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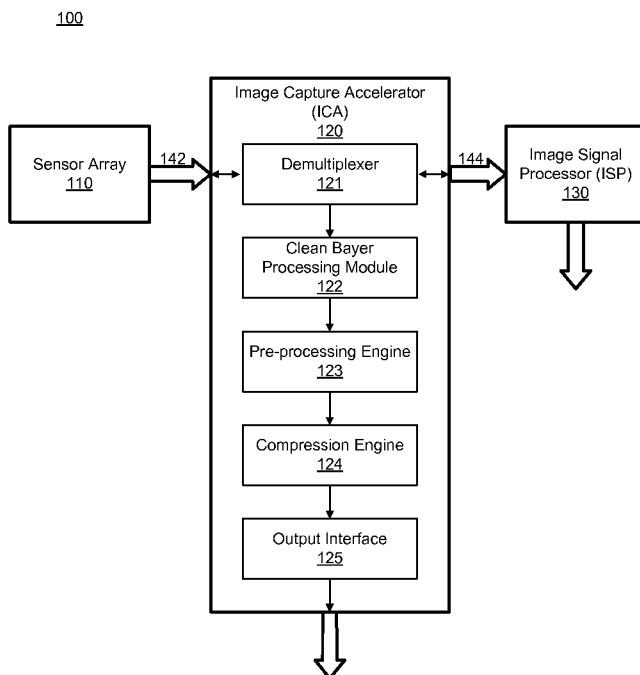
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[Continued on next page]

(54) Title: IMAGE CAPTURE ACCELERATOR



(57) Abstract: An image capture accelerator performs accelerated processing of image data. In one embodiment, the image capture accelerator includes accelerator circuitry including a pre-processing engine and a compression engine. The pre-processing engine is configured to perform accelerated processing on received image data, and the compression engine is configured to compress processed image data received from the pre-processing engine. In one embodiment, the image capture accelerator further includes a demultiplexer configured to receive image data captured by an image sensor array implemented within, for example, an image sensor chip. The demultiplexer may output the received image data to an image signal processor when the image data is captured by the image sensor array in a standard capture mode, and may output the received image data to the accelerator circuitry when the image data is captured by the image sensor array in an accelerated capture mode.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2013/050389

A. CLASSIFICATION OF SUBJECT MATTER IPC(8) - H04N 5/343 (2014.01) USPC - 348/221.1 According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC(8) - H04N 5/335, 343, 357, 369, 378 (2014.01) USPC - 348/207.99, 222.1, 294; 386/E5.007		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched CPC - H04N 5/23245, 335, 343, 357, 369, 378 (2013.01)		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) Orbit, Google Patents, Google Scholar		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2010/0061707 A1 (KOSAKAI et al) 11 March 2010 (11.03.2010) entire document	9
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Y		1-8, 10-13
Y	US 2009/0059031 A1 (MIYAKOSHI) 05 March 2009 (05.03.2009) entire document	1-8, 10-13
A	US 2009/0169120 A1 (OTANI) 02 July 2009 (02.07.2009) entire document	1-13
A	US 2006/0221230 A1 (DUTTA et al) 05 October 2006 (05.10.2006) entire document	1-13
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/>		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 20 February 2014		Date of mailing of the international search report 06 MAR 2014
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201		Authorized officer: Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2013/050389

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

- 1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

- 2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

- 3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

See extra sheet.

- 1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
- 2. As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
- 3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
- 4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
1-13

- Remark on Protest**
- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
 - The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
 - No protest accompanied the payment of additional search fees.

Continuation of Box III.

This application contains claims directed to more than one species of the generic invention. These species are deemed to lack unity of invention because they are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for more than one species to be examined, the appropriate additional examination fees must be paid. The species are as follows:

Species I) a demultiplexer configured to receive image data captured by an image sensor array, the demultiplexer configured to output the received image data to an image signal processor ("ISP") when the image data is captured by the image sensor array in a first capture mode, and configured to output the received image data to the accelerator circuitry when the image data is captured by the image sensor array in a second capture mode, figure 1

Species II) a set of pixel bits, each pixel bit with an associated bit depth; bypassing demosaicing operations performed by an ISP; converting the pixel bit depths of the pixel bits of the image data using one or more look-up tables; reordering the converted image data into a format of the YUV color space; encoding the transformed image data using one or more encoders; and storing the encoded image data in a non-transitory computer-readable storage medium, figure 4

The claims are deemed to correspond to the species listed above in the following manner:

Species I) figure 1; claims 1-8, 10-13

Species II) figure 4; claims 14-25

The following claims are generic: claim 9 is generic.

The species listed above do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, the species lack the same or corresponding special technical features for the following reasons:

Species I) figure 1; have the special technical feature of a demultiplexer configured to receive image data captured by an image sensor array, the demultiplexer configured to output the received image data to an image signal processor ("ISP") when the image data is captured by the image sensor array in a first capture mode, and configured to output the received image data to the accelerator circuitry when the image data is captured by the image sensor array in a second capture mode. This special technical feature is not present in species II.

Species II) figure 4; have the special technical feature of a set of pixel bits, each pixel bit with an associated bit depth; bypassing demosaicing operations performed by an ISP; converting the pixel bit depths of the pixel bits of the image data using one or more look-up tables; reordering the converted image data into a format of the YUV color space; encoding the transformed image data using one or more encoders; and storing the encoded image data in a non-transitory computer-readable storage medium. This special technical feature is not present in species I.

Species I and II lack unity of invention because even though the inventions of these species require the technical feature of an image capture accelerator comprising receiving image data captured by an image sensor array, and processing using an image signal processor, and a processing module, this technical feature is not a special technical feature as it does not make a contribution over the prior art in view of US 2006/0221230 A1 (DUTTA et al) 05 October 2006 (05.10.2006). Dutta et al. teaches an image capture accelerator 26 (fig. 2, para. 21) comprising receiving image data captured by an image sensor array 12, processing using an image signal processor 14, and outputting the processed image (output is Bayer data from the RGB color filter, para. 18) to a processing module (CPU 26a).

Since none of the special technical features of the Species I and II inventions is found in more than one of the inventions, unity of invention is lacking.