

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TESLA, INC.

Petitioner,

v.

INTELLECTUAL VENTURES II LLC

Patent Owner.

Case No. IPR2025-00339

U.S. Patent No. 7,916,180

Patent Owner Demonstratives

Independent Claims of the '180 Patent

1. A digital camera comprising:
a plurality of channels, wherein each channel includes an optics component and an array of photo-detectors integrated on a semiconductor substrate, the plurality of channels including a first channel having a first field of view (FOV) comprising a first angular width of a scene imaged by the camera and a second channel having a second FOV comprising a second angular width of the scene imaged by the camera, wherein the first and second angular widths are different; and
a processing component coupled to the plurality of channels, the processing component configured to independently control simultaneous data acquisition with each of the plurality of channels, the processing component configured to combine data of a frame from at least one of the plurality of channels to provide an image having a relatively high resolution.

22. A method comprising:
configuring a first optics component relative to a first image sensor to form a first channel having a first field of view (FOV) that comprises a first angular width of a scene;
configuring a second optics component relative to a second image sensor to form a second channel having a second FOV that comprises a second angular width of the scene, wherein the first and second angular widths are different;
independently controlling simultaneous data acquisition with each of the first and second channels during a frame; and
combining data received during the frame from one or more of the first and second channels to provide an image.

The Issues Before the Board Today

- Does Ground 1 actually **prove simultaneous data acquisition** with the claimed channels, rather than sequential capture plus stitching?
- Does Petitioner prove **independently controlling ... during a frame** as claim 22 requires, or has it substituted downstream readout and expert-created timing diagrams for what the reference actually says?
- Does Matsushima teach or even support **different exposure/integration times** for the two imaging systems, when its text repeatedly uses singular exposure language?
- Has Petitioner actually explained how Yu's dynamic-range approach fits Matsushima's stitched different-FOV architecture?
- For Ground 3, is Labaziewicz even prior art?

Claim Construction

“simultaneous data acquisition
with each of the plurality of
channels”

Claims 1 and 22 require actual simultaneous acquisition by the claimed channels

The plain meaning of “simultaneous” in “simultaneous data acquisition with each of the plurality of channels” requires at least some data acquisition with each of the plurality of channels to occur at the same time. For example, the recitation of “simultaneous” in this phrase requires at least some overlap in the data acquisition windows in each of the plurality of channels. Ex. 2020, ¶62.

POR, 15

“Simultaneous” means at the exact same time. The Reply argues that the plain meaning of “simultaneous” includes “nearly simultaneous,” but cites no dictionary or other authority that equates the two because none exists. When events occur “simultaneous” they happen at the exact same time; when events occur “nearly” simultaneously they happen almost but not at the exact same time.¹ Under controlling precedent, the fact that the specification refers to both “simultaneous or nearly simultaneous” image capture, but the claims refer only to “simultaneous” means that “nearly simultaneous” is outside the scope of the claims. See, POR, at 15-16. The Reply attempts to distinguish that precedent because, according to Petitioner, “nearly simultaneous” and “simultaneous” are not mutually exclusive.

Sur-Reply, 1

Q. So if the difference is several nanoseconds, it is also nearly; is that right?

A. Well, the point is it's --

simultaneous is at the same time. If I said to you I'm moving my right hand and my left hand simultaneously, that means I'm moving them both at the same time, versus nearly simultaneous, where I may move my right hand and a few milliseconds or later I move my left hand. I don't think I can move in a nanosecond world, but -- so it's -- the point is simultaneous is at the same time of whatever something is happening.

EX1070, 12:24-13:10

Q. How do you define nearly?

A. Nearly simultaneous, close to simultaneous, close in time.

Q. How close is nearly?

A. Well, I mean, close in time, like, you know, maybe -- I mean, kind of like -- I think in the previous proceeding that we were talking about, you had a -- a reference that was Miyazaki. It had images that are, essentially, close in time by delta T.

So that would be nearly simultaneous. They're close in time. There's some time instance between them. They're not at the same time.

EX1070, 10:4-17

Claims 1 and 22 require actual simultaneous acquisition by the claimed channels

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POR, 15

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Sur-Reply, 1

A digital camera system and methods are described below that provide a digital camera in which multiple fields of view (FOV) of an image are simultaneously acquired. The digital camera system includes a digital camera having two or more camera channels each with independent image sensors. The sensor of each camera channel has an active area that includes multiple picture elements (pixels), and image capture includes simultaneous or nearly simultaneous use of the multiple camera channels. Each camera channel and associated optics of that camera channel has a predetermined field of view that can be different from other camera channels of the digital camera system. The digital camera system therefore makes possible the formation of multiple high resolution images in which different fields of view are acquired simultaneously. The digital camera system further includes methods for forming images as described below.

EX1001, 3:21-36

The digital camera systems of an embodiment provide digital cameras with large effective single-frame dynamic exposure ranges through the use of multiple camera channels, including multiple optics and image sensors. The multiple camera channels are all configured to image the same field of view simultaneously, and each operates independently under a different integration time. The digital camera can include, for example, a 3x3 assembly of image sensors, perhaps three sensor of each color (e.g., red (R), green (G), and blue (B)) and the integration time of the sensors associated with each color can be varied, for example, each color can have three distinct values (e.g., 0.1 msec, 1 msec, and 10 msec integration time, respectively). The data from all sensors can be digitally combined to provide a much greater dynamic range within one frame of digital camera data. The raw digital camera data could be used by digital signal processing of the scene. The digital data can also be stored and displayed to exhibit low light or bright light characteristics as desired.

Exhibit 2031

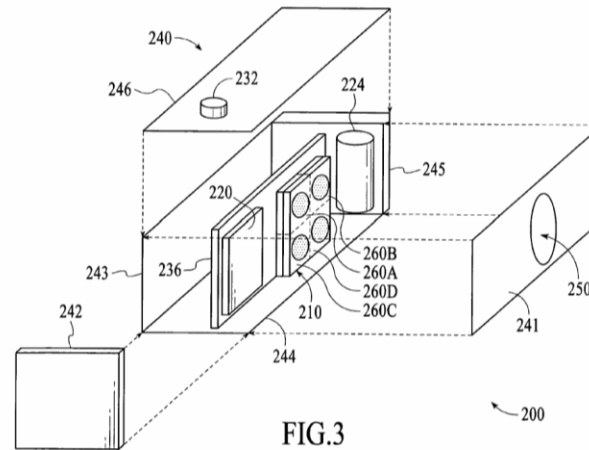
Digital photography often requires imaging and subsequent display of different fields of views of the same or nearly the same scene. In some applications it is desirable to capture different fields of view of the same scene at the same time. This is not possible with optical zoom because of the time required to move the optical elements. Electronic zoom can display wide and narrow field of view (FOV) by cropping and enlarging the size of a portion of an image, but the displayed narrow field is often of inferior resolution. Foveal image sensors that use multiple pixels arranged both within and about a central fovea region of the chip can be used to acquire both a wide and narrow field of view. The pixels in the central fovea region have a smaller size than the pixels arranged in peripheral rings about the central region. The foveal image sensor has high resolution only in the narrow field of view. Multiple digital cameras with different fields of view can be integrated into a single camera body and used to acquire images simultaneously; however a system including multiple digital cameras is large and expensive. Consequently, there is a need for a high-performance solid-state digital camera that is capable of simultaneously acquiring imaging having high resolution using multiple fields of view.

EX1001, 2:1-24

EX1001, 20:7-25

The '180 patent repeatedly emphasizes simultaneous acquisition of multiple FOVs, while separately disclosing “simultaneous or nearly simultaneous” embodiments; the claims recite only “simultaneous.”

The digital cameras described herein enable imaging that includes simultaneous acquisition of multiple fields of view of an image. FIG. 3 shows a digital camera 200 configured for simultaneous acquisition of multiple fields of view, under an embodiment. The digital camera 200 includes a digital camera subsystem 210, an electronic image storage media 220, a power supply 224, a peripheral user interface (represented as a shutter button) 232, a circuit board 236 that supports and/or electrically couples or interconnects the components, a housing 240 (including housing portions 241, 242, 243, 244, 245 and 246) and a shutter assembly (not shown), which controls an aperture 250 and passage of light into the digital camera 200. The digital camera subsystem (DCS) 210 includes one or more camera channels (e.g., four camera channels 260A-260D) and replaces and/or fulfills one, some or all of the roles fulfilled by the lens assembly 110, the color filter 112 and the image sensor 116 of the digital camera 100 described above. The four camera channels 260A-260D are configured through pixel array size and/or optical focal length to provide a desired field of view for that channel. The four camera channels 260A-260D can be operated simultaneously with independent electrical control of features such as integration time control and frame rate (in video applications) to name a few.



An optics portion of a second camera channel receives light from within a second field of view and transmits one or more portions of the received light to the corresponding sensor portion. The sensor portion of the second camera channel receives one or more portions of the light transmitted by the optics portion and outputs a signal representative of the received light. The output signal from the sensor portion is coupled to the image processor, which can generate an image or data based at least in part on information of the output signal. The operations of the second camera channel are simultaneous or nearly simultaneous with the operations of the first camera channel. Operations of any additional camera channels are similar to operations of the first and/or second camera channels described above.

EX1001, 8:63-65

EX1001, 5:44-67

“during a frame”

Claim 22's "during a frame" limits control of acquisition by the channels — not downstream processing

Claim 22 recites "independently controlling ... data acquisition ... during a frame." In this context, a "frame" is digital data corresponding to a single image. See, e.g., Ex. 1001, 20:19-21 (referring to "one frame of digital camera data"). Ex. 2020, ¶64. The phrase "during a frame" corresponds to the exposure interval during which an image sensor captures a single image." See, e.g., Ex. 2009, 11:49-51 ("A single frame period is the continuous exposure time over which any of the entire array of pixels ... is exposed").³ Consistent with Patent Owner's proposed construction, the '180 Patent repeatedly speaks of controlling the "frame rate," which is typically expressed as the number of single images captured by the sensor per second. Ex. 1001, 4:57-60 ("imager frame rate"); 4:9-15 ("independent frame rate"), 5:63-66 ("frame rate"); 7:23-27 ("frame rate"); and Ex. 2020, ¶64.

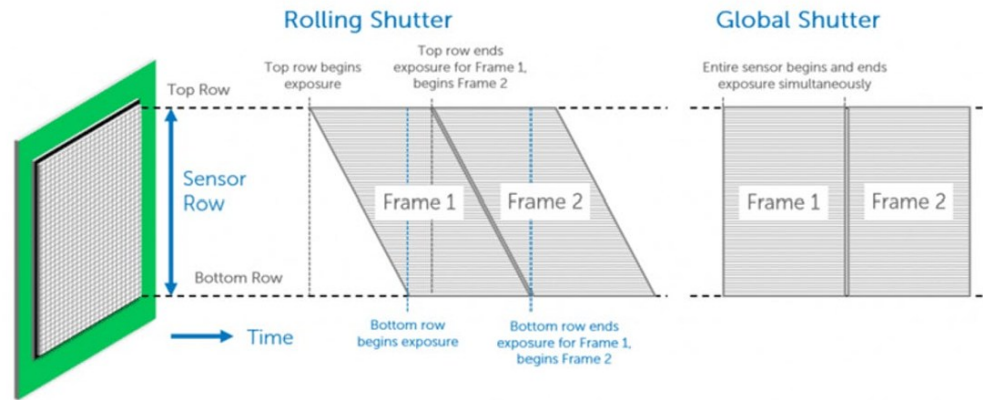
The digital camera systems of an embodiment provide digital cameras with large effective single-frame dynamic exposure ranges through the use of multiple camera channels, including multiple optics and image sensors. The multiple camera channels are all configured to image the same field of view simultaneously, and each operates independently under a different integration time. The digital camera can include, for example, a 3×3 assembly of image sensors, perhaps three sensor of each color (e.g., red (R), green (G), and blue (B)) and the integration time of the sensors associated with each color can be varied, for example, each color can have three distinct values (e.g., 0.1 msec, 1 msec, and 10 msec integration time, respectively). The data from all sensors can be digitally combined to provide a much greater dynamic range within one frame of digital camera data. The raw digital camera data could be used by digital signal processing of the scene. The digital data can also be stored and displayed to exhibit low light or bright light characteristics as desired.

EX1001, 20:8-24

POR, 16-17

Rolling Mode == During A Frame

In contrast to exposure control, which is used by conventional digital cameras to manage dynamic range, the digital camera systems of an embodiment use integration time control to control the time the electrical signal is integrated on a charge storage device (capacitance) within a sensor (pixel), as described herein. Integration time control, also referred to as “focal plane shutter” control, controls the time the electrical signal is integrated or accumulated by controlling a switch (e.g., charge integration switch) coupled or connected to the sensor or a photo-detection mechanism of a sensor. For example, the charge integration switch is placed in a state to allow charge to accumulate within the sensor for a period of time approximately equal to the integration time corresponding to that sensor; upon completion of the integration period, the switch is placed in a state to transfer the accumulated charge as a photo-signal to a processing component. Digital camera components or circuitry are configured to allow independent control of the charge integration switch associated with each sensor, thereby making possible dynamic range control for each sensor. The integration time control can be executed (depending on readout configuration) according to a number of techniques, for example, rolling mode and/or snap-shot mode to name a few.

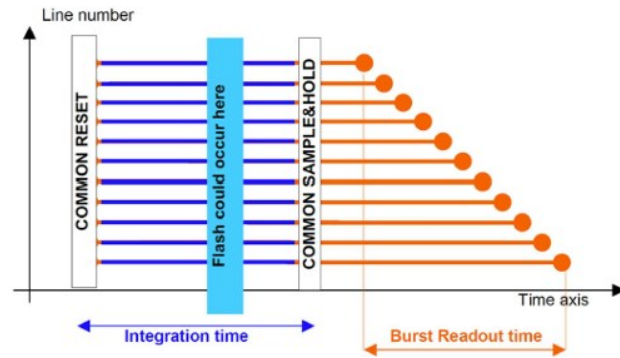


Ex. 2020, ¶46. Significantly, as depicted above, in the rolling shutter mode the start and stop times of the integration interval of individual rows of pixels must necessarily be controlled during the frame time, while in the global shutter mode no such control is used during the frame time. Ex. 2020, ¶47.

POR, 10

EX1001, 20:29-51

“During a Frame” occurs during data acquisition



Ex. 1069, ¶69. Focusing on the components that the Petition maps to a *channel* (i.e., the optics and *sensor*), the diagram above illustrates that the *sensor acquires the data during the integration time* (blue) and provides it to a “Common Sample & *Hold*” component from which the data is read out. Clearly, by the time the data is stored in the “Common Sample & *Hold*” component, the *acquisition of data by the sensor (and the channel) has concluded*. Completely absent from the analysis of Petitioner’s declarant is an explanation of how the control of the “burst readout” -- which occurs *after* data acquisition by the sensor (and *the channel*) has concluded -- meets the claim language which requires controlling “data acquisition *with each of the first and second channels*” (i.e., data acquisition with the optics and sensor that form each channel).

Sur-Reply, 8-9

The Reply (at 5) proposes equating “during a frame” with a frame period corresponding to “the time lapsed between successive image readouts.” That proposed construction renders the phrase “during a frame” in claim 22 completely meaningless because essentially *every moment* that the camera is functioning is “between successive image readouts.” If the Applicant had intended to claim “independently controlling simultaneous data acquisition” at *any moment* that the camera was functioning, there would have been no reason to have included a temporal limitation (i.e., “during a frame”) in the claim.

Sur-Reply, 9

“independently control”

Common Control is Not Independent Control

Next, the '180 Patent identified two electrical parameters to be independently controlled "for each camera channel," namely, "imager frame rate and integration time." *Id.*, 3:58-60 (emphasis added). Later in the specification, the '180 Patent reiterated its disclosure of controlling each channel or field of view both simultaneously and independently. *Id.*, 4:9-15, 5:63-66 and 7:23-27.

POR, 6

The digital cameras described herein enable imaging that includes simultaneous acquisition of multiple fields of view of an image. FIG. 3 shows a digital camera 200 configured for simultaneous acquisition of multiple fields of view, under an embodiment. The digital camera 200 includes a digital camera subsystem 210, an electronic image storage media 220, a power supply 224, a peripheral user interface (represented as a shutter button) 232, a circuit board 236 that supports and/or electrically couples or interconnects the components, a housing 240 (including housing portions 241, 242, 243, 244, 245 and 246) and a shutter assembly (not shown), which controls an aperture 250 and passage of light into the digital camera 200. The digital camera subsystem (DCS) 210 includes one or more camera channels (e.g., four camera channels 260A-260D) and replaces and/or fulfills one, some or all of the roles fulfilled by the lens assembly 110, the color filter 112 and the image sensor 116 of the digital camera 100 described above. The four camera channels 260A-260D are configured through pixel array size and/or optical focal length to provide a desired field of view for that channel. The four camera channels 260A-260D can be operated simultaneously with independent electrical control of features such as integration time control and frame rate (in video applications) to name a few.

EX1001, 5:44-67

In the digital camera subsystem 210, the optics portion of each camera channel can be configured similar to and/or different from the optics portion of at least one other camera channel. For example, embodiments of the digital camera subsystem 210 include optics portions that are configured approximately the same while having a different sensor array size (area) between camera channels to provide a different FOV capability. The sensor array area change can be accomplished by changing the number of pixels and/or pixel size of the array. In addition to array area differences between the channels, parameters of the image sensor electrical operation (e.g., integration time, frame rate, etc.) can be configured differently in order to optimize system camera performance in the field of view of one or more specific camera channels.

EX1001, 7:14-27

camera systems of an embodiment can be used in active vision systems of autonomous or semi-autonomous host systems. These systems range from commercial and industrial applications to surveillance and military applications. The commercial and industrial applications may involve robots, unmanned vehicles, self-navigating cars, automatic assembly and product inspection systems. The surveillance and military applications may involve iris and facial imaging, smart weapons and missile defense systems. The digital camera system of an embodiment improves performance of imaging systems and improves functions of search, detection, recognition and tracking by providing simultaneous high resolution imaging in multiple fields of view with optimum electrical operation (such as independent frame rate and integration time control) in each field of view.

EX1001, 4:1-15

Common Control is Not Independent Control

The Reply (at 21) also makes the unsupported allegation that in Matsushima “each system’s ‘**aperture value and shutter speed**’ are determined” based on its imaging EV value” (emphasis in original). The Reply follows this allegation with citations to [0032] and [0034] of Matsushima, neither of which says what Petitioner alleges. Paragraph [0032] makes no mention of an “EV value,” and paragraph [0034] states that “*the* subject luminance (*imaging EV value*) is determined based on integration of the R, G, and B signals in a single frame by the integration circuits 60A and 60B, and *the* aperture value and shutter speed are determined based on this *imaging EV value*” (emphasis added). This disclosure indicates that *one* luminance (EV value) is determined for *the subject*, and a *common* aperture value as well as a *common* shutter speed are used in both imaging systems,” rather than “*independently*” controlling simultaneous data acquisition with each of the first and second channels,” as claimed.

Matsushima’s release button does not equate to the application of *independently controlling* data acquisition with *each of the first and second channels* “during a frame.” First, there is no evidence that depression of the release button *independently* controls the first and second channels. Rather, to the extent actuation of the release button is “control,” it is *common* control -- rather than *independent* control -- with respect to the first and second channels. Ex. 2020, ¶109. Second, actuation of the release button does not occur “during a frame,” i.e., at a point *between the beginning and the end of the exposure interval* during which the image sensor captures a single image. See, Section II(B), *supra*; Ex. 2020, ¶110. On the contrary, a POSITA would have understood that actuation of the release button would necessarily need to occur *before* the exposure interval during which the image sensor captures an image. *Id.*

POR, 37-38

Sur-Reply, 21

Ground 1: Matsushima and Yu

- Claims 1-3, 10-12, 22, 24-25, 28, 30, 32-33

Ground 1 fails because Matsushima
does not disclose simultaneous data
acquisition with the channels

Claims 1-3, 10-12, 22, 24-25, 28, 30, 32-33

Matsushima never says the two images are captured simultaneously

The term “simultaneously” does not appear in Matsushima, and Matsushima never states that images 62A and 62B are acquired at the same time. Ex. 2020, ¶87. In alleging that Matsushima discloses “*simultaneous* data acquisition with each of the plurality of channels,” the Petition (at 21) relies on [0031] of Matsushima, which states:

CPU 30 performs various calculations such as focus evaluation calculations and AE calculations based on the image signals outputted from CCD 18A and CCD 18B, and the driving circuits 52A and 52B of the imaging lenses 15A and 15B, the focus lenses 16A and 16B, and the apertures 17A and 17B are controlled based on these calculations. In other words, when the lens groups 19A and 19B are composed of zoom lenses, the motors 54A and 54B are driven to zoom the imaging lenses 15A and 15B and change the imaging magnification. These motors 54A and 54B can be omitted when a manual zooming configuration or a single focal length lens is used. Ex. 1007, [0031].

Nothing in [0031] of Matsushima discloses that images 62A and 62B are acquired at the same time, or compels the conclusion the images 62A and 62B are acquired in overlapping acquisition windows. Ex. 2020, ¶88. The disclosure in [0031] of Matsushima is consistent with the *sequential* capturing of images 62A and 62B followed by alignment and stitching the images together as taught in Matsushima and the other references from the time directed to mosaicing. *Id.*

The Petition (at 23-24) also cites to [0021] and Claim 1 of Matsushima for the proposition that Matsushima discloses “simultaneous data acquisition with each of the plurality of channels.” Those portions of Matsushima state:

In addition, CCD 18A and CCD 18B can be, for example, CCDs of the same size, that is, the same number of pixels. Therefore, when the image captured with the first imaging system 12A is the captured image 62A shown in FIG. 3 (A), the image captured by the second imaging system 12B is the scaled-up captured image 62B at the center of FIG. 3 (A), as shown in FIG. 3 (B). Ex. 1007, [0021].

* * *

[Claim 1] A digital camera comprising: a first imaging system including a first image sensor for imaging a subject and a first lens for forming an image of the subject on the first image sensor; a second imaging system including a second image sensor for imaging the subject and a second lens with a focal length longer than the first lens for forming an image of the subject on the second image sensor; a scale-down means ... ; and a synthesizing means for correcting ... Ex. 1007, 2.

Again, nothing in the above passages of Matsushima discloses that images 62A and 62B are acquired at the same time, or compels the conclusion the images 62A and 62B are acquired in overlapping acquisition windows. Ex. 2020, ¶90. The

POR, 28

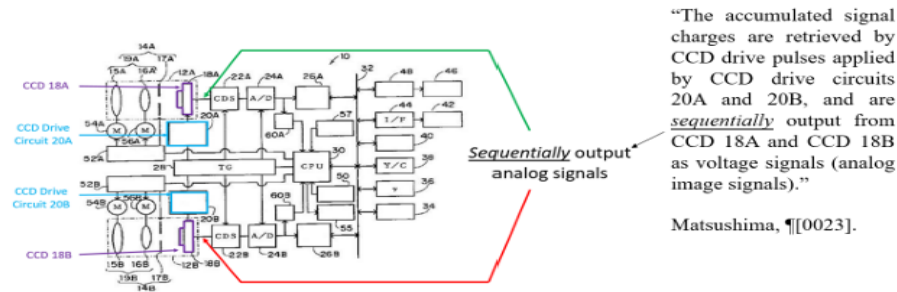
POR, 29

Matsushima expressly says the outputs are sequential

Not only does Matsushima fail to disclose simultaneous data acquisition by its image sensors 18A and 18B, Matsushima points in the opposite direction by expressly disclosing that data is retrieved sequentially from the image sensors. From Matsushima:

The subject images formed on the light-receiving surfaces of CCD 18A and CCD 18B via their respective imaging optics 14A and 14B are subjected to signal charge conversion by each sensor in the CCD that corresponds to the amount of incident light. The accumulated signal charges are retrieved by CCD drive pulses applied by CCD drive circuits 20A and 20B, and are sequentially output from CCD 18A and CCD 18B as voltage signals (analog image signals). Ex. 1007, ¶[0023].

This aspect of Matsushima's disclosure is depicted in the annotated diagram of Figure 1 of Matsushima (annotations added by Patent Owner) shown below:



Neither Petitioner nor its declarant explains why Matsushima would sequentially output analog signals from its CCDs 18A and 18B to two separate downstream signal processing paths if the images on CCDs 18A and 18B were acquired simultaneously. In his Supplemental Declaration, Petitioner's declarant

Even though Matsushima does not expressly or inherently describe simultaneous image capture, the Reply (at 10) alleges that “Matsushima teaches simultaneous acquisition as understood by a POSITA.” This argument erroneously presupposes that a reference which neither expressly nor inherently discloses a feature can nonetheless “teach” the feature. The Reply cites no authority that supports this proposition because none exists. Instead, the Reply (at 10) cites to *In re Gleave*, 560 F.3d 1331, 1334 (Fed. Cir. 2009) for the irrelevant proposition that a reference need not use the exact words in the claim. That proposition would have been applicable here if, for example, Matsushima described “data acquisition with each of the first and second channels” that occurred at the “same time” as opposed to “simultaneous data acquisition with each of the first and second channels” as recited in the claim. But Matsushima says nothing of the sort. The Reply (at 10) also

Sur-Reply, 14

Sur-Reply, 11-12

"DEMONSTRATIVE EXHIBIT - NOT EVIDENCE"
Exhibit 2031

Petitioner's "synchronous" argument is not enough

[0023] The subject images formed on the light-receiving surfaces of CCD 18A and CCD 18B via their respective imaging optics 14A and 14B are subjected to signal charge conversion by each sensor in the CCD that corresponds to the amount of incident light. The accumulated signal charges are retrieved by CCD drive pulses applied by CCD drive circuits 20A and 20B, and are sequentially output from CCD 18A and CCD 18B as voltage signals (analog image signals) corresponding to each signal charge.

EX1007, 23

[0027] A timing signal generating circuit (TG) 28 provides appropriate timing signals to the CCD drive circuits 20A and 20B, the CDS circuits 22A and 22B, and the A/D converters 24A and 24B in response to commands from the CPU 30, and each circuit is driven synchronously by timing signals applied from the timing signal generating circuit 28.

EX1007, 27

For several reasons, this passage does not disclose simultaneous data acquisition with a plurality of channels. First, Matsushima discloses that these timing signals are used to control the timing of the retrieval of information from the CCDs, rather than the acquisition of data by each CCD. See, Ex. 1007, [0023] ("The accumulated signal charges are retrieved by CCD drive pulses applied by CCD drive circuits 20A and 20B, and are sequentially output from CCD 18A and CCD 18B"); Ex. 2020, ¶94. Second, Matsushima states only that the timing signal generator 28 provides "appropriate timing signals to the CCD drive circuits 20A and 20B" -- the reference never states that it provides simultaneous timing signals to the CCD drive circuits. Ex. 2020, ¶95. Third, even if Matsushima had been referring to image acquisition signals in [0027] (as opposed to data retrieval signals), Matsushima's disclosure that "each circuit is driven synchronously by timing signals applied from the timing signal generating circuit 28" is not equivalent to a disclosure that such circuits are driven simultaneously. The fact that two circuits operate synchronously means only that the operation of both circuits is based on a common clock signal -- not that the circuits are necessarily driven simultaneously. Ex. 2020, ¶96, citing, Ex. 2028, 1:15-24 and 1:60-65 (explaining that synchronous circuits are one that "operate in a synchronous manner relative to a system clock" such that each circuit operates in a fixed relationship with each other) and Ex. 2029, 30:58-65 ("Generally, synchronization is used to obtain a fixed relationship among ... two or more signals").

POR, 31

Petitioner Advances a New Ground in the Reply

The Reply (at 13-14) attempts to backfill that gap by way of a Supplemental Declaration that purports to offer a new obviousness rationale that proposes a POSITA would have *modified* Matsushima's *sequential* operations with *simultaneous* ones based on Choi (Ex. 1008) and/or Weldy (1014),³ *neither of which were combined with Matsushima* in any of the *instituted grounds* challenging the independent claims of the '180 Patent. *See*, Ex. 1069, ¶49. The new rationale must be rejected because a Petitioner cannot use a Reply to advance a new obviousness rationale where, as here, the Petition itself was devoid of any obviousness rationale whatsoever. Furthermore, the new rationale should be rejected because it is based on Choi (Ex. 1008) and/or Weldy (1014) which are not combined with Matsushima in any of the instituted grounds challenging the independent claims of the '180 Patent. This trial is limited to the instituted grounds, and the Petitioner is not permitted to plug holes in its chosen grounds by attempting to add new references to those grounds in its Reply.

Sur-Reply, 15-16

Even if Matsushima did not expressly disclose “simultaneous” acquisition (which it does), a POSITA would understand that Matsushima’s disclosure, including its multi-channel architecture, synchronous control of channels, and capturing two images that are scaled versions of the same scene, renders obvious simultaneous acquisition during a frame. Ex.1069, ¶49 (explaining it was well-known to perform simultaneous data acquisition in Matsushima’s imaging system having a multi-channel architecture, such that the captured images have “no time difference” to eliminate the need for “compensating for errors caused by the time difference.”); Ex.1008, [0069] (describing the well-known technique to capture images “simultaneously”); Ex.1014, 5:14-16 (describing multiple channels “simultaneously capture light information from the same scene”).

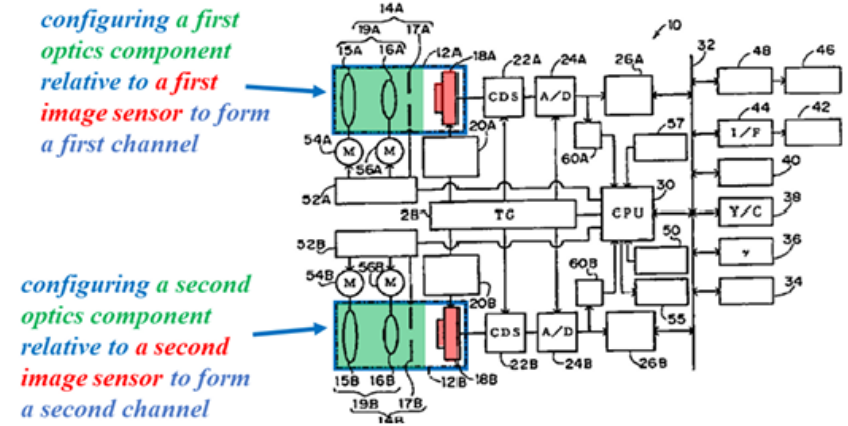
Reply, 13-14

Ground 1 also fails because
Petitioner has not proven “during
a frame”

Claims 22, 24-25, 28, 30, and 32-33

Petitioner's reply relies on downstream circuitry outside the claimed channels

Perhaps even more significantly, the Petition itself maps “each of the first and second channels” to an optics component and a sensor in the prior art, rather than other components that perform downstream read-out and signal processing performed. In connection with Ground 1, the Petition (at 14-15) maps the claimed “first channel” to only Matsushima’s “first imaging system 12A” which is limited to “first lens group 19A” and “first image sensor 18A.” The mappings in the Petition do not include correlated double sample circuit (CDS) 22A, A/D converter 24A or other downstream processing within the claimed “first channel.” Similarly, the Petition (at 18-19) maps the claimed “second channel” to only Matsushima’s “second imaging system 12B” which is limited to “second lens group 19B” and “second image sensor 18B.” Again, the mappings in the Petition do not include



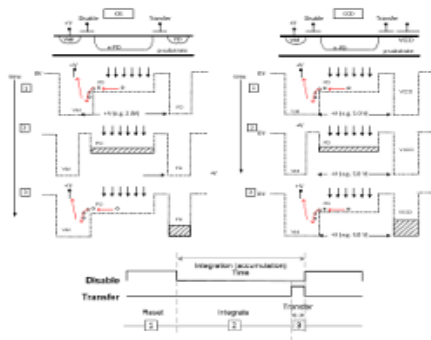
Petition, 19. Thus, as demonstrated by the Petition itself, the claimed first and second channels do not include circuitry for performing downstream read-out or image processing. Thus, based on the Petition’s own mappings, the “data acquisition with each of the first and second channels” that is being controlled “during a frame” in claim 22, is limited to data acquisition with the optics portion and sensor that form each channel, rather than downstream read-out and signal processing performed by components that are not identified by the Petition as part of each channel.

Sur-reply 6-7

The new Guidash timing diagram is not tied to Matsushima

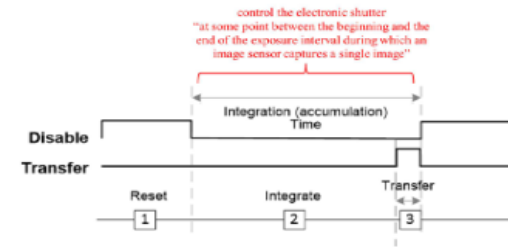
In the “Technical Background” section of his original declaration, under the heading “Exposure,” Petitioner’s declarant stated:

53. When a photodiode is disabled from collecting light, photoelectrons are still created from incident light, but they are continuously drained from the photodiode to a power supply connection in the pixel. Such periods do not affect the imaging result, and are not considered to be part of the integration time/exposure time/shutter speed. This is shown in the figures that I created below.



Ex. 1003, ¶53. Petitioner’s declarant provided no supporting citation to a source for any of the figures he created, nor did he assert that the information represented in the drawings constituted prior art to the ‘180 Patent. Also missing from his original declaration was any assertion that such information was tethered in any way to Matsushima.

In his Supplemental Declaration, Petitioner’s declarant uses an annotated version of the drawing that he previously created (reproduced below) to allege that Matsushima controls “the transfer of accumulated charges ... ‘at some point between the beginning and the end of the exposure interval.’”



Ex. 1069, ¶59. However, the specific timing diagram (above) created by Petitioner’s declarant (depicting an overlap between the integration time and the transfer period) is not disclosed in Matsushima, which says nothing of the sort. Nor is there even the conclusory allegation that the specific timing diagram created by Petitioner’s declarant is inherent in Matsushima, much less than factual support. Matsushima merely discloses that “CCD 18A and CCD 18B each have a shutter drain via a shutter gate, and the accumulated signal charges can be swept to the shutter drain by driving the shutter gates with shutter gate pulses.” Ex. 1007, ¶[0024]. The reference makes no mention whatsoever of any overlap between the integration time and the transfer period, and the drawings created by Petitioner’s declarant are neither prior art, nor evidence of any subject matter expressly or inherently disclosed in the reference.

Su-Reply, 16-17

Sur-Reply, 17-18

Release button, lens/aperture control, and timing-signal arguments all occur at the wrong stage

The Petition also maps the pressing of Matsushima's "release button" to the application of independent control "during a frame." Petition, 24-25. Pressing Matsushima's release button does not equate to the application of *independently controlling* data acquisition with *each of the first and second channels "during a frame."* First, there is no evidence that depression of the release button *independently* controls the first and second channels. Rather, to the extent actuation of the release button is "control," it is *common* control -- rather than *independent* control -- with respect to the first and second channels. Ex. 2020, ¶109. Second, actuation of the release button does not occur "during a frame," i.e., at a point *between the beginning and the end of the exposure interval* during which the image sensor captures a single image. See, Section II(B), *supra*; Ex. 2020, ¶110. On the contrary, a POSITA would have understood that actuation of the release button would necessarily need to occur *before* the exposure interval during which the image sensor captures an image. *Id.*

POR, 37-38

There is no evidence that such integration time control is applied "during the frame," i.e., at a point *between the beginning and the end of the exposure interval* during which the image sensor captures an image. Ex. 2020, ¶114. Matsushima does not disclose that its integration control operates in a "rolling mode" (or using a "rolling shutter") where the *start and stop time* of the integration interval of individual rows (or scanlines) of pixels is *controlled during the frame*. Nor is such an implementation inherent in Matsushima. *Id.* For example, a sensor can be operated in a "snap-shot" mode (also referred to as a "global shutter") where common control signals are applied only at the *confines* of the frame exposure rather than during the frame, i.e., at some point *between the beginning and the end* of the exposure interval during which the image sensor captures a single image. *Id.* Thus, Matsushima fails to disclose (expressly or inherently) integration time control that is applied "during the frame." *Id.*

POR, 40

Ground 1 fails because Matsushima
does not disclose independent
integration/exposure control

Claims 1-3, 10-12, 22, 24-25, 28, 30, 32-33

Matsushima's text uses singular exposure language

[0017] FIG. 1 is a block diagram showing the configuration of a digital camera. This digital camera 10 has two independent imaging systems (a first imaging system 12A and a second imaging system 12B), and subject images are formed on the light-receiving surfaces of CCD 18A and 18B via imaging optics 14A and 14B, respectively.

EX1007, 17

[0034] For AE control, the subject luminance (imaging EV value) is determined based on integration of the R, G, and B signals in a single frame by the integration circuits 60A and 60B, and the aperture value and shutter speed are determined based on this imaging EV value. The apertures 17A and 17B are driven via the drive circuits 52A and 52B, and the CCD 18A and CCD 18B charge accumulation time is controlled using an electronic shutter to reach the determined shutter speed. As a result, optimal exposure adjustment and focusing are performed simply by pointing the imaging lenses 15A and 15B of the digital camera 10 at the subject.

EX1007, 34

[0035] During imaging and recording, the AF operation is performed when the release button is "half-pressed," and the metering operation is repeated several times to obtain the exact imaging EV. The final aperture value and shutter speed for imaging is then determined based on the imaging EV. The apertures 17A and 17B are then driven to the final aperture value when the release button is "fully press", and the charge accumulation time is controlled by the electronic shutters at the determined shutter speed. Instead of AE control based on image signals acquired from CCD 18A and CCD 18B, other well-known photometric sensors may be used.

EX1007, 35

EX1007, 17

Petitioner's "different EV values" reading is not in the reference

Petitioner's expert stated:

99. Matsushima performs independent control of aperture and charge accumulation time for each channel to achieve "optimal exposure adjustment" for image acquisition, because the AE control is based on independently determined imaging EV values of the channels with different FOVs, e.g., *different EV values for each channel*, where the corresponding portions of the FOVs of the same scene have different brightness. Ex.1007, [0017]. The AE control is performed by independently controlling charge accumulation times for the channels, based on the independent determination of *the first subject luminance* for the first FOV and the second subject luminance for the second FOV. Ex.1007, [0034]. Matsushima describes that the first subject luminance of shooting angle α and *the second subject luminance* of shooting angle β are determined independently (by circuit 60A for first channel, and 60B for second channel independently). Ex.1007, [0034] (AE control is based on the subject luminance (imaging EV value) according to the scene of the respective FOV).

Ex. 1003, ¶99 (emphasis added). The assertions that Matsushima has "different EV values for each channel" and that in Matsushima there is "a first subject luminance" and "a second subject luminance" are not supported (either expressly or inherently) in Matsushima. Ex. 2020, ¶125. The only citations (to paragraphs [0017] and [0034] of Matsushima) provided by Petitioner's expert do not disclose "*different* EV values for each channel" -- the actual text discloses "*this* EV value" (*singular*). *Id.* Nor does the text of Matsushima describe "a first subject luminance" and "a second subject luminance" -- instead, the actual text of Matsushima refers to "*the* subject luminance" (again, singular). *Id.*

POR, 45-46

Later, Petitioner's expert alleges:

102. In Matsushima, the charge accumulation time/integration times of the two channels would have independent values, because the first and second channels are controlled independently based on captured images of *different subject luminance* with different FOVs. Ex.1007, [0034]. For example, the first sensor imaging the larger FOV (see 62A including the sun, the sky and other background objects) has *a different subject illuminance* (e.g., a higher subject illuminance) from the second sensor imaging the smaller FOV (see 62B including a person and a flower), thereby *a different integration time* (e.g., a shorter integration time) is determined for the first channel. (Emphasis added).

The text of Matsushima (e.g., at [0034]-[0035]) says just the opposite. Ex.

2020, ¶127. Specifically, those portions of Matsushima describe "*the* subject luminance" (singular) and "*the* charge accumulation time" (singular) -- rather than different subject luminances or different integration times. *Id.* The reasoning proposed by Petitioner's expert is not grounded in the actual words of Matsushima.

POR, 46

Matsushima's natural-boundary objective cuts against Petitioner's theory

[Problem] To provide a digital camera that can prevent unnatural boundary regions even when a telephoto captured image is combined in the center of a wide-angle captured image, and that can obtain images at various magnifications using a simple configuration.

EX1007, Abstract

Thus, in addition to deviating from the actual text of Matsushima, Petitioner's reading of Matsushima is inconsistent with the state of the art, which recognized that achieving a natural boundary⁶ between images with different exposures was problematic. For these additional reasons, the Petitioner has failed to demonstrate that Matsushima expressly or inherently discloses *independent control of the integration time* of each channel. Ex. 2020, ¶137.



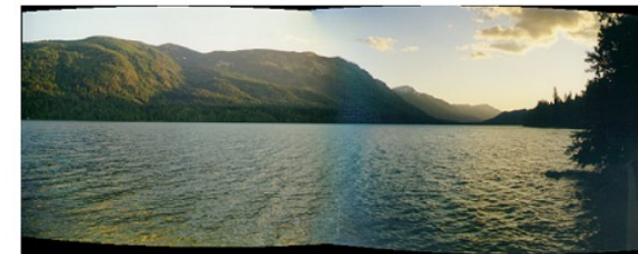
(A)

POR, 49



(B)

POR, 50



(C)

POR, 51

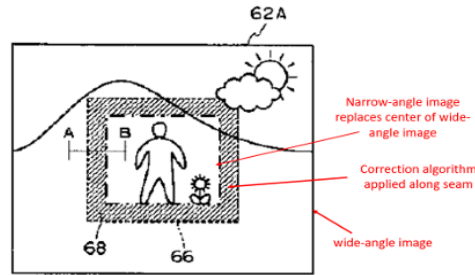
EX1007, 51-52

"DEMONSTRATIVE EXHIBIT - NOT EVIDENCE"
Exhibit 2031

No motivation to combine Matsushima and Yu as proposed

As shown above, one of the color sensors has a dynamic range of “X” while the black and white sensor has a dynamic range of “Y.” Ex. 1005, 9:19-23. Yu’s approach for expanding the dynamic range of a given color pixel is simply to add any “extra dynamic range Y level” sensed by the black and white sensor to “what the color sensor cannot sense.” *Id.*, 9:29-40; Ex. 2020, ¶144. Therefore, Yu’s process for expanding the dynamic range in any given area of an image is dependent upon there being a plurality of spatially aligned pixels (captured by different sensors) in the area of interest. Without such spatially aligned pixels, Yu would not be able to increase the dynamic range of one image (e.g., a color image) by adding the “extra dynamic range Y level” sensed by the black and white sensor to “what the color sensor cannot sense.” Ex. 1005, 9:29-40; Ex. 2020, ¶144.

POR, 55



Completely lacking from Matsushima’s techniques are *spatially aligned pixels captured by different sensors*, as needed to increase dynamic range in Yu. Ex. 2020, ¶146. Rather, in Matsushima, *only* pixels captured for narrow-angle image 62B are positioned in the center of the composite image, and *only* pixels captured for the wide-angle image 62A surround the center region with the scaled-down version of the narrow-angle image. As a result, there is *no* region in Matsushima’s composite image where *spatially aligned pixels captured by different sensors* even *exist*. Since the application of Yu’s dynamic range extension technique is predicated on the existence of spatially aligned pixels captured from different sensors, there is no way of applying Yu’s technique for extending dynamic range to the images with different fields of view captured and stitched together by Matsushima. *Id.*

POR, 56-57

The Reply (at 25) argues that the references need not be bodily incorporated. Maybe so, but it is still Petitioner’s burden to explain *how* a POSITA would have combined or modified the references and *how* the modified system *would have functioned*. The Petitioner fails to meet that burden. If the references were not bodily incorporated, then how would Matsushima’s *image-stitching* technique for image synthesis be combined with Yu’s technique where a plurality of *spatially aligned pixels captured by different sensors* are used to expand the dynamic range, in a manner that meets the claim language? On this question, both the Petition and the Reply are silent.

Sur-Reply 24-25

Ground 3: Choi, Labaziewicz, and Yu

- Claims 22-23, 28, 30, 33

Labaziewicz is not prior art because the August 25, 2004 provisional provides written-description support for the challenged multi-channel / different-FOV subject matter.

- The provisional discloses multiple arrays, multiple lenses, and signal processing that combines signals from all arrays into a composite image — i.e., the core multi-channel architecture.
(POR, 60-64; EX2020, ¶¶150-155; EX1047, 4-5, 7-8.)
- The provisional further discloses exposure control occurring differently for each array and different integration times for each array.
(POR, 61-64; EX2020, ¶¶152-155; EX1047, 10.)
- Petitioner's FOV argument fails because the provisional discloses arrays of any size and shape, including equal-sized arrays; with equal-sized arrays, different focal lengths yield different FOVs even under Petitioner's own formula.
(Sur-Reply, 25-27; EX2020, ¶153; EX1047, 11, 12, 22 (Fig. 3).)
- The provisional defines each array as a group of photodetectors that creates one image. Petitioner never explains why those separate image-forming arrays are not multiple sensors in substance.
(POR, 62-64; Sur-Reply, 27; EX2020, ¶154; EX1047, 8.)

Conclusion

- Does Ground 1 actually prove **simultaneous data acquisition** with the claimed channels, rather than sequential capture plus stitching?
 - No. The references teach sequential acquisition
- Does Petitioner prove **independently controlling ... during a frame** as claim 22 requires, or has it substituted downstream readout and expert-created timing diagrams for what the reference actually says?
 - No. The references do not teach any adjustments are made during the frame
- Does Matsushima teach or even support **different exposure/integration times** for the two imaging systems, when its text repeatedly uses singular exposure language?
 - No. The references teach using a single EV value for both sensors
- Has Petitioner actually explained how Yu's dynamic-range approach fits Matsushima's stitched different-FOV architecture?
 - No. A Petitioner has not met their burden of showing why a POSITA would combine the references
- For Ground 3, is Labaziewicz even prior art?
 - Labaziewicz was filed after the provisional application and therefore is not prior art under 35 USC 103

Appendix

Q. When you refer to **simultaneous**, what is the minimum time difference that you would still consider **simultaneous**?

A. I don't understand what you mean.

Q. If the time difference of two events is several nanoseconds, would you consider that **simultaneous**?

A. **Simultaneous** means at the same time.

So as long as event A and event B are happening at the same time within practical engineering applications as we are discussing here in this '180, then it's **simultaneous**, at the same time, just like the claims here call for.

Q. What do you mean by at the same time within practical engineering applications?

A. Well, I mean, within -- within practical, you know -- you know, nothing can move, for instance, in one, you know, nanosecond or picosecond. You know, things -- depending on the application that you're at, things have different time intervals that they're moving. Some things don't move as quickly as others. Cars don't move in nanoseconds.

So **simultaneous** would be two events are happening at the same time, as close in time as engineeringly possible, in a sense, as practical and as we're talking about in this application for the -- for the camera systems that we're talking about.

Q. So what is the practical time difference to be considered at the same time

A. At the same time. They're **simultaneously** moving. I'm capturing image alpha and I'm capturing image beta at the same time.

EX1070, 17:2-15:5

EX1070, 16:14-17:20

"DEMONSTRATIVE EXHIBIT - NOT EVIDENCE"
Exhibit 2031