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Building 5, NL-5656 AE Eindhoven (NL).(81) Designated States (unless otherwise indicated, for every
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(54) Title: CORTICAL BONE SEGMENTATION FROM MR DIXON DATA

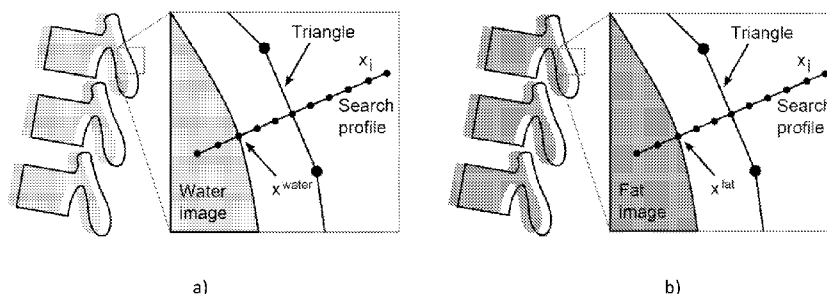


FIG. 2

(57) Abstract: The present invention relates to a method for segmenting MR Dixon image data. A processor and a computer program product are also disclosed for use in connection with the method. The invention finds application in the MR imaging field in general and more specifically may be used in the generation of an attenuation map to correct for attenuation by cortical bone during the reconstruction of PET images. In the method, a surface mesh is adapted to a region of interest by: for each mesh element in the surface mesh: selecting a water target position based on a water image feature response in the MR Dixon water image; selecting a fat target position based on a fat image feature response in the MR Dixon fat image; and displacing each mesh element from its current position to a new position based on both its water target position and its corresponding fat target position.

INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2014/062421

A. CLASSIFICATION OF SUBJECT MATTER
INV. G01R33/48 G01R33/56
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)
G01R

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	YI WANG ET AL: "3D Multi-parametric Breast MRI Segmentation Using Hierarchical Support Vector Machine with Coil Sensitivity Correction", ACADEMIC RADIOLOGY, vol. 20, no. 2, 23 October 2012 (2012-10-23), pages 137-147, XP055092666, ISSN: 1076-6332, DOI: 10.1016/j.acra.2012.08.016 page 138, column 2, paragraph 2 - page 141, column 2, paragraph 1; figure 1 ----- -/--	1-8, 13-15

☒ 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

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International application No

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	ECABERT O ET AL: "Automatic Model-Based Segmentation of the Heart in CT Images", IEEE TRANSACTIONS ON MEDICAL IMAGING, IEEE SERVICE CENTER, PISCATAWAY, NJ, US, vol. 27, no. 9, 30 April 2008 (2008-04-30), pages 1189-1201, XP011226714, ISSN: 0278-0062, DOI: 10.1109/TMI.2008.918330 cited in the application the whole document -----	1-8, 13-15
A	MICHOPOULOU S K ET AL: "Atlas-Based Segmentation of Degenerated Lumbar Intervertebral Discs From MR Images of the Spine", IEEE TRANSACTIONS ON BIOMEDICAL ENGINEERING, IEEE SERVICE CENTER, PISCATAWAY, NJ, USA, vol. 56, no. 9, 14 April 2009 (2009-04-14), pages 2225-2231, XP011343029, ISSN: 0018-9294, DOI: 10.1109/TBME.2009.2019765 cited in the application the whole document -----	1-8, 13-15

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2014/062421

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, 13-15

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, 13-15

A method for segmenting MR Dixon image data, wherein an MR Dixon water and an MR Dixon fat image are used to generate and adapt a surface mesh model for a region of interest.

2. claims: 9-12

A method for obtaining a PET attenuation map after segmenting MR Dixon image data, wherein an MR Dixon water and an MR Dixon fat image are used to generate and adapt a surface mesh model for a region of interest, and comprising assigning at least one gamma photon attenuation coefficient to at least one volume bounded by the surface mesh model.
