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(54) Title: METHOD AND A SYSTEM FOR MEDICAL IMAGING

(57) Abstract: The present invention relates to method and a system for detecting an anatomical structure (35) in a medical data (30), wherein the method comprises receiving the medical data (30) associated with the anatomical structure (35), comparing a test value of context features of each unit point of the medical data (30) with a range assigned to reference context features of the medical data (30), wherein the reference context features are derived using information from a neighborhood of the anatomical structure from a training medical data, assigning a score to each unit point as a function of the comparison, and detecting the presence of the anatomical structure (35) in the medical data (30) based on the score of the unit points.
The present invention relates to a method and a system for detecting an anatomical structure in a medical data. Medical imaging data or medical data of a subject comprises one or more multidimensional medical images of the subject, such as 2D, 3D images, and the like. For example, the medical imaging data can relate to 4D ultrasound, computer tomography (CT), magnetic resonance (MR). To detect a particular anatomical structure in the medical imaging data, a clinic or a radiologist is required to browse through many 2D slices of the medical imaging data. For example, the slices can be browsed using a cine feature, wherein the slices of the medical imaging data can be browsed slice by slice or multiple slices can be browsed like a video. The cine feature comprises features like play/pause or next/previous depending on whether the slices are browsed slice by slice or like a video.

On detecting the particular anatomical structure, the clinician generally marks a region of interest around the anatomical structures. However, to identify the anatomical structure and to mark the region of interest, the clinician has to spend considerable amount of time.

The object of the present invention is to improve the detection of an anatomical structure in a medical data.

The above object is achieved by a method of detecting an anatomical structure in a medical data, the method comprising receiving the medical data associated with the anatomical structure, comparing a test value of context features of each unit point of the medical data with a range assigned to reference context features of the medical data, wherein the reference context features are derived using information from a neighborhood of the anatomical structure from a training.
medical data, assigning a score to each unit point as a function of the comparison, and detecting the presence of the anatomical structure based on the score of the unit points.

The context features of a unit point of the medical data comprise information of a neighborhood of the unit point. The reference context features can be obtained from training medical data for a respective anatomical structure. The use of context features enable in using information of the surrounding of the anatomical structure. The comparison of the information of the surrounding of the region of the medical data and the information of the surrounding of the unit point enables in detecting the presence of the anatomical structure in the medical data easily. Thus, this improves the accuracy of detection of the anatomical structure as feeble anatomical structures can also be detected.

According to an embodiment, the detection of the anatomical structure includes determining unit points having the score greater than a threshold score to obtain positive unit points. This achieves in identifying unit points that most likely represent the anatomical structure.

According to yet another embodiment, the detection includes detecting appearance features of the positive unit points, and detecting a shape of the anatomical structure in the medical data using appearance features of the positive unit points. The appearance features of the positive unit points enables in detecting the shape of the anatomical structure from the positive unit points. The appearance features of the positive unit points provide additional information of the positive unit points which enables in detecting the shape of the anatomical structure.

According to yet another embodiment, the comparison of the test value of context features includes receiving an input indicating the anatomical structure to be detected, and
obtaining the reference context features corresponding to the input received. Thus, the corresponding reference context features relating to the anatomical structure to be detected can be obtained.

According to yet another embodiment, the method further comprises assigning a unique identification number to a portion of the medical data comprising the anatomical structure, and associating the unique identification number to a user input received corresponding to the anatomical structure. This enables in accessing the portion of the medical data comprising the anatomical structure easily and quickly as the complete medical data is not required to be browsed for accessing the portion of the medical data comprising the desired anatomical structure.

According to yet another embodiment, wherein the method further comprises displaying the portion of the medical data comprising the anatomical structure. The detected anatomical structure in the medical data can be displayed.

Another embodiment includes a medical imaging system for detecting an anatomical structure in a medical data, the medical imaging system comprising an acquisition device for acquiring the medical data of a subject associated with the anatomical structure, a processing unit configured to compare a test value of context features of each unit point of the medical data with a range assigned to reference context features of the medical data, wherein the reference context features are derived using information from a neighborhood of the anatomical structure from a training medical data, assign a score to each unit point as a function of the comparison, and detect the presence of the anatomical structure based on the score of the unit points.

The present invention is further described hereinafter with reference to illustrated embodiments shown in the accompanying drawings, in which:
FIG 1 illustrates an exemplary block diagram of a medical imaging system for detecting an anatomical structure in a medical data according to an embodiment herein,

FIG 2 illustrates an example of a medical data of a subject according to an embodiment herein,

FIG 3 illustrates an example of a score map for a medical data, wherein each unit point is assigned a score based on a comparison,

FIG 4 illustrates an example of a shape of an anatomical structure detected using a set of positive points from a score map,

FIG 5 an example of a cine application comprising the embodiments described herein,

FIG 6 is a flow diagram illustrating method of deriving reference context features for an anatomical structure from one or more training medical data according to an embodiment herein,

FIG 7 is a flow diagram illustrating a method of detecting an anatomical structure in a medical data according to an embodiment herein, and

FIG 8 illustrates a representative hardware environment for practicing the embodiments described herein.

Various embodiments are described with reference to the drawings, wherein like reference numerals are used to refer to like elements throughout. In the following description, for purpose of explanation, numerous specific details are set forth in order to provide a thorough understanding of one or
It may be evident that such embodiments may be practiced without these specific details.

FIG 1 illustrates an exemplary block diagram of a medical imaging system 10 for detecting an anatomical structure in a medical data according to an embodiment herein. The system 10 comprises an acquisition device 15, a processing unit 20 and a memory device 25. The acquisition device 15 acquires medical data of a subject. The term "medical data" used herein refers to multidimensional medical images such as 2D, 3D and the like. The acquired medical data is provided to the processing unit 20 for processing by the acquisition device and the processing unit is configured to process the medical data. According to an aspect herein, the processing unit 20 is configured to process the medical data to detect an anatomical structure of the subject.

FIG 2 illustrates an example of a medical data of a subject according to an embodiment herein. In the illustrated medical data 30, for example, it is assumed that the anatomical structure 35 do be detected is a right optic nerve. Generally, the appearance of right optic nerve is feeble and it is very hard to detect by normal human observation. In the illustrated medical data 30, the right optic nerve can be seen inside the rectangle 36, and is designated as the anatomical structure 35.

Referring now to FIG 1 and FIG 2, to detect the feeble right optic nerve 35 in the medical data 30, the processing unit 20 is configured to access the memory device 25 and obtain reference context features stored at the memory device 25 corresponding to the right optic nerve 35. The reference context features are derived using information from a neighborhood of the anatomical structure from one or more training medical data of the anatomical structure. For example, the reference context features can be derived in a training phase for the anatomical structure from the one ore
more training medical data. The process of deriving the reference context features will be explained in detail later.

A "processing unit" as used herein is a device for executing machine-readable instructions stored on a computer readable medium, for performing tasks and may comprise any one or combination of, hardware and firmware. For example, the processing unit may be implemented using a microcontroller, microprocessor, electronic devices, or other electronic units to perform the functions described herein or a combination thereof. The machine-readable instructions may be stored within the processing unit or external to the processor. The memory device 25 can be deployed using a volatile or a non-volatile memory.

Referring still to FIG 1 and FIG 2, the processing unit 20 on obtaining the reference context features is configured to compare a test value of the context features of each unit point of the medical data 30 with a range assigned to the reference context features. The term unit point used herein refers to the smallest unit point of the medical data that can be represented or controlled, such as a pixel of a 2D image and a voxel of a 3D image. The medical data can comprise one or more 2D or 3D slices. Thus, the processing unit 20 can be configured to compare the test value of the context features of each unit point in each slice of the medical data. The use of context features enable in using surrounding information of the anatomical structures obtained from training medical data for detecting the anatomical structures in the medical data. This enables in detecting an anatomical structure having feeble appearance or when geometric relation with other anatomical structures or surrounding is well constrained. Based on the comparison, the processing unit 20 is configured to assign a score to each unit point of the medical data as a function of the comparison. For example, the processing unit 20 can be configured to generate a score map using the scores assigned to each unit points of the medical data. In an aspect, the
comparison and assignment of the score to each unit point based on the comparison can be performed using an adaptive boosting algorithm. The processing unit 20 can be configured to perform the functions of the adaptive boosting algorithm.

FIG 3 illustrates an example of a score map for the medical data 30, wherein each unit point is assigned a score based on the comparison. In the illustrated score map 40, in the region within the rectangle 45 it can be seen that the unit points corresponding to the right optic nerve 35 are distinctly represented. The scope map 40 illustrated in the example of FIG 3 is a 2D score map. However, the score map can be a 3D score map also. If the medical data comprises a plurality of 2D slices, a plurality of respective 2D score maps can be generated for each 2D slice. Similarly, if the medical data comprises a plurality of 3D slices, a plurality of respective 3D score maps can be generated for each 3D slice.

Referring now to FIGS 1 through FIG 3, using the assigned score to each unit point of the medical data 30 in the score map 40, the processing unit 20 is configured to detect the presence of the right optic nerve 35. To detect the right optic nerve 35, in an aspect, the processing unit 20 is configured to determine unit points having the score greater than a threshold score to obtain positive unit points. The term positive unit points used herein refers to the unit points having a score greater than the threshold score, and thus, are unit points that most likely represent the anatomical structure. In the shown example of FIG 3, the positive unit points, designated as 50, are shown as enclosed within the rectangle 45. The threshold score can be selected as per the accuracy desired. Determining the unit points whose score is greater than the threshold score enables in removing false positive substantially. In an aspect, the threshold score for each type of the anatomical structure can be determined as per the accuracy desired and stored in the memory device 25. The processing unit 20 can be configured to
access the memory device and obtain the threshold score. In another aspect, for each type of anatomical structure, the threshold score can be provided as an input to the processing unit 20.

Referring now to FIGS 1 through 3, according an embodiment herein, to detect the shape of the anatomical structure 35, the processing unit 20 can be configured to detect appearance features of the positive unit points 50 representing the anatomical structure 35. Generally, positive unit points 50 representing the anatomical structure 35 will be the neighboring unit points as depicted within the rectangle 45 in the score map 40. The positive unit points 50 representing the anatomical structure 35 are referred to herein as a set of positive unit points. In the shown example FIG 3, only one set of positive unit points 50 is illustrated for example purpose only. In some aspects, a score map can comprise multiple set of positive unit points representing a plurality of anatomical structures. The anatomical structures can be of the same type if one anatomical structure can be present at different locations within a body the subject. Additionally, the different set of positive unit points can represent different anatomical structures if the different anatomical structures desired to be detected can be detected in the same slice of the medical data. A set of positive unit points will be neighboring unit points because the positive unit points will most likely be the unit points representing the anatomical structure and thus will be in a region in the medical data where the anatomical structure 35 is present.

The processing unit 20 is configured to determine the appearance features of each positive unit point in the respective score map of each slice of the medical data. The appearance features can be detected by applying an appearance detection algorithm over the positive unit points of each slice of the medical data. For example, a gabor based linear discriminant analysis (LDA) classifier can be used for detecting the appearance features of the positive unit points 50. The appearance detection algorithm can determine one or
more of the appearance features, such as, intensity, textures, edge responses, colour histograms and other features used for object detection for each of the positive unit points 50 of the score map 40. From the detected appearance features of the positive unit points 50, the processing unit 20 is configured to detect the shape of the anatomical structure 35. The appearance features of the positive unit points 50 provide additional information and thus achieves in detecting the shape of the anatomical structure.

FIG 4 illustrates an example of a shape of the anatomical structure 35 detected using the set of positive points 50 from the score map 40 of FIG 3. The shape of the anatomical structure 35 can be seen within the rectangle 55.

Referring now to FIG 1, according to an aspect, the system 10 comprises an input device 30 operably coupled to the processing unit 20. A user, such as a radiologist can provide an indication to the processing unit 20 as to which anatomical structure is required to be detected. Responsive to the input, the processing unit 20 is configured to access the memory device 25 to obtain the reference context features corresponding to the anatomical structure for which the indication was provided via the input device 30. Alternatively, the processing unit 20 can access the memory device 25 to obtain reference context features of different anatomical structures stored therein and detect the respective anatomical structures in the medical data. The detected anatomical structure can be displayed to the user using a display device 35 operably coupled to the processing unit 20. Additionally, the input device 30 can be used for by the radiologist for providing the threshold score for an anatomical structure as an input to the processing unit 20.

Referring now to FIG 1 and FIG 4, according to an aspect, the processing unit 20 is configured to assign a unique identification to a portion of the medical data comprising...
the detected anatomical structure 35. The unique identification can be such that the portion of the medical data comprising the detected anatomical structure 35 can be identified uniquely. For example, the unique identification can be a unique number, a character string or a combination of number and characters. In the example of FIG 4, the anatomical structure 35 is detected in a single 2D slice of the medical data. Thus, the processing unit 20 will assign a unique identification to the slice of the medical data comprising the anatomical structure 35. The unique identification assigned to the slice comprising the anatomical structure 35, i.e., the right optic nerve, can be associated with an input received from a user corresponding to right optic nerve. For example, if a plurality of different anatomical structures are detected in the medical data, and a user is interested in displaying the right optic nerve 35, the slice of the medical data comprising the right optic nerve 35 can be easily accessed by using the unique identification and then displayed. This also achieves in easy report generation as the respective portions of medical data comprising one or more respective anatomical structure can easily be accessed using the unique identification and the complete medical data is not required to be browsed for accessing the portion of the medical data comprising the anatomical structure 35. This is described in more detail in the description of FIG 5 below.

FIG 5 with reference to FIG 1 illustrates an example of a cine application comprising the embodiments described herein. In the illustrated example of FIG 5, the cine application, apart from comprising conventional browsing features, such as, play/pause, next/previous, and the like, comprises anatomy wise browsing. The input tab for play is designated as 106 and the input tab for pause is designated as 107. Similarly, the input tab for next is designated as 108 and the input tab for previous is designated as 109. For example, in a head and neck CT medical data, the six input tabs 110 to
of the cine application can be assigned to anatomical structures as follows:

110 - Right optic nerve
111 - Left optic nerve
112 - Right eye
113 - Left eye
114 - Right parotid optic nerve
115 - Left parotid

A radiologist desiring to look at a particular anatomical structure can click or press the input tab corresponding to the anatomical structure. The processing unit 20 is configured to display the anatomical structure for which the input tab was clicked by accessing the portion of the medical data comprising the particular anatomical structure using the unique identification assigned to the portion of the medical data. This enables the radiologist to view the desired anatomical structure easily without manually scanning each slice of the medical data. In the example of FIG 5, it is shown that the portion of the medical data 115 corresponding to right optic nerve 35 is displayed on the radiologist clicking the input tab 110. Similarly, the respective portion of the medical data comprising other anatomical structures designated by the respective input tabs 111 to 115 can be displayed on clicking the corresponding input tabs 111 to 115. Additionally, for report generation purposes, the portions of medical data comprising diagnostically relevant anatomical structures can be inserted into the report easily.

FIG 6 is a flow diagram illustrating method of deriving reference context features for an anatomical structure from one or more training medical data according to an embodiment herein. At block 120, a region is marked on an anatomical structure of one or more training medical data for which reference context features are desired to be generated. Advantageously, the region is marked at the center of the anatomical structure. Next at, block 125, a neighborhood of
the region of the anatomical structure is sampled to obtain a plurality of context features for the anatomical structure. Moving next to block 130, the plurality of context features are evaluated to determine the context features having discriminative information for the anatomical structure and are herein referred to as reference context features. Thus, a reduced set of context features having discriminative information of the anatomical structure is obtained from the complete set of context features. This achieves in reduction in processing during the detection of the anatomical structure in test medical data. At block 135, a value in the form of a range is assigned to the reference context features. For example, the range for a reference context feature can be determined with respect to values of positive and negative training examples of the anatomical structure. The range assists in identifying positive context features from the medical data to be tested. For example, the steps of blocks 130 and 135 can be performed using a feature selection algorithm such as an adaptive boosting algorithm.

FIG 7 is with reference to FIGS 1 through 7 is a flow diagram illustrating a method of detecting an anatomical structure in a medical data according to an embodiment herein. At block 140, the medical data associated with the anatomical structure 35 acquired by the acquisition device 15 is received. Next, at block 145, a test value of context features of each unit point of the medical data is compared with a range assigned to reference context features of the medical data, wherein the reference context features are derived using information from a neighborhood of the anatomical structure from a training medical data. At block 150, a score is assigned to each unit point as a function of the comparison. Next, at block 155, the presence of the anatomical structure 35 is detected based on the score of the unit points.

The embodiments herein can take the form of an entirely hardware embodiment, an entirely software embodiment or an
embodiment including both hardware and software elements. The embodiments that are implemented in software include but are not limited to, firmware, resident software, microcode, etc.

Furthermore, the embodiments herein can take the form of a computer program product accessible from a computer-readable or computer-readable medium providing program code for use by or in connection with a computer or any instruction execution system. For the purposes of this description, a computer-readable or computer-readable medium can be any apparatus that can comprise, store, communicate, propagate, or transport the program for use by or in connection with the instruction execution system, apparatus, or device.

The medium can be an electronic, magnetic, optical, electromagnetic, infrared, or semiconductor system (or apparatus or device) or a propagation medium. Examples of a computer-readable medium include a semiconductor or solid state memory, magnetic tape, a removable computer diskette, a random access memory (RAM), a read-only memory (ROM), a rigid magnetic disk and an optical disk. Current examples of optical disks include compact disk - read only memory (CD-ROM), compact disk - read/write (CD-R/W) and DVD.

A data processing system suitable for storing and/or executing program code will include at least one processor coupled directly or indirectly to memory elements through a system bus. The memory elements can include local memory employed during actual execution of the program code, bulk storage, and cache memories which provide temporary storage of at least some program code in order to reduce the number of times code must be retrieved from bulk storage during execution.

Input/output (I/O) devices (including but not limited to keyboards, displays, pointing devices, etc.) can be coupled to the system either directly or through intervening I/O controllers. Network adapters may also be coupled to the
system to enable the data processing system to become coupled to other data processing systems or remote printers or storage devices through intervening private or public networks. Modems, cable modem and Ethernet cards are just a few of the currently available types of network adapters.

FIG 8 depicts a representative hardware environment for practicing the embodiments described herein. This schematic drawing illustrates a hardware configuration of an information handling/computer system 160 in accordance with the embodiments herein. The system 160 comprises at least one processor or central processing unit (CPU) 165. The CPU 165 is interconnected via bus 170 to various devices such as a memory 175, input/output (I/O) controller 180, and user interface controller 185. Depending on the type and configuration of the system 160, the memory 175 may be volatile (such as random access memory (RAM) etc., non-volatile (read only memory (ROM), flash memory devices etc.,) or a combination of the two. The memory 175 is used to store instructions and data for use by the CPU 165. The I/O controller 180 can connect to peripheral devices, such as CD drives 190 and hard drives 195, or other program storage devices that are readable by the system 160. Typically, an operating system for the computer system 160 as well as an application program is stored onto the hard drive 195. The operating system runs on the CPU 165 and is used to coordinate and provide control of various components within system 160. The system 160 can read the inventive instructions on the hard drive 195 and load them onto the memory 175 for execution by the CPU 165. The user interface controller 185 can connect to a keyboard 200, mouse 205, speaker 210, microphone 215, display device 220 and/or other user interface devices such as a touch screen device (not shown) to the bus 170 to gather user input and also to provide system output to the user.
The embodiments described herein enable detecting an anatomical structure of a subject from a medical data easily without the requirement of a radiologist browsing all the slices of the medical data manually to identify the anatomical structure. Manually identifying the anatomical structure is time consuming as all the slices will have to be browsed. Additionally, in cases where the appearance of the anatomical structure is feeble, manual detection is difficult and may not be correct. The use of context features achieve in detection of the feeble and geometrically constrained anatomical structures. Moreover, the embodiments can also be used for report generation where portions of medical data comprising diagnostically relevant anatomical structures can be inserted into the report automatically.

While this invention has been described in detail with reference to certain preferred embodiments, it should be appreciated that the present invention is not limited to those precise embodiments. Rather, in view of the present disclosure which describes the current best mode for practicing the invention, many modifications and variations would present themselves, to those of skilled in the art without departing from the scope and spirit of this invention. The scope of the invention is, therefore, indicated by the following claims rather than by the foregoing description. All changes, modifications, and variations coming within the meaning and range of equivalency of the claims are to be considered within their scope.
Patent claims

1. A method of detecting an anatomical structure (35) in a medical data (80),
- receiving the medical data (30) associated with the anatomical structure 35,
- comparing a test value of context features of each unit point of the medical data (30) with a range assigned to reference context features of the medical data (30), wherein the reference context features are derived using information from a neighborhood of the anatomical structure from a training medical data,
- assigning a score to each unit point as a function of the comparison, and
- detecting the presence of the anatomical structure (35) in the medical data (30) based on the score of the unit points.

2. The method according to claim 1, wherein the detection of the presence of the anatomical structure (35) includes determining unit points having the score greater than a threshold score to obtain positive unit points (50).

3. The method according to anyone of the claims 1 to 2, wherein the detection includes:
- detecting appearance features of the positive units points (50), and
- detecting a shape of the anatomical structure (35) in the medical data (30) using appearance features of the positive unit points (50).

4. The method according to anyone of the claims 1 to 3, wherein the comparison of the test value of context features includes:
- receiving an input indicating the anatomical structure (35) to be detected, and
- obtaining the reference context features corresponding to the input received.
5. The method according to anyone of the claims 1 to 4, further comprising:
- assigning a unique identification number to a portion of the medical data (115) comprising the anatomical structure (35), and
- associating the unique identification number to a user input received corresponding to the anatomical structure (35).

6. The method according to claim 5, further comprising displaying the portion of the medical data (115) comprising the anatomical structure (35).

7. A medical imaging system (10) for detecting an anatomical structure (35) in a medical data (30), the medical imaging system (10) comprising:
- an acquisition device (15) for acquiring the medical data (30) of a subject associated with the anatomical structure (35),
- a processing unit (20) configured to:
  - compare a test value of context features of each unit point of the medical data (30) with a range assigned to reference context features of the medical data (30), wherein the reference context features are derived using information from a neighborhood of the anatomical structure from a training medical data,
  - assign a score to each unit point as a function of the comparison, and
  - detect the presence of the anatomical structure (35) based on the score of the unit points.

8. The medical imaging system (10) according to claim 7, wherein the processing unit (20) is configured to determine unit points having the score greater than a threshold score to obtain positive unit points (50).
9. The medical imaging system (10) according to anyone of the claims 7 and 8, wherein the processing unit (20) is configured to:
- identify a region (107) around the positive units points, and
- detect the anatomical structure (35) within the region (107) using appearance features of the anatomical structure (35).

10. The medical imaging system (10) according to anyone of the claims 7 to 9, wherein the processing unit (20) is configured to:
- receive an input indicating the anatomical structure (35) to be detected, and
- obtain the reference context features corresponding to the input received.

11. The medical imaging system (10) according to anyone of the claims 7 to 10, wherein the processing unit (20) is further configured to:
- assign a unique identification number to a portion of the medical data (115) comprising the anatomical structure (35), and
- associate the unique identification number to a user input received corresponding to the anatomical structure (35).

12. The medical imaging system (10) according to claim 7, further comprising a display device (35) operably coupled to the processing unit (20) and configured to display the portion of the medical data (115) comprising the anatomical structure (35).
This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. **X** Claims Nos.: 1-8 because they relate to subject matter not required to be searched by this Authority, namely:
   
   see FURTHER INFORMATION sheet PCT/ISA/210

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).

This International Searching Authority found multiple inventions in this international application, as follows:

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.
A. CLASSIFICATION OF SUBJECT MATTER

INV. G06T7/00 A61B6/00

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A61B 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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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<td>X</td>
<td>US 2007/230795 A1 (ABRAMOFF MICHAEL D [US] ET AL) 4 October 2007 (2007-10-04) paragraphs [0004], [0005], [0023] - [0025], [0027], [0028], [0031], [0050], [0055] - [0067], [0070] - [0078], [0080]; claims 1,24; figures 1,5,7,9</td>
<td>7-10, 12</td>
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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
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*"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

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Date of the actual completion of the international search: 30 November 2012
Date of mailing of the international search report: 11/12/2012

Name and mailing address of the ISA:
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Tel. (+31-70) 340-3940,
Fax. (+31-70) 340-3916
Authorized officer:
Daoukou, Eleni
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<td>X</td>
<td>US 2005/228272 A1 (YU DAPHNE [US]) 13 October 2005 (2005-10-13) paragraphs [0024] - [0026], [0030], [0035]; figures 1, 4a-5b, 6</td>
<td>7-9</td>
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<td>US 2009/228299 A1 (KANGARLOO HOOSHANG [US] ET AL) 10 September 2009 (2009-09-10) paragraphs [0033], [0036], [0037], [0052], [0081]; figures 1-3</td>
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Continuation of Box II.1

Claims Nos.: 1-6

Claim 1 is directed to a method comprising steps, which did not necessarily involve the use of technical means. All the individual steps could be carried out by a qualified person as mental acts. Actually, any doctor performs consciously or unconsciously these steps, when he/she evaluates a radiological image. His/her decision is based on his/her knowledge and experience acquired during training with medical data. Therefore, the scope of this claim is considered as a method for performing mental acts, for which no search is required under Rule 39.1 (iii) PCT. The same applies to claims 2-6, which are dependent on claim 1.