



- (51) International Patent Classification:  
*G06T 5/50* (2006.01)
- (21) International Application Number:  
PCT/US2014/031354
- (22) International Filing Date:  
20 March 2014 (20.03.2014)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:  
61/812,148 15 April 2013 (15.04.2013) US  
61/812,151 15 April 2013 (15.04.2013) US  
14/012,518 28 August 2013 (28.08.2013) US
- (71) Applicant: **QUALCOMM INCORPORATED** [US/US];  
Attn: International IP Administration, 5775 Morehouse Drive, San Diego, California 92121-1714 (US).
- (72) Inventors: **SHARMA, Piyush**; 5775 Morehouse Drive, San Diego, California 92121 (US). **SHROFF, Nitesh**; 5775 Morehouse Drive, San Diego, California 92121 (US). **REZAIIFAR, Ramin**; 5775 Morehouse Drive, San Diego, California 92121 (US).
- (74) Agent: **WYMAN, Bryan H.**; Silicon Valley Patent Group LLP, 4010 Moorpark Avenue, Suite 210, San Jose, California 95117 (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, BN, 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, IR, IS, JP, KE, KG, 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, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, 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, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, 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, KM, ML, MR, NE, SN, TD, TG).

**Declarations under Rule 4.17:**

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))

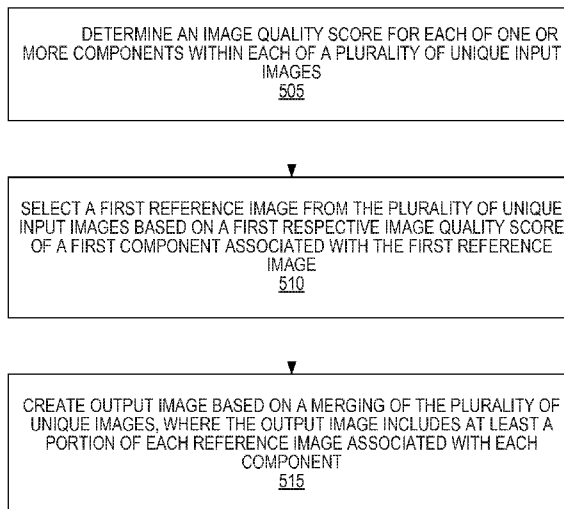
**Published:**

- with international search report (Art. 21(3))

- (88) Date of publication of the international search report:  
29 January 2015

(54) Title: REFERENCE IMAGE SELECTION FOR MOTION GHOST FILTERING

**FIG. 5**



(57) Abstract: Exemplary methods, apparatuses, and systems for image processing are described. One or more reference images are selected based on image quality scores. At least a portion of each reference image is merged to create an output image. An output image with motion artifacts is compared to a target to correct the motion artifacts of the output image.





INTERNATIONAL SEARCH REPORT

International application No  
PCT/US2014/031354

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JACOBS K ET AL: "Automatic HDRI generation of dynamic environments", INTERNATIONAL CONFERENCE ON COMPUTER GRAPHICS AND INTERACTIVE TECHNIQUES ARCHIVE ACM SIGGRAPH 2005 SKETCHES, ACM NEW YORK, NY, US, no. 43, 31 July 2005 (2005-07-31), page 1, XP002562044,	1-5, 10-14, 19-23, 28-32
A	section 3, par. "HDRI generation"	6-9, 15-18, 24-27, 33-36
X	----- SIMON SILK ET AL: "Fast high dynamic range image deghosting for arbitrary scene motion", GRAPHICS INTERFACE CONFERENCE 2012, 28 May 2012 (2012-05-28), pages 85-92, XP058009887, Toronto, Ontario, Canada ISBN: 978-1-4503-1420-6	6-9, 15-18, 24-27, 33-36
A	section 3.4; figures 4a,4c	1-5, 10-14, 19-23, 28-32
A	----- EP 2 515 273 A1 (CSR TECHNOLOGY INC [US]) 24 October 2012 (2012-10-24) paragraphs [0114] - [0121], [0128] - [0129]	1-36
A	----- US 2013/028509 A1 (MOON YOUNG SU [KR] ET AL) 31 January 2013 (2013-01-31) paragraphs [0050], [0067], [0071], [0086]	1-36
A	----- ABHILASH SRIKANTHA ET AL: "Ghost detection and removal for high dynamic range images: Recent advances", SIGNAL PROCESSING: IMAGE COMMUNICATION, vol. 27, no. 6, 1 July 2012 (2012-07-01), pages 650-662, XP055036838, ISSN: 0923-5965, DOI: 10.1016/j.image.2012.02.001 the whole document	1-36
	-----	

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US2014/031354

## 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.:

### 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: 1-5, 10-14, 19-23, 28-32

Selecting a reference image for combining the input images in such a way that the output image contains at least part of the reference image in a component (an area with a motion artifact). The selecting is carried out by determining a quality score for each of the input images within the component.

---

2. claims: 6-9, 15-18, 24-27, 33-36

Selecting a reference image for replacing a ghosty component (an area with a motion artifact) in an HDR image, which has been obtained by combining input images, with a corresponding component from the selected reference image. The selecting is carried out by comparing the ghosty component of the HDR image to the corresponding components of each of the input images.

---

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No  
PCT/US2014/031354

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2515273	A1	CN 103002225 A	27-03-2013
		EP 2515273 A1	24-10-2012
-----			
US 2013028509	A1	CN 102905058 A	30-01-2013
		JP 2013031174 A	07-02-2013
		KR 20130013288 A	06-02-2013
		US 2013028509 A1	31-01-2013
-----			