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[Continued on next page]

(54) Title: ILLUMINATION DETECTION USING CLASSIFIER CHAINS

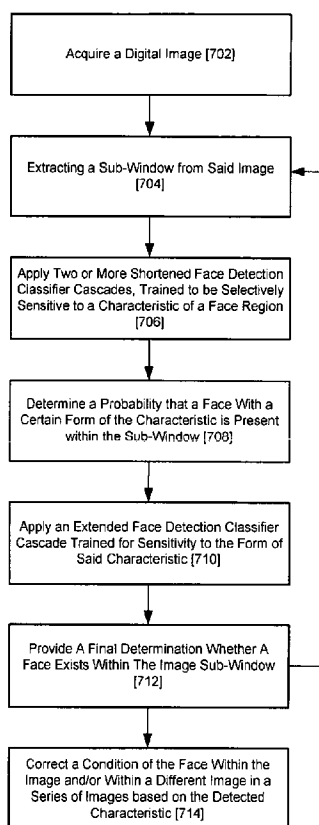


Figure 9A

(57) Abstract: A face illumination normalization method includes acquiring a digital image including a face that appears to be illuminated unevenly. One or more uneven illumination classifier programs are applied to the face data to determine the presence of the face within the digital image and/or the uneven illumination condition of the face. The uneven illumination condition may be corrected to thereby generate a corrected face image appearing to have more uniform illumination, for example, to enhance face recognition.

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NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG,
CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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| | | |
|---|---|---|
| A. CLASSIFICATION OF SUBJECT MATTER INV. G06K9/00 G06K9/62 | | |
| 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) G06K | | |
| 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 practical, search terms used) EPO-Internal | | |
| C. DOCUMENTS CONSIDERED TO BE RELEVANT | | |
| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
| X | MITRA S ET AL: "Gaussian Mixture Models Based on the Frequency Spectra for Human Identification and Illumination Classification" AUTOMATIC IDENTIFICATION ADVANCED TECHNOLOGIES, 2005. FOURTH IEEE WORK SHOP ON BUFFALO, NY, USA 17-18 OCT. 2005, PISCATAWAY, NJ, USA, IEEE, 17 October 2005 (2005-10-17), pages 245-250, XP010856528 ISBN: 978-0-7695-2475-7 Section 3. "Human identification: GMM based on phase", Section 4. "Illumination classification: GMM based on magnitude", in particular Section 4.1. "Application to illumination normalization" <div style="text-align: center; margin-top: 10px;">-/--</div> | 1,2,5,6, 8,9,18 |
| <div style="display: flex; justify-content: space-between;"> <input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex. </div> | | |
| * Special categories of cited documents : | | |
| <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>*A* document defining the general state of the art which is not considered to be of particular relevance</p> <p>*E* earlier document but published on or after the international filing date</p> <p>*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)</p> <p>*O* document referring to an oral disclosure, use, exhibition or other means</p> <p>*P* document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>*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</p> <p>*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</p> <p>*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.</p> <p>*&* document member of the same patent family</p> </div> </div> | | |
| Date of the actual completion of the international search <div style="text-align: center; margin-top: 10px;">26 June 2008</div> | | Date of mailing of the international search report <div style="text-align: center; margin-top: 10px;">23/10/2008</div> |
| 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 <div style="text-align: center; margin-top: 10px;">Grigorescu, Cosmin</div> |

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|-----------|---|-----------------------|
| X | <p>KOUZANI A Z: "Illumination-effects compensation in facial images" SYSTEMS, MAN, AND CYBERNETICS, 1999. IEEE SMC '99 CONFERENCE PROCEEDINGS. 1999 IEEE INTERNATIONAL CONFERENCE ON TOKYO, JAPAN 12-15 OCT. 1999, PISCATAWAY, NJ, USA, IEEE, US, vol. 6, 12 October 1999 (1999-10-12), pages 840-844, XP010363112 ISBN: 978-0-7803-5731-0 Section II. "Proposed illumination-effects compensation method", in particular p. VI-842, Algorithm 1: Training, Synthesis</p> | 1,18 |
| X | <p>SORIANO M ET AL: "Making saturated facial images useful again" PROCEEDINGS OF THE SPIE, SPIE, BELLINGHAM, VA, vol. 3826, 17 June 1999 (1999-06-17), pages 113-121, XP002325961 ISSN: 0277-786X the whole document, in particular Section 2.2. "Color correction by RGB eigenfaces"</p> | 1,5,18 |
| A | <p>SIM T ET AL: "The CMU Pose, Illumination, and Expression (PIE) database" AUTOMATIC FACE AND GESTURE RECOGNITION, 2002. PROCEEDINGS. FIFTH IEEE INTERNATIONAL CONFERENCE ON, IEEE, PISCATAWAY, NJ, USA, 20 May 2002 (2002-05-20), pages 53-58, XP010949335 ISBN: 978-0-7695-1602-8 the whole document</p> | 1-10 |

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.2

Claims Nos.: 3

It cannot be understood what is meant by the "simultaneous" in connection with "detection" since claim 1 does not clearly recite a step of detection.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guideline C-VI, 8.2), should the problems which led to the Article 17(2)PCT declaration be overcome.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP2008/001578

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.: 3
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:
see FURTHER INFORMATION sheet PCT/ISA/210
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 allsearchable 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, 2, 4-10, 18

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: 1,2,4-10,18

Method for correcting non-uniform face illumination;
acquisition device provided with said functionality (claim
18)

2. claims: 11-17

Method for face region detection based on a cascade of
classifiers
