



(51) International Patent Classification:

G01J 3/28 (2006.01) G01C 11/02 (2006.01)
G01J 3/51 (2006.01) H01L 31/0216 (2006.01)

(21) International Application Number:

PCT/US2012/034821

(22) International Filing Date:

24 April 2012 (24.04.2012)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

61/478,871 25 April 2011 (25.04.2011) US
61/565,345 30 November 2011 (30.11.2011) US

(71) Applicant (for all designated States except US): **SKYBOX IMAGING, INC.** [US/US]; 1061 Terra Bella Avenue, Mountain View, CA 94043 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **MANN, Julian, M.** [US/US]; 1061 Terra Bella Avenue, Mountain View, CA 94043 (US). **BERKENSTOCK, Daniel** [US/US]; 1061

Terra Bella Avenue, Mountain View, CA 94043 (US). **ROBINSON, M., Dirk** [US/US]; 1061 Terra Bella Avenue, Mountain View, CA 94043 (US).

(74) Agent: **MILLER, Kimberly, J.**; Knobbe Martens Olson & Bear LLP, 2040 Main Street, 14th Floor, Irvine, CA 92614 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, 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, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE,

[Continued on next page]

(54) Title: SYSTEMS AND METHODS FOR OVERHEAD IMAGING AND VIDEO

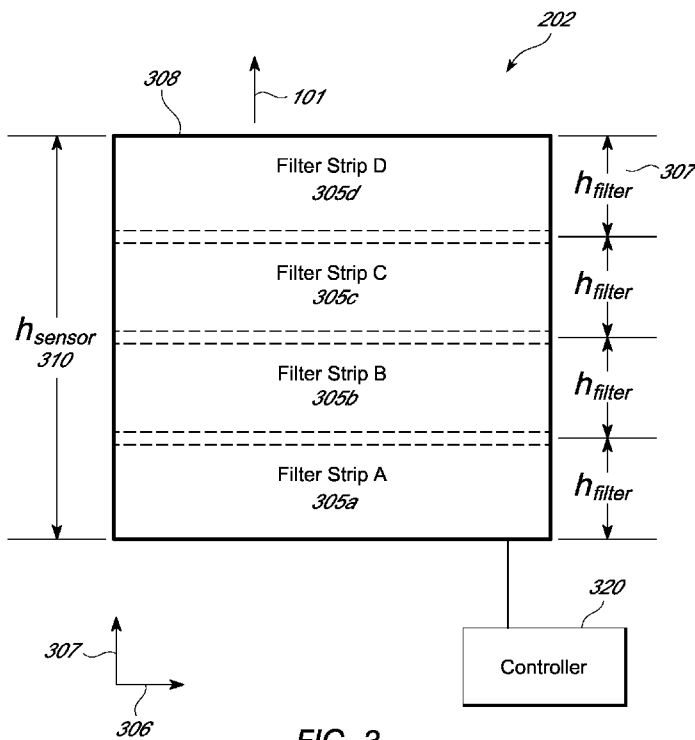


FIG. 3

(57) Abstract: Examples of an imaging sensor include a two-dimensional staring sensor with spectral filter strips for multispectral overhead imaging. The sensor may also include a panchromatic sensor with block or strip filters. The sensor may be used to collect multispectral color image data at a sampling resolution from overhead imaging platforms such as airplanes or satellites. The sensor can be used to provide video images. If a panchromatic sensor is included, the sensor may be used to collect panchromatic image data. Examples of methods for processing the image data include using the panchromatic image data to perform multi-frame enhancement or panchromatic sharpening on spectral images to improve their quality and resolution.





DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT,
LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE,
SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA,
GN, GQ, GW, ML, MR, NE, SN, TD, TG).

— *before the expiration of the time limit for amending the
claims and to be republished in the event of receipt of
amendments (Rule 48.2(h))*

Declarations under Rule 4.17:

— *of inventorship (Rule 4.17(iv))*

Published:

— *with international search report (Art. 21(3))*

(88) Date of publication of the international search report:

14 March 2013

INTERNATIONAL SEARCH REPORT

International application No PCT/US2012/034821

A. CLASSIFICATION OF SUBJECT MATTER
 INV. G01J3/28 G01J3/51 G01C11/02 H01L31/0216
 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)

G01J H01L H04N G01C G01N

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 Y	US 2003/193589 A1 (LAREAU ANDRE G [US] ET AL) 16 October 2003 (2003-10-16) paragraph [0020] - paragraph [0059] figures 2-9 -----	1,2,4,5, 7,8 3,6
X Y	DE 20 2009 003286 U1 (SENSOVATION AG [DE]) 28 May 2009 (2009-05-28) paragraphs [0012] - [0021], [0026], [0040] - [0053] figures 3-6 -----	1,2,4,5, 7,8 3,6
X Y	WO 00/55602 A1 (UNIV VIRGINIA [US]; LAUFER GABRIEL [US]) 21 September 2000 (2000-09-21) page 58, line 12 - page 60, line 19 figures 8a, 8b ----- -/--	1,2,4,5, 7,8 3,6

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

25 July 2012

Date of mailing of the international search report

03/01/2013

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
 NL - 2280 HV Rijswijk
 Tel. (+31-70) 340-2040,
 Fax: (+31-70) 340-3016

Authorized officer

Haller, Mirjam

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2012/034821

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 2 242 252 A2 (SONY CORP [JP]; SONY ELECTRONICS INC [US]) 20 October 2010 (2010-10-20) paragraph [0037] -----	3,6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/034821

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.:

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.:

1-8

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.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1-8

Sensor for collecting image data comprising a spectral sensor with an imaging surface having a certain imaging width, a plurality of spectral filters having the same width covering an imaging portion of the imaging surface, wherein each filter has a filter height that is at least a minimum height as defined by the ratio of the rate at which an image appears to move across the spectral sensor (vsensor) over the rate of frame capture (fps), wherein the spectral filters have different spectral filter heights.

2. claims: 9-28

Sensor for collecting image data comprising a spectral sensor with an imaging surface having a certain imaging width, a plurality of spectral filters having the same width covering an imaging portion of the imaging surface, wherein each filter has a filter height that is at least a minimum height as defined by the ratio of the rate at which an image appears to move across the spectral sensor (vsensor) over the rate of frame capture (fps), the sensor further comprising a panchromatic sensor having at least the same width as the spectral sensors and at least the minimum height configured to capture panchromatic image data of the region of interest, such as to allow the generation of an enhanced panchromatic image and the performance of panchromatic sharpening.

3. claims: 29-33

Method of enhancing spectral image data comprising steps of receiving a plurality of spectral images of portions of a region of interest, each image comprising a plurality of spectral image strips corresponding to different wavelengths of light, registering the spectral image strips to create a plurality of reconstructed spectral images, combining the reconstructed images to create a multispectral image, converting the multispectral image into a color system comprising a luminance component to create a converted multispectral image and replacing the luminance component of the converted multispectral image with a replacement spectral image to generate an enhanced spectral image.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/US2012/034821

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2003193589 A1	16-10-2003	AU 2003267941 A1 US 2003193589 A1 WO 03106917 A2	31-12-2003 16-10-2003 24-12-2003

DE 202009003286 U1	28-05-2009	NONE	

WO 0055602 A1	21-09-2000	AU 5265800 A CA 2365866 A1 EP 1169631 A1 IL 145413 A JP 2002539446 A WO 0055602 A1	04-10-2000 21-09-2000 09-01-2002 20-11-2005 19-11-2002 21-09-2000

EP 2242252 A2	20-10-2010	CN 101867720 A EP 2242252 A2 JP 2010252312 A US 2010265313 A1	20-10-2010 20-10-2010 04-11-2010 21-10-2010
