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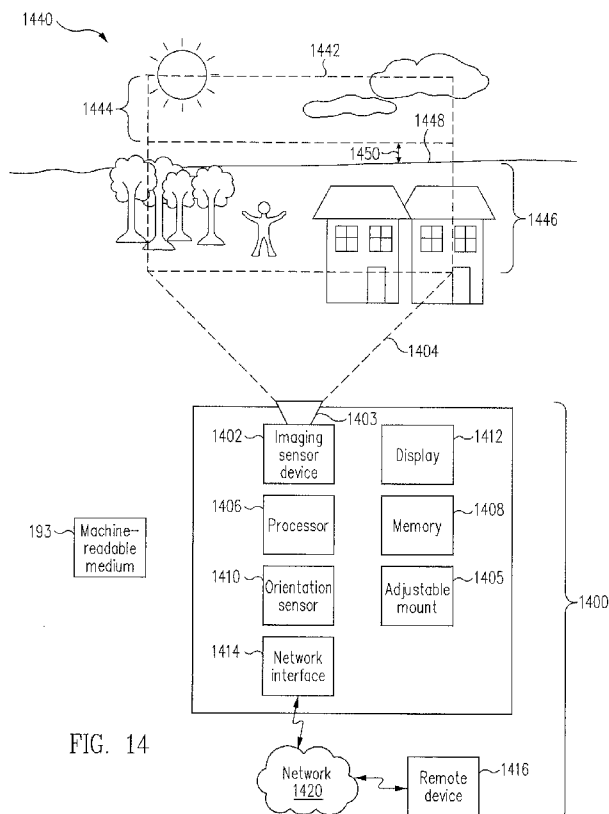
61/745,440	21 December 2012 (21.12.2012)	US
61/746,069	26 December 2012 (26.12.2012)	US
61/746,074	26 December 2012 (26.12.2012)	US
61/748,018	31 December 2012 (31.12.2012)	US
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14/099,818	6 December 2013 (06.12.2013)	US

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[Continued on next page]

(54) Title: SYSTEMS AND METHODS OF SUPPRESSING SKY REGIONS IN IMAGES



(57) Abstract: Various techniques are provided for systems and methods to process images to reduce consumption of an available output dynamic range by the sky in images. For example, according to one or more embodiments of the disclosure, a region or area in images that may correspond to the sky may be identified based on the location of the horizon in the images. A distribution of irradiance levels in the identified sky region may be analyzed to determine a dynamic range attributable to the sky region. A transfer function that compresses the dynamic range attributable to the sky region may be generated and applied so that the sky in the images may be suppressed, thereby advantageously preserving more dynamic range for terrestrial objects and other objects of interest in the images.



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(81) **Designated States** (*unless otherwise indicated, for every
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BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM,
DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM,
GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN,
KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA,
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TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK,
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INTERNATIONAL SEARCH REPORT

International application No
PCT/US2013/077265

A. CLASSIFICATION OF SUBJECT MATTER
INV. G06T5/40 H04N5/33 H04N1/62 H04N5/232 H04N5/341
ADD.

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)
G06T H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2011/279673 A1 (TEICH ANDREW C [US] ET AL) 17 November 2011 (2011-11-17)	1,11
Y	paragraphs [0070], [0094]	2-7, 12-17
Y	----- "Dynamic range compression and contrast enhancement in IR imaging systems", SPIE, PO BOX 10 BELLINGHAM WA 98227-0010 USA, 31 December 2007 (2007-12-31), XP040246825, pages 1,3,4	2,3,12, 13
A	----- US 2012/213411 A1 (NOZAKI TAKEO [JP]) 23 August 2012 (2012-08-23) paragraph [0014] ----- -/-	1,11



Further documents are listed in the continuation of Box C.



See patent family annex.

* 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

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Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2013/077265

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 additional 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 an 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.:
1-7, 11-17
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.:

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.

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2013/077265

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 1 939 809 A1 (PIONEER CORP [JP]) 2 July 2008 (2008-07-02) paragraph [0114] -----	4-7, 14-17
Y	US 2006/078215 A1 (GALLAGHER ANDREW C [US]) 13 April 2006 (2006-04-13) paragraphs [0086], [0091] -----	4-7, 14-17

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2013/077265

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2011279673 A1	17-11-2011	EP 2655180 A1	30-10-2013
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		WO 2012087715 A1	28-06-2012

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		WO 2007029454 A1	15-03-2007

US 2006078215 A1	13-04-2006	NONE	

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-3, 11-13

Improving compression of the dynamic range in the sky region.

2. claims: 4-7, 14-17

Reliable detection of sky areas in an image

3. claims: 8-10, 18-20

An infrared focal plane array of pixels (IR-FPA) which outputs non-uniformity-corrected images.
