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[Continued on next page]

(54) Title: SCORING AND ADJUSTING PIXELS BASED ON NEIGHBORHOOD RELATIONSHIPS FOR REVEALING DATA IN IMAGES

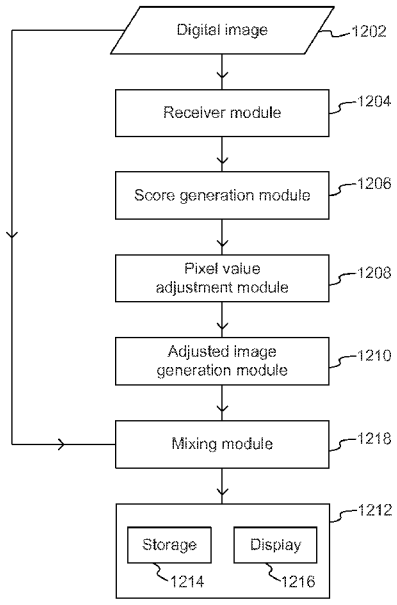


FIG. 12

(57) Abstract: A machine/computer implemented system, method, and computer program product for scored pixel intensity value adjustment of a digital image is disclosed. The system is configured to obtain a digital image from data storage and perform pixel-by-pixel comparisons to generate per pixel scores. The types of comparisons include discovering minima and maxima per pixel scores by comparing to neighboring non-adjacent pixel pairs, delta pair scores by comparing to neighboring pixels, and multiple vector score types by comparing to vectors made up of individual pixels. This new information is applied to adjust each pixel's value. The system is further configured to generate a collection of such scores for a plurality of pixels in a digital linage and to generate a multi-dimensional scored pixel adjusted image. The scored pixel adjustment yields a new digital image, wherein the value of a given pixel is adjusted based on one or more of the score types.

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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, ML, MR, NE, SN, TD, TG).

Published:

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— *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))*

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INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER
INV. G06T5/20
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

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, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	"Chapter 4 - Image Enhancement" In: Rafael C Gonzalez; Richard E Woods: "Digital Image Processing", 1 September 1993 (1993-09-01), Addison-Wesley Publishing Company, XP002699414, ISBN: 0-201-60078-1 pages 161-201, page 161 - page 164 page 189 - page 201	1,7-11, 17-21, 27-30

X	EP 1 679 654 A1 (ST MICROELECTRONICS RES & DEV [GB]) 12 July 2006 (2006-07-12)	4,14,24
A	the whole document	2,3,12, 13,23

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[X] Further documents are listed in the continuation of Box C.

[X] 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

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
26 September 2013	10/10/2013

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Salvador, Elena

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2013/030709

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6 195 467 B1 (ASIMOPOULOS NIKOS [US] ET AL) 27 February 2001 (2001-02-27) the whole document	2,3,12, 13,22,23
X	US 2007/064792 A1 (CHIU YI-JEN [US] ET AL) 22 March 2007 (2007-03-22) abstract figures 3-5 paragraph [0024] - paragraph [0036]	4,14,24
X	US 6 681 054 B1 (GINDELE EDWARD B [US]) 20 January 2004 (2004-01-20) abstract figures 5,6 column 1 - column 3 column 6, last paragraph - column 10	5,6,15, 16,25,26
X	DESHPANDE S D ET AL: "Max-mean and max-median filters for detection of small targets", PROCEEDINGS OF THE SPIE - THE INTERNATIONAL SOCIETY FOR OPTICAL ENGINEERING SPIE-INT. SOC. OPT. ENG. USA, vol. 3809, 1999, pages 74-83, XP002713614, ISSN: 0277-786X abstract Section 2	5,6,15, 16,25,26

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2013/030709

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: 1-3, 7-13, 17-23, 27-30

   Machine-implemented method, system and computer readable storage medium having program instructions for generating an adjusted digital image by means of spatial filtering of an input image, the spatial filtering being characterized by the features of claims 2 and 3 which analyse pairs of non-adjacent neighboring pixels (minima or maxima score).

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2. claims: 4, 14, 24

   Machine-implemented method, system and computer readable storage medium having program instructions for generating an adjusted digital image by means of spatial filtering of an input image, the spatial filtering being characterized by the features of claim 4 which analyse a neighboring pixel or a group of neighboring pixels (delta pair score).

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3. claims: 5, 6, 15, 16, 25, 26

   Machine-implemented method, system and computer readable storage medium having program instructions for generating an adjusted digital image by means of spatial filtering of an input image, the spatial filtering being characterized by the features of claims 5 and 6 which analyse sets of neighboring pixels on line segments (vector score).

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2013/030709

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1679654 A1	12-07-2006	EP 1679654 A1	12-07-2006
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		WO 2007040765 A1	12-04-2007
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