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- (71) Applicant (for all designated States except US):
SIEMENS MEDICAL SOLUTIONS USA, INC.
[US/US]; 51 Valley Stream Parkway, Malvern, Pennsylvania 19355 (US).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): **HERMOSILLO**

VALADEZ, Gerardo [MX/US]; 206 Fowler Drive, West Chester, Pennsylvania 19382 (US). **PERIASWAMY, Senthil** [IN/US]; 272 Yorktown Court, Malvern, Pennsylvania 19355 (US).

(74) Agents: **MONTGOMERY, Francis G.** et al.; Siemens Corporation- Intellectual Property Dept., 170 Wood Avenue South, Iselin, New Jersey 08830 (US).

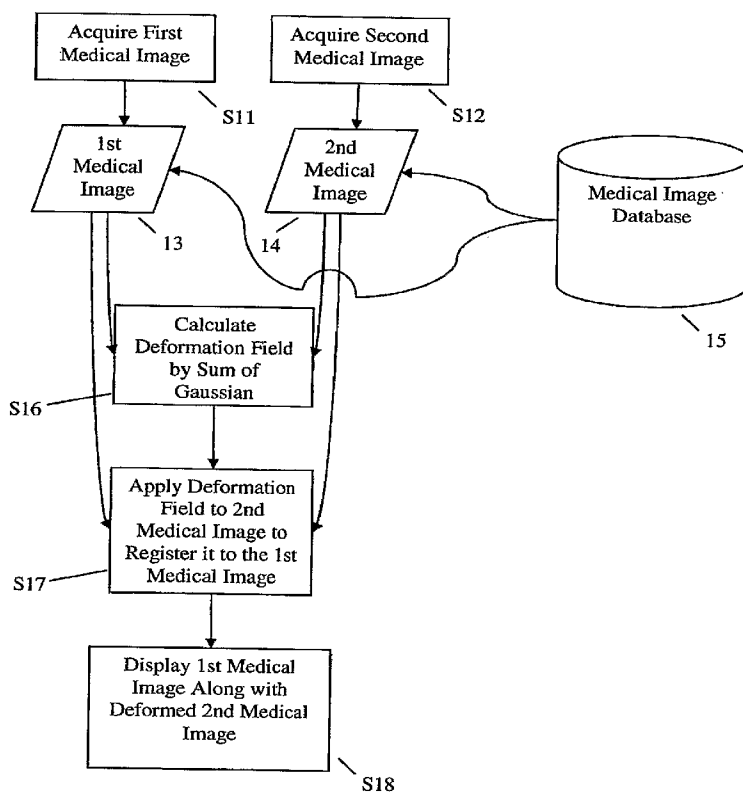
(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, 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, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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[Continued on next page]

(54) Title: METHODS AND SYSTEMS FOR REGISTRATION OF IMAGES

Fig. 1



(57) Abstract: A method for registering images, for example medical images, includes acquiring a first image (13). A second image (14) is acquired. A deformation field for registering the second image to the first image is calculated. The deformation field includes a sum of a plurality of weighted distortion vectors each of which has a substantially Gaussian distribution. The calculated deformation field is applied to the second image to register it to the first image.

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GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, 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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INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER
 INV. G06T7/00 G06K9/64

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 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, INSPEC, COMPENDEX, EMBASE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PERIASWAMY S ET AL: "ELASTIC REGISTRATION IN THE PRESENCE OF INTENSITY VARIATIONS" IEEE TRANSACTIONS ON MEDICAL IMAGING, IEEE SERVICE CENTER, PISCATAWAY, NJ, US, vol. 22, no. 7, July 2003 (2003-07), pages 865-874, XP001241984 ISSN: 0278-0062	9-17
Y A	abstract page 865, right-hand column, last line page 866, left-hand column, last paragraph ----- -/--	1-8 18,25

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 document 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
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Date of the actual completion of the international search	Date of mailing of the international search report
23 April 2008	06/05/2008

Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer Kessler, Cordula
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INTERNATIONAL SEARCH REPORT

International application No

PCT/US2007/018494

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WEI G-Q ET AL: "INTENSITY- AND GRADIENT-BASED STEREO MATCHING USING HIERARCHICAL GAUSSIAN BASIS FUNCTIONS" IEEE TRANSACTIONS ON PATTERN ANALYSIS AND MACHINE INTELLIGENCE, IEEE SERVICE CENTER, LOS ALAMITOS, CA, US, vol. 20, no. 11, November 1998 (1998-11), pages 1143-1160, XP000800294 ISSN: 0162-8828	1-8
A	abstract Section 3.1 Section 3.2	18-25
A	----- PERIASWAMY ET AL: "Medical image registration with partial data" MEDICAL IMAGE ANALYSIS, OXFORD UNIVERSITY PRESS, OXFORD, GB, vol. 10, no. 3, June 2006 (2006-06), pages 452-464, XP005405123 ISSN: 1361-8415 abstract Section 3.1.2	1-8, 18, 25
A	----- XIAOYAN XU ET AL: "Differential evolution with powell's direction set method in medical image registration" BIOMEDICAL IMAGING: MACRO TO NANO, 2004. IEEE INTERNATIONAL SYMPOSIUM ON ARLINGTON, VA, USA APRIL 15-18, 2004, PISCATAWAY, NJ, USA, IEEE, 15 April 2004 (2004-04-15), pages 732-735, XP010773937 ISBN: 0-7803-8389-3 abstract page 732, left-hand column, last paragraph	4, 6, 7, 13, 15, 16, 18, 25
A	----- US 6 681 057 B1 (NAIR DINESH [US] ET AL) 20 January 2004 (2004-01-20) abstract column 9, line 40 - column 11, line 9; figure 5	18-25
A	----- US 5 631 981 A (RAO ARUN [US]) 20 May 1997 (1997-05-20) column 6, line 42 - column 7, line 48; figures 3-5 abstract	18-25
A	----- US 5 611 000 A (SZELISKI RICHARD S [US] ET AL) 11 March 1997 (1997-03-11) abstract; figure 14	18-25

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2007/018494

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: 1-17

Registering images by calculating a deformation/distortion field

1.1. claims: 1-8

The deformation field comprising a sum of weighted component fields with vectors that are spatially Gaussian distributed.

1.2. claims: 9-17

The distortion field comprising a polynomial model.

2. claims: 18-25

Incrementally optimising the deformation that registers one image to another.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2007/018494

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 6681057	B1	20-01-2004	NONE	
US 5631981	A	20-05-1997	EP JP	0663645 A2 7271984 A
				19-07-1995 20-10-1995
US 5611000	A	11-03-1997	NONE	