Obviousness
 - “determine a portion” (1[e] / 2[c])
6. Secondary Considerations

'413 Patent, Claims 1 And 2

Claim 1

1[e]

determine a portion within the input image, the portion including a subset of the pixels; and

'413 Patent (EX1001), 9:8-9

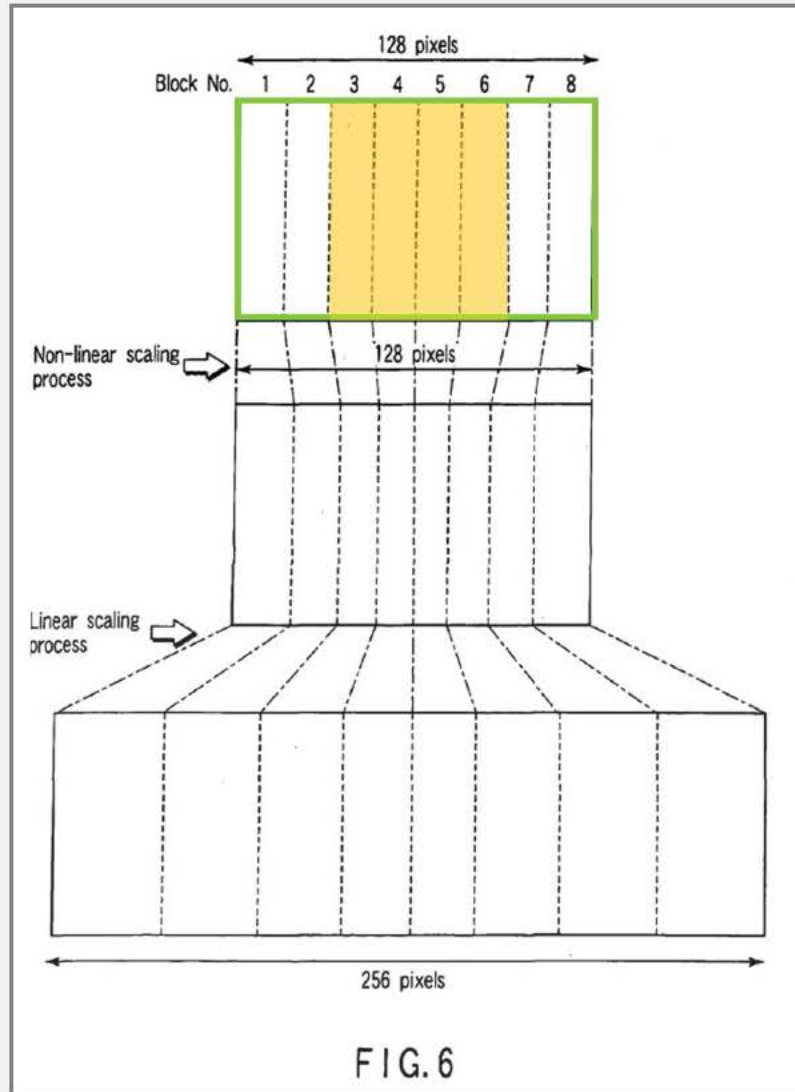
Claim 2

2[c]

determine a portion within the input image, the portion including a subset of the pixels; and

'413 Patent (EX1001), 9:37-38

Obara Teaches “determin[ing] a portion”

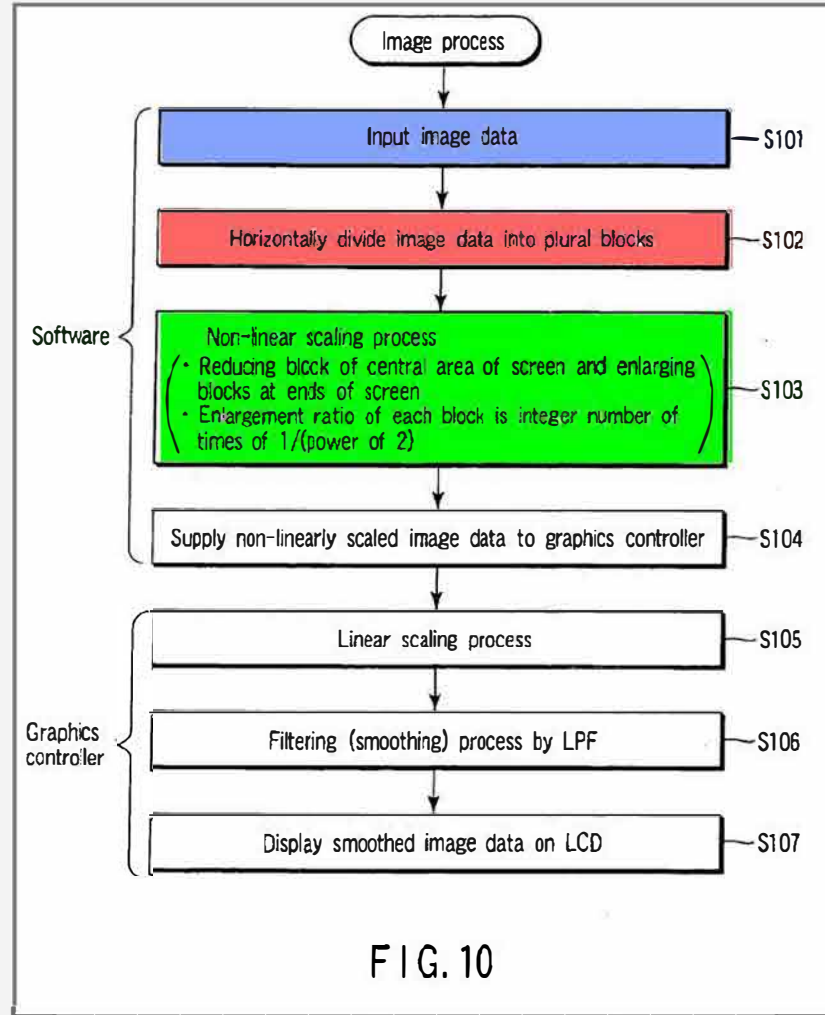


[0062] The non-linear scaling module 215 vertically divides the original image data (A) into, for example, eight image blocks. The non-linear scaling module 215 horizontally reduces image blocks 3, 4, 5 and 6 which belong to the central area. Further, the non-linear scaling module 215 horizontally alters (enlarges) the sizes of the other image blocks with enlargement ratios that gradually increase toward the blocks located at both ends of the image data.

Obara (EX1006), [0062]

*Obara (EX1006),
Fig. 6*

Obara Teaches “determin[ing] a portion” Under PO’s Construction



Obara
(EX1006),
Fig. 10

[0082] To start with, the CPU 111, that is, the non-linear scaling module 215, inputs image data which is to be processed (block S101). The CPU 111, or the non-linear scaling module 215, divides input image data into a plurality of vertically extending image blocks (block S102), and subjects the input image data to a non-linear scaling process (block S103). In block S103, the CPU 111, or the non-linear scaling module 215, horizontally alters the size of at least one image block, which belongs to a central area of the input image data, with an enlargement ratio less than 1, thereby horizontally reducing the at least one image block. Further, in block S103, the CPU 111, or the non-linear scaling module 215, horizontally alters the sizes of the other image blocks with enlargement ratios which have values greater than the enlargement ratio corresponding to the image block of the central block and gradually increase toward end portions of the input image data. As regards any one of the image blocks of the input image data, a value corresponding to an integral multiple of $1/2^n$ is chosen as the enlargement ratio. In the size altering process, the CPU 111, or the non-linear scaling module 215, executes an arithmetic process including multiplication of positive integers and bit shift.

Obara (EX1006), [0082]

Roadmap

1. The '413 Patent
2. Claim Construction
3. Meulen-Chao
4. Fleming
5. Obara-Liu
- 6. Secondary Considerations**

Petitioner's Motion to Strike

Petitioner's Motion To Strike Sur-reply Arguments

1. Arguments that the '413 patent excludes non-uniformly shifting along one axis

- a. POR made narrowing arguments (“non-uniform” means “non-linear,” the claims require a certain order for the steps), but no arguments that the '413 claims exclude the embodiment of non-uniformly shifting along one axis.
- b. POR argues that equations at 6:65-7:5 and 7:6-42 in the '413 specification are applied to “every pixel” (POR, 26-27), but then Sur-reply argues 6:65-7:5 equations “not embodied by the limitation” (Sur-reply, 23-24).
- c. Patent Owner's expert testified that claim 1 of the '413 covers the examples described in the specification. (EX1015, 21:13-18.)

Petitioner's Motion To Strike Sur-reply Arguments

2. Patent Owner's new separate device argument

- a. Petition presented that it would have been obvious to apply the non-uniform shifting of Fleming/Obara by processor(s) included within a camera. (Petition, 28, 71.)
- b. Reply emphasized the same argument as the Petition, stating the benefits are “compared to applying non-uniform shifting by a separate device.” (Reply, 20-21.)
- c. Sur-reply newly argues that the combination's benefits are compared to a “hypothetical [involving] re-uploading the image back to the camera for display.” (Sur-reply, 27.)

Petitioner's Motion To Strike Sur-reply Arguments

3. Arguments that Meulen's "one" display region option means not non-uniformly shifting all other display regions

- a. Petition and Reply pointed to 10:19-26 to show Meulen teaches non-uniform shifting along both axes. (Petition, 90-92; Reply, 18-20.)
- b. POR pointed to Meulen's Table 1 and 5:65-67 and argued "each" region's compression is affected by the horizontal position and display regions only. (POR, 38-41.)
- c. Sur-reply points to different passages, 5:67-6:3 and 8:15-18, and argues the disclosures of "one" in "one or more display regions" means Meulen does not non-uniformly shift all other display regions. (Sur-reply, 24.)

4. Patent Owner's shift to arguing presumption of nexus

- a. POR argued "there is a **direct** nexus between SuperView and the objective evidence." (POR, 49 (emphasis added).)
- b. Sur-reply argued "a **presumptive** nexus for SuperView." (Sur-reply, 24-25 (emphasis added).)

Patent Owner's Motion to Strike

Petitioner's Opposition To Patent Owner's Motion To Strike

1. Palm Treo arguments and evidence

- a. Meulen discloses its device may be a “Palm® Treo™ smartphone[,],” as POR acknowledged. (POR, 10.)
- b. Petition reproduces Figure 1 of Meulen, which shows a Palm Treo. (Petition, 86.)
- c. Directly responsive to Patent Owner's arguments that Meulen's device did not display images captured by its built-in camera (POR, 15), and there was no need for Meulen to perform aspect ratio conversion (POR, 16).

2. Sub-sampling arguments

- a. Directly responsive to Patent Owner's argument that Meulen's compression uses polyphase filtering **only**. (POR, 11, 30.)
- b. Reply elaborated on Petition's arguments that Meulen's method involves shifting. (Petition, 90-92.)
- c. Petition identified Meulen's Table 1 embodiment (Petition, 90), which Meulen describes as “compris[ing] software to perform sample-rate conversion” (EX1007, 6:48-49).

Petitioner's Opposition To Patent Owner's Motion To Strike

3. Camera arguments and evidence

- a. Petition argued it would have been obvious for the processor(s) of Fleming or Obara to be within a camera. (Petition, 28, 72.)
- b. Elaboration on the Petition's argument that cameras at the time of the '413 patent had a need to perform aspect ratio conversion. (Petition, 28, 72.)
- c. Directly responsive to Patent Owner's argument that camera designers at the time of the '413 patent did not contemplate performing aspect ratio conversion and there were major design problems. (POR, 62.)

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

I hereby certify that the attached PETITIONER'S DEMONSTRATIVES
was served as of the below date via e-mail (by agreement) to the following counsel
of record for Patent Owner:

James M. Glass, Registration No. 46,729
John T. McKee, Registration No. 65,926
Quincy Lu, Registration No. 76,954
Patrick Schmidt (*pro hac vice*)
Nathaniel A. Hamstra, Registration No. 65,680
Quinn Emanuel Urquhart & Sullivan LLP
Email: jimglass@quinnemanuel.com
Email: johnmckee@quinnemanuel.com
Email: quincylu@quinnemanuel.com
Email: patrickschmidt@quinnemanuel.com
Email: nathanhamstra@quinnemanuel.com

Dated: October 3, 2025

By: /s/ Jean Nguyen
Jean Nguyen