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(54) ULTRASONIC SCANNING METHOD AND ULTRASONIC SCANNING DEVICE

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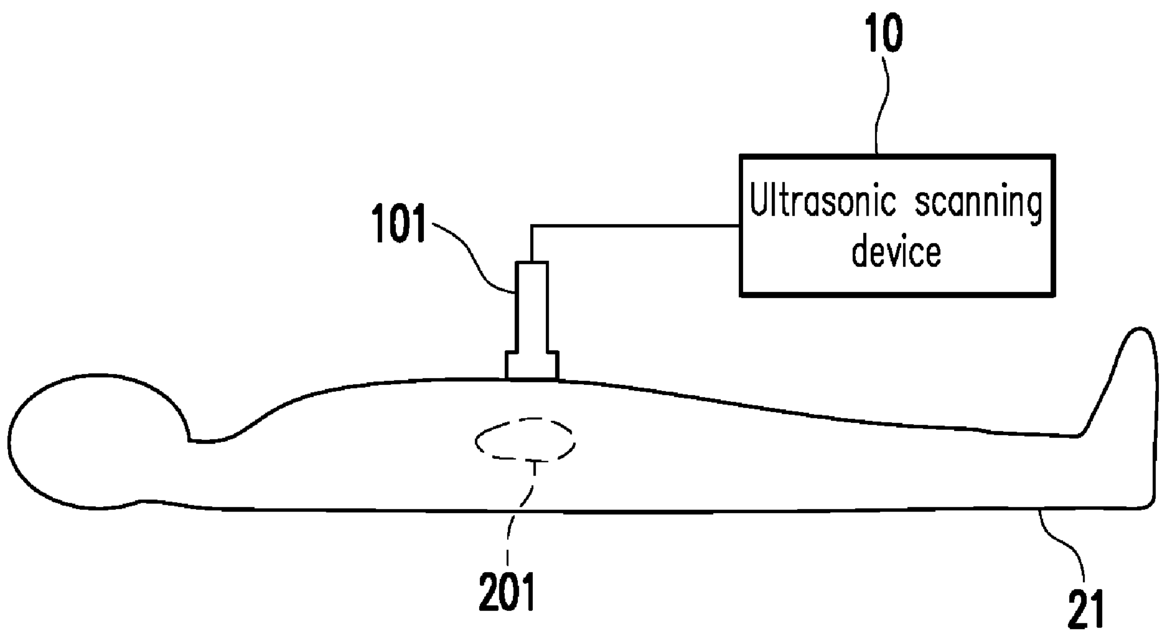
(57) **ABSTRACT**

An ultrasonic scanning method for an ultrasonic scanning device is provided according to an embodiment of the disclosure. The ultrasonic scanning method includes: performing an ultrasonic scanning operation on a human body by an ultrasonic scanner to obtain an ultrasonic image; analyzing the ultrasonic image by an image recognition module to identify an organ pattern in the ultrasonic image; and generating, automatically, a guiding message according to an identification result of the organ pattern, wherein the guiding message is configured to guide a moving of the ultrasonic scanner to scan a target organ of the human body.



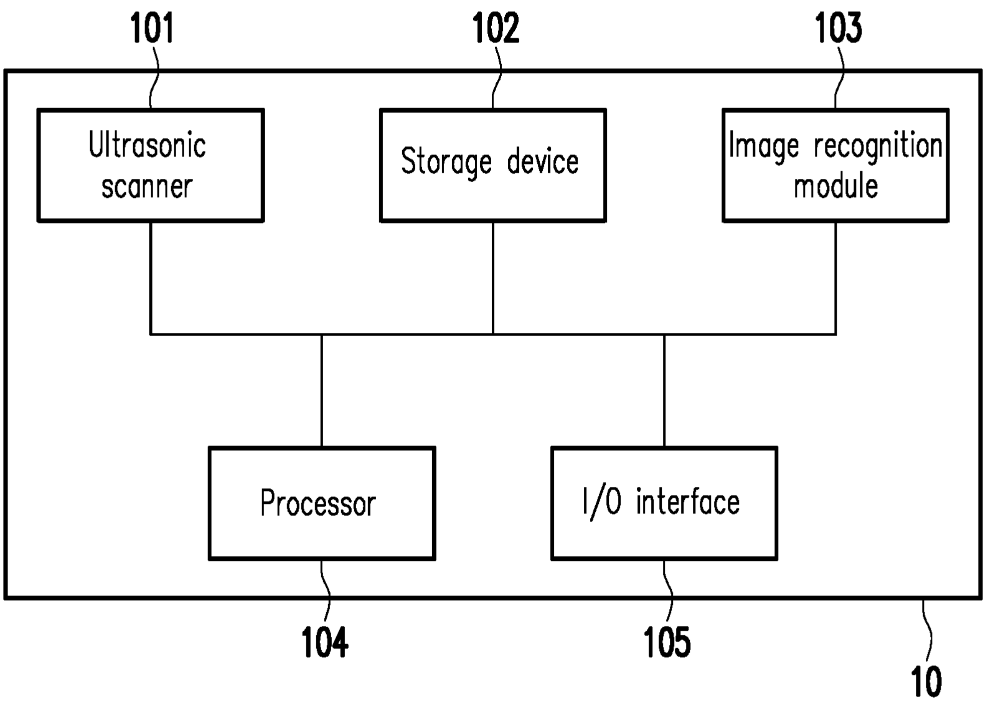

101
102
103
Ultrasonic scanner
Storage device
Image recognition module
Processor
I/O interface
104
105
10

FIG. 1

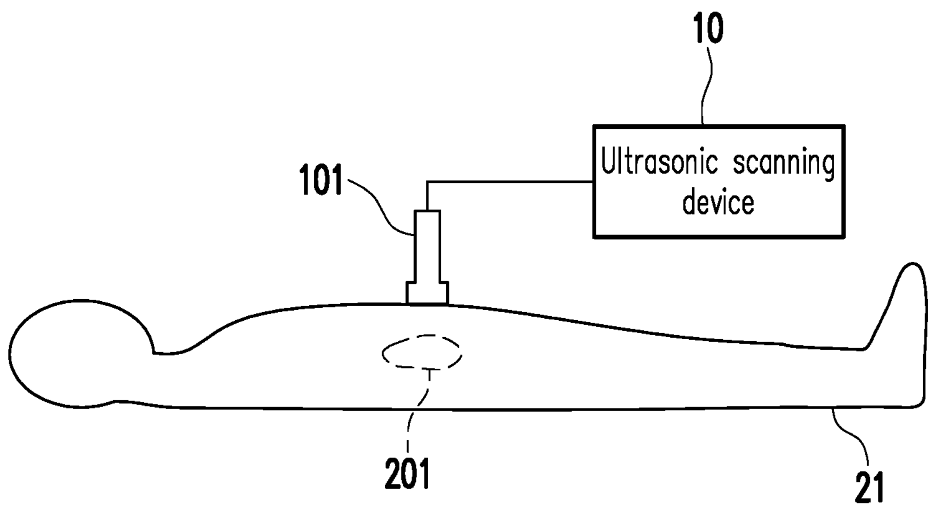

10
Ultrasonic scanning device
101
201
21

FIG. 2

31

Images	Coordinates
1	(x1,y1)
2	(x2,y2)
3	(x3,y3)
4	(x4,y4)
5	(x5,y5)

FIG. 3

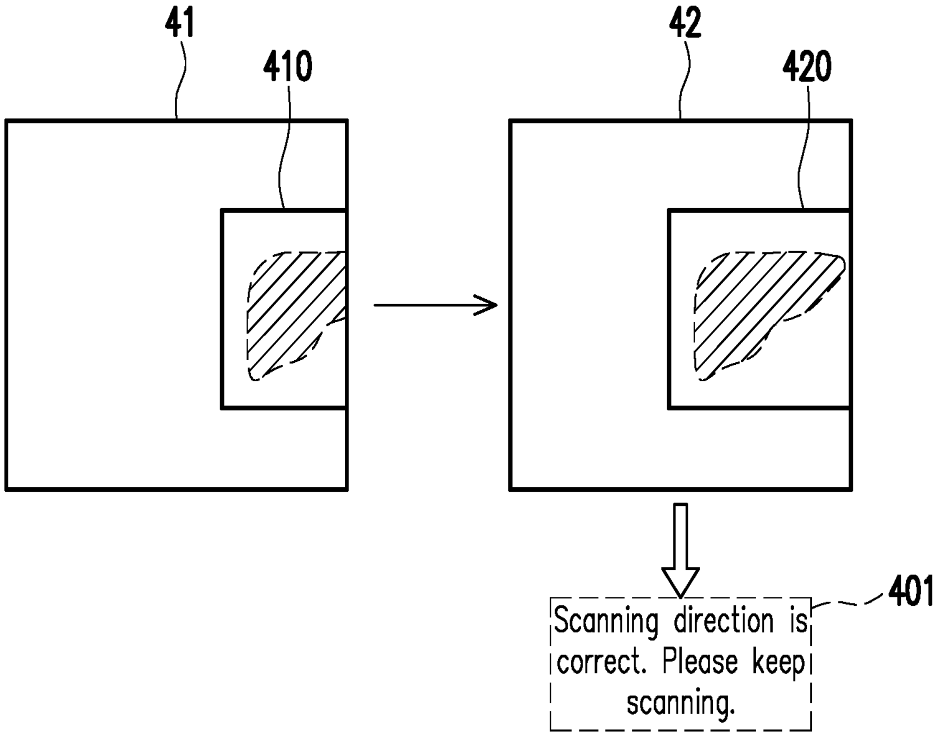


FIG. 4

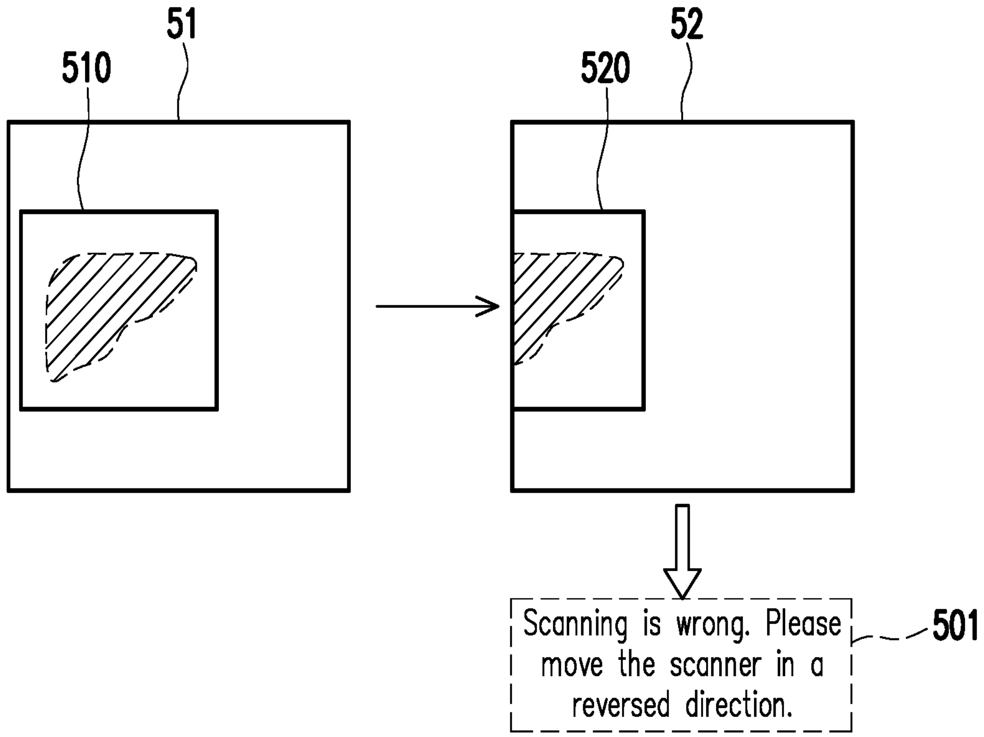

51
510
52
520
Scanning is wrong. Please move the scanner in a reversed direction.
501

FIG. 5

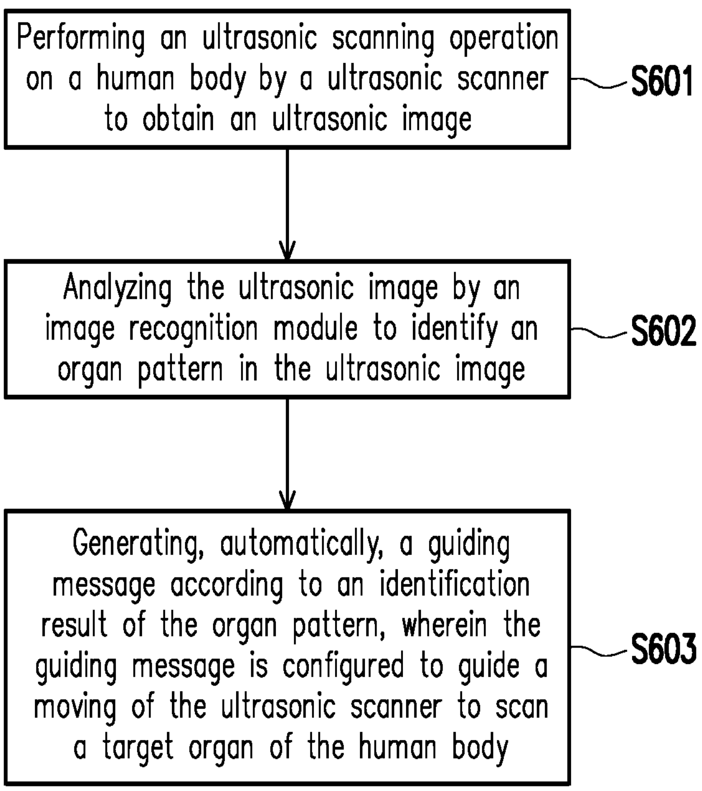

Performing an ultrasonic scanning operation on a human body by a ultrasonic scanner to obtain an ultrasonic image
S601
Analyzing the ultrasonic image by an image recognition module to identify an organ pattern in the ultrasonic image
S602
Generating, automatically, a guiding message according to an identification result of the organ pattern, wherein the guiding message is configured to guide a moving of the ultrasonic scanner to scan a target organ of the human body
S603

FIG. 6

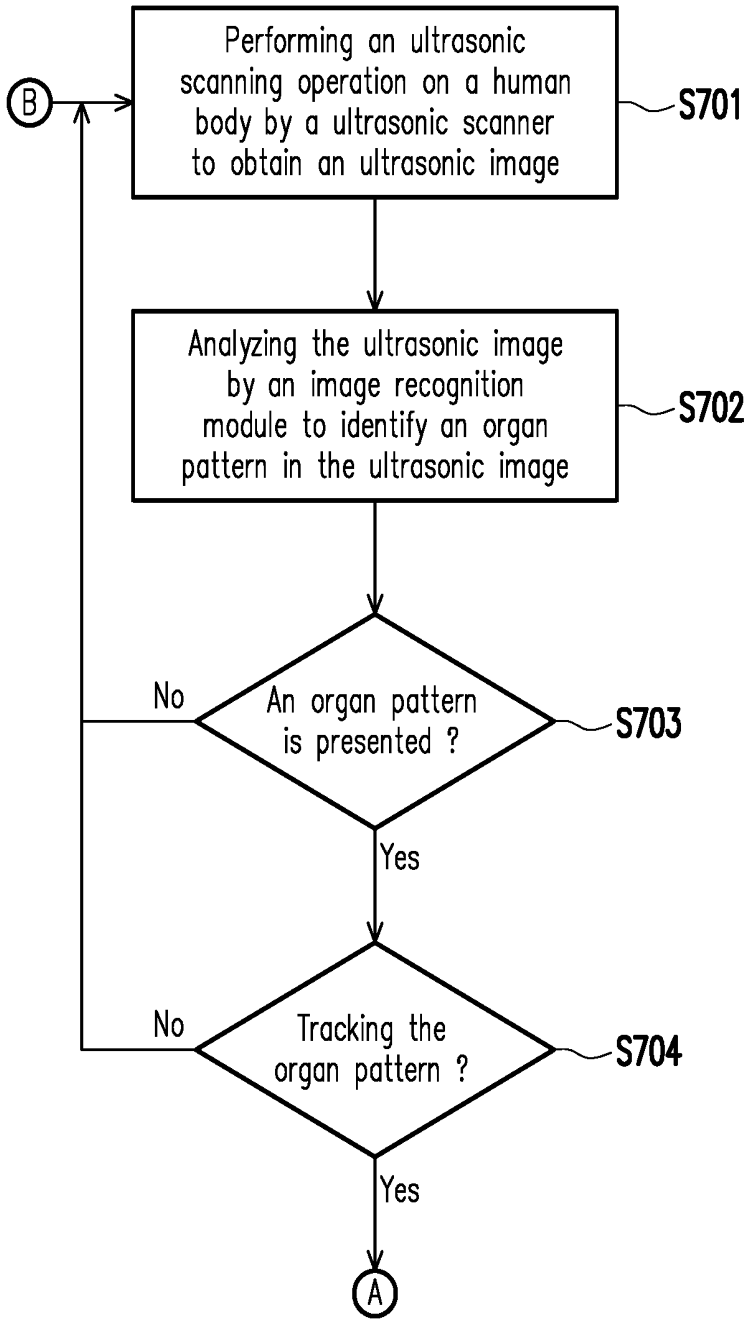

Performing an ultrasonic scanning operation on a human body by a ultrasonic scanner to obtain an ultrasonic image
S701
Analyzing the ultrasonic image by an image recognition module to identify an organ pattern in the ultrasonic image
S702
An organ pattern is presented ?
S703
No
Yes
Tracking the organ pattern ?
S704
No
Yes
B
A

FIG. 7

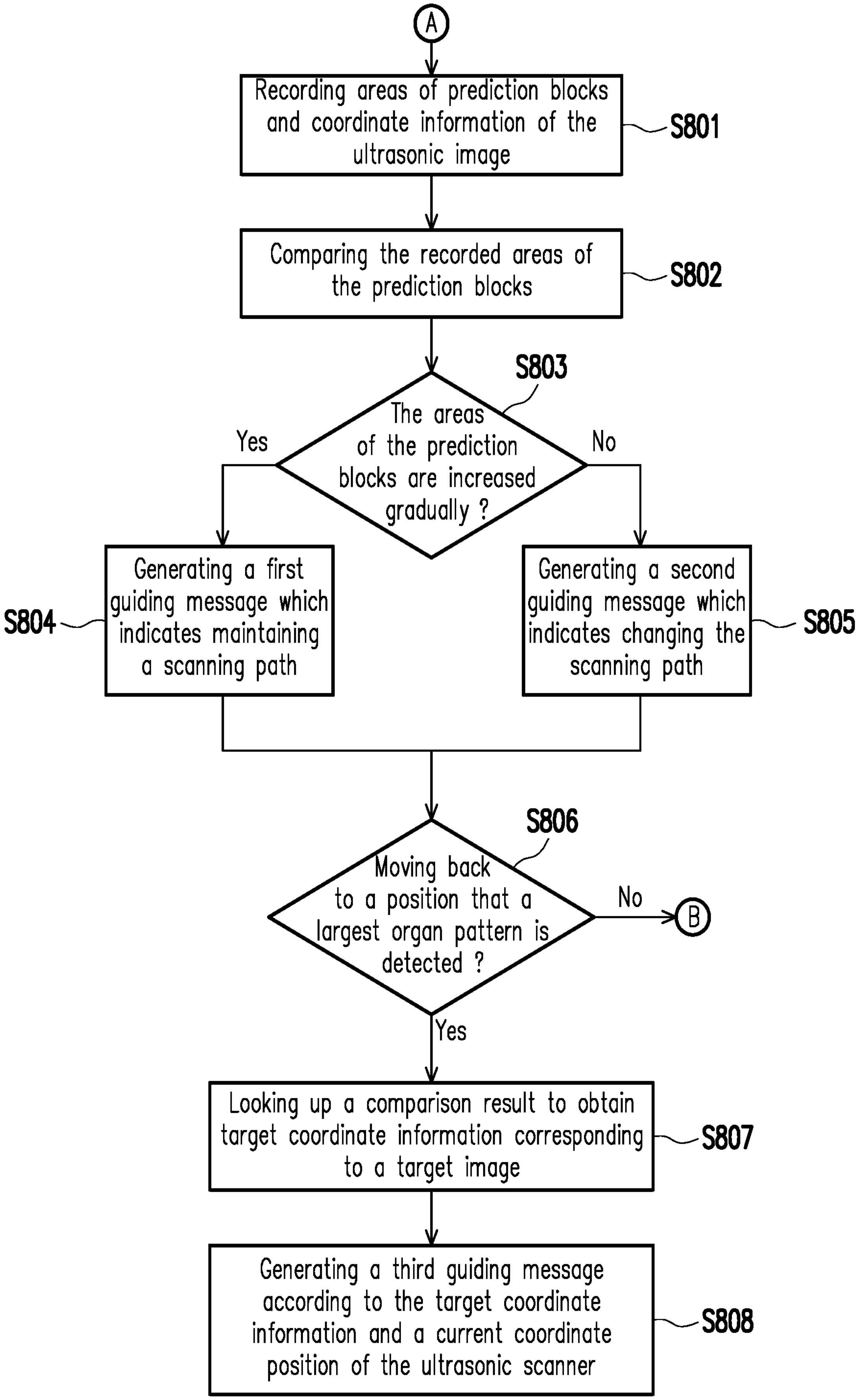

A
Recording areas of prediction blocks and coordinate information of the ultrasonic image
S801
Comparing the recorded areas of the prediction blocks
S802
S803
The areas of the prediction blocks are increased gradually ?
Yes
No
Generating a first guiding message which indicates maintaining a scanning path
S804
Generating a second guiding message which indicates changing the scanning path
S805
S806
Moving back to a position that a largest organ pattern is detected ?
No
B
Yes
Looking up a comparison result to obtain target coordinate information corresponding to a target image
S807
Generating a third guiding message according to the target coordinate information and a current coordinate position of the ultrasonic scanner
S808

FIG. 8

ULTRASONIC SCANNING METHOD AND ULTRASONIC SCANNING DEVICE

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims the priority benefit of Taiwan application serial no. 108100344, filed on Jan. 4, 2019. The entirety of the above-mentioned patent application is hereby incorporated by reference herein and made a part of this specification.

BACKGROUND

Technical Field

[0002] The disclosure is related an ultrasonic scanning technology, and more particularly related to an ultrasonic scanning method and an ultrasonic scanning device.

Description of Related Art

[0003] The ultrasonic scanning device may be used to obtain an organ image of a human body based on ultrasonic waves to evaluate an organ state based on the organ image. However, conventional ultrasonic scanning devices require professional operation, and ultrasonic images obtained by ultrasonic scanning also require professional identification. It is not easy for a person without professional training to identify a particular organ from the ultrasonic images. Furthermore, in practice, professionals such as doctors or inspectors may also misinterpret organ patterns due to various conditions (such as lack of professionalism or fatigue) when operating an ultrasonic scanning device, which leads to inefficiency in the inspection and even to inaccurate inspection results.

SUMMARY

[0004] The disclosure provides an ultrasonic scanning method and an ultrasonic scanning device, which may automatically analyze ultrasonic images and provide a guiding message for assisting scanning according to the analysis result, thereby improving the above problem.

[0005] An ultrasonic scanning method for an ultrasonic scanning device is provided according to an embodiment of the disclosure. The ultrasonic scanning method includes: performing an ultrasonic scanning operation on a human body by an ultrasonic scanner to obtain an ultrasonic image; analyzing the ultrasonic image by an image recognition module to identify an organ pattern in the ultrasonic image; and generating, automatically, a guiding message according to an identification result of the organ pattern, wherein the guiding message is configured to guide a moving of the ultrasonic scanner to scan a target organ of the human body.

[0006] An ultrasonic scanning device including an ultrasonic scanner and a processor is provided according to an embodiment of the disclosure. The ultrasonic scanner is configured to perform an ultrasonic scanning operation on a human body to obtain an ultrasonic image. The processor is coupled to the ultrasonic scanner and configured to analyze the ultrasonic image by an image recognition module to identify an organ pattern in the ultrasonic image. The processor is further configured to generate, automatically, a guiding message according to an identification result of the organ pattern, and the guiding message is configured to guide a moving of the ultrasonic scanner to scan a target organ of the human body.

[0007] Based on the above, after performing an ultrasonic scanning operation on the human body via the ultrasonic scanner to obtain an ultrasonic image, the image recognition module may analyze the ultrasonic image to identify an organ pattern in the ultrasonic image. Then, the guiding message may be automatically generated according to the identification result of the organ pattern. In particular, the guiding message may direct the movement of the ultrasonic scanner to scan the target organ of the human body, thereby reducing the burden on professionals to perform the ultrasonic scanning and/or unsupervised personnel may also easily operate the ultrasonic scanning device for simple scanning.

[0008] To make the aforementioned more comprehensible, several embodiments accompanied with drawings are described in detail as follows.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The accompanying drawings are included to provide a further understanding of the disclosure, and are incorporated in and constitute a part of this specification. The drawings illustrate exemplary embodiments of the disclosure and, together with the description, serve to explain the principles of the disclosure.

[0010] FIG. **1** is a schematic diagram of an ultrasonic scanning device according to an embodiment of the disclosure.

[0011] FIG. **2** is a schematic diagram of an ultrasonic scanning operation according to an embodiment of the disclosure.

[0012] FIG. **3** is a schematic diagram of ultrasonic images and corresponding coordinate information according to an embodiment of the disclosure.

[0013] FIG. **4** and FIG. **5** are schematic diagrams showing guiding messages according to a numerical relationship between areas of prediction blocks according to an embodiment of the disclosure.

[0014] FIG. **6** is a flow chart of an ultrasonic scanning method according to an embodiment of the disclosure.

[0015] FIG. **7** and FIG. **8** are flow charts of an ultrasonic scanning method according to an embodiment of the disclosure.

DESCRIPTION OF THE EMBODIMENTS

[0016] FIG. **1** is a schematic diagram of an ultrasonic scanning apparatus according to an embodiment of the disclosure. Referring to FIG. **1**, the ultrasonic scanning device **10** includes an ultrasonic scanner **101**, a storage device **102**, an image recognition module **103**, a processor **104**, and an input/output (I/O) interface **105**. The ultrasonic scanner **101** is configured to perform an ultrasonic scanning operation on a human body to obtain ultrasonic images. For example, the ultrasonic scanner **101** may include a hand-held probe. The ultrasonic scanner **101** may emit ultrasonic waves and receive ultrasonic waves reflected from a human organ. The ultrasonic images may be obtained based on the reflected ultrasonic waves. In the following embodiments, two-dimensional ultrasonic images are taken as examples for description. However, in another embodiment, the ultrasonic image may also include three-dimensional ultrasonic images, which is not limited in the present disclosure.

[0017] The storage device **102** is used to store data. For example, the storage device **102** may include a volatile storage medium and a non-volatile storage medium. The volatile storage medium may include a random access memory (RAM). The non-volatile memory module may include a flash memory module, a read only memory (ROM), a solid state drive (SSD), and/or a conventional hard disk (e.g., a hard disk drive, HDD), etc. In addition, the number of storage devices **102** may be one or more, which is not limited by the disclosure.

[0018] The image recognition module **103** is configured to perform an image recognition on the obtained ultrasonic image. For example, the image recognition module **103** may perform the image recognition based on a convolutional neural network (CNN) architecture or other type of image recognition architecture (or algorithm). The image recognition module **103** may be implemented in a software or hardware form. In an embodiment, the image recognition module **103** includes a software module. For example, the code of the image recognition module **103** may be stored in the storage device **102** and may be executed by the processor **104**. In an embodiment, the image recognition module **103** includes a hardware circuit. For example, the image recognition module **103** may include a graphics processing unit (GPU) or other programmable general purpose or special purpose microprocessor, a digital signal processor, a programmable controller, a special application integrated circuit, programmable logic devices or other similar devices or a combination of these devices. In addition, the number of the image recognition modules **103** may be one or more, which is not limited by the present disclosure.

[0019] The processor **104** is coupled to the ultrasonic scanner **101**, the storage device **102**, and the image recognition module **103**. The processor **104** may be used to control the ultrasonic scanner **101**, the storage device **102**, and the image recognition module **103**. For example, the processor **104** may include a central processing unit (CPU), a graphics processor, or other programmable general purpose or special purpose microprocessor, a digital signal processor, a programmable controller, a special application integrated circuit, programmable logic devices or other similar devices or a combination of these devices. In an embodiment, the processor **104** may be used to control the overall or partial operation of the ultrasonic scanning device **10**. In an embodiment, the image recognition module **103** may be implemented inside the processor **104** in a software, a firmware or a hardware form. Moreover, the number of processors **104** may be one or more, and the disclosure is not limited thereto.

[0020] The I/O interface **105** is coupled to the processor **104**. The I/O interface **105** is configured to receive signals and/or output signals. For example, the I/O interface **105** may include a screen, a touch screen, a touch pad, a mouse, a keyboard, a physical button, a speaker, a microphone, a wired communication interface, and/or a wireless communication interface, and the type of the I/O interface **105** is not limited thereto.

[0021] FIG. **2** is a schematic diagram of an ultrasonic scanning operation according to an embodiment of the disclosure. Referring to FIG. **1** and FIG. **2**, an operator may hold the ultrasonic scanner **101** and move the ultrasonic scanner **101** on the human body **21** to perform an ultrasonic scanning operation. Further, a gel may be applied between the ultrasonic scanner **101** and the human body **21** to facilitate the ultrasonic scanning operation. Taking FIG. **2** as an example, the ultrasonic images obtained by this ultrasonic scanning operation may present a pattern (also referred to as an organ pattern) of an organ **201**. For example, the organ **201** may include various human organs such as the heart, the liver, and/or the uterus, and the present disclosure is not limited thereto. The obtained ultrasonic images may be stored in the storage device **102**.

[0022] The processor **104** may analyze the ultrasonic images by the image recognition module **103** to identify an organ pattern in the ultrasonic images. The processor **104** may automatically generate a guiding message according to the identification result of the organ pattern. This guiding message may be used to guide the movement (or moving) of the ultrasonic scanner **101** to scan a specific organ (also referred to as a target organ) of the human body **21**. For example, the guiding message may be output as an image by a screen of the I/O interface **105** and/or as a sound by a speaker of the I/O interface **105**. Alternatively, the guiding message may also be output in other forms (such as a vibrating or buzzer), which is not limited by the disclosure. Further, the target organ may be various human organs such as the heart, the liver, and/or the uterus, and the present disclosure is not limited thereto. The operator may move the ultrasonic scanner **101** according to the guiding message to continuously scan the target organ and/or continuously enlarge the pattern area of the target organ in the ultrasonic images during the scanning process.

[0023] In an embodiment, the guiding message may include a guiding message. The operator may move the ultrasonic scanner **101** in a specific direction according to the guiding message. In an embodiment, the guiding message may include a message indicating whether the current direction of movement of the ultrasonic scanner **101** is correct. The operator may determine whether to change the moving direction of the ultrasonic scanner **101** based on the guiding message. In this way, even if the operator is not trained in professional ultrasonic scanning and/or in analysis of the ultrasonic images, one general user may also perform an ultrasonic scanning of the target organ based on the guiding message and/or obtain an ultrasonic image showing the complete pattern (or maximum pattern area) of the target organ. In addition, the guiding message may also be used to guide a professional such as a doctor or an inspector to assist in the ultrasonic scanning of the target organ.

[0024] In an embodiment, the processor **104** may record coordinate information corresponding to a certain ultrasonic image. This coordinate information may reflect the position of the ultrasonic scanner **101** when capturing (or obtaining) the ultrasonic image. For example, a sensor module may be disposed in the ultrasonic scanner **101**. For example, the sensor module may include an optical sensor, a gyroscope, and a gravity sensor (e.g., G-sensor) to sense a position, a moving direction, and/or a moving distance of the ultrasonic scanner **101**. The processor **104** may obtain the coordinate information corresponding to a certain ultrasonic image according to the information provided by the sensor module.

[0025] FIG. **3** is a schematic diagram of ultrasonic images and corresponding coordinate information according to an embodiment of the disclosure. Referring to FIG. **3**, coordinate table **31** records a plurality of coordinates (x1, y1) to (x5, y5) corresponding to the ultrasonic images numbered 1 to 5. Taking the ultrasonic images numbered 1 and 2 as an example, when capturing the ultrasonic image numbered 1, the position of the ultrasonic scanner **101** is at a coordinate (x1, y1); when capturing an ultrasonic image numbered 2, the position of the ultrasonic scanner **101** is at a coordinate (x2, y2), and so on. After performing image recognition of the organ pattern on a certain ultrasonic image, the processor **104** may generate the guiding message according to the identification result of the organ pattern and the coordinate information corresponding to the ultrasonic images in the coordinate table **31**. In other words, the current position, the past positions, and/or movement trajectory of the ultrasonic scanner **101** may be considered in the operation of generating the guiding message. It should be noted that the five ultrasonic images in the coordinate table **31** are merely examples. In another embodiment, more or fewer ultrasonic images and the corresponding coordinate information may be recorded in the coordinate table **31**. Alternatively, the coordinate table **31** may also record the ultrasonic images and the corresponding coordinate information in other forms. In addition, more information that may be used to generate the guiding message may also be recorded in the coordinate table **31**, depending on actual needs.

[0026] In an embodiment, the image recognition module **103** may determine a prediction block in an ultrasonic image. The prediction block reflects a range of the organ pattern recognized by the image recognition module **103** in the ultrasonic image. Taking an ultrasonic image including a liver pattern as an example, after performing an image recognition on the ultrasonic image, the image recognition module **103** may determine a prediction block in the ultrasonic image. This prediction block reflects the approximate range of the liver pattern in this ultrasonic image.

[0027] In an embodiment, the prediction block covers a range of the organ pattern of the target organ. For example, if a plurality of organ patterns are included in one ultrasonic image, the image recognition module **103** may determine a prediction block according to an organ pattern (also referred to as a target organ pattern) belonging to the target organ among the organ patterns, so that the prediction block may (only) cover the range of this target organ pattern. From another point of view, after determining the target organ, the image recognition module **103** may start tracking the organ pattern of the target organ and ignore the remaining organ patterns that do not belong to the target organ. For example, assuming that the determined target organ is the liver, the image recognition module **103** may begin tracking the liver pattern that may appear in the ultrasonic images and ignore the organ patterns of the remaining organs (e.g., kidney or heart) in the ultrasonic images.

[0028] In an embodiment, the processor **104** may obtain an area of the prediction block in a certain ultrasonic image. The size of this area may reflect the proportion of the area occupied by the prediction block in the ultrasonic image. The processor **104** may generate the guiding message based on the area. For example, after continuously obtaining a plurality of ultrasonic images, the processor **104** may generate the guiding message according to a numerical relationship between the areas of the prediction blocks in these ultrasonic images. For example, the numerical relationship may reflect the change in areas between such prediction blocks.

[0029] FIG. **4** and FIG. **5** are schematic diagrams showing guiding messages according to a numerical relationship between areas of prediction blocks according to an embodiment of the disclosure. Referring to FIG. **4**, it is assumed that after an ultrasonic image **41** is obtained, an ultrasonic image **42** is successively obtained by moving the ultrasonic scanner **101**. The prediction block **410** in the ultrasonic image **41** is determined, and the prediction block **420** in the ultrasonic image **42** is determined. The prediction blocks **410** and **420** may respectively cover at least a portion of the organ pattern of the target organ (marked with diagonal lines in

[0030] FIG. **4**).

[0031] The processor **104** may compare the area of the prediction block **410** to the area of the prediction block **420** to obtain a numerical relationship between the areas of prediction blocks **410** and **420**. In the present embodiment, the numerical relationship between the areas of the prediction blocks **410** and **420** reflects that the area of the prediction block **410** is smaller than the area of the prediction block **420**. Accordingly, the processor **104** may generate a guiding message (also referred to as a first guiding message) **401** to indicate the operator of the ultrasonic scanner **101** that the current scanning direction is correct and the scanning could be continue.

[0032] In an embodiment, the area of the prediction block **410** being smaller than the area of the prediction block **420** may be considered as a first numerical relationship between the prediction blocks **410** and **420**. The first numerical relationship indicates that as the ultrasonic scanner **101** moves, the areas of the prediction blocks in the ultrasonic images gradually increases (equivalent to the areas of the patterns of the target organ in the ultrasonic images gradually increases), as shown in FIG. **4**. Therefore, the guiding message **401** may inform the operator to continue the scanning based on the current moving direction of the ultrasonic scanner **101** without adjusting the moving direction of the ultrasonic scanner **101**. Thereby, the scanning position of the ultrasonic scanner **101** may be gradually brought closer to the position of the target organ.

[0033] Referring to FIG. **5**, it is assumed that after an ultrasonic image **51** is obtained, an ultrasonic image **52** is successively obtained by moving the ultrasonic scanner **101**. The prediction block **510** in the ultrasonic image **51** is determined, and the prediction block **520** in the ultrasonic image **52** is determined. The prediction blocks **510** and **520** may respectively cover at least a portion of the organ pattern of the target organ (marked with diagonal lines in FIG. **5**).

[0034] The processor **104** may compare the area of the prediction block **510** with the area of the prediction block **520** to obtain a numerical relationship between the areas of the prediction blocks **510** and **520**. In the present embodiment, the numerical relationship between the areas of the prediction blocks **510** and **520** reflects that the area of the prediction block **510** is larger than the area of the prediction block **520**. Therefore, the processor **104** may generate a guiding message (also referred to as a second guiding message) **501** to remind the operator of the ultrasonic scanner **101** that the current scanning direction is wrong and the ultrasonic scanner **101** may be moved in the opposite (or reversed) direction (or other directions).

[0035] In an embodiment, the area of the prediction block **510** being greater than the prediction block **520** may be considered as the second numerical relationship between the prediction blocks **510** and **520**. The second numerical relationship indicates that as the ultrasonic scanner **101** moves, the areas of the prediction blocks in the ultrasonic images are gradually reduced (equivalent to the areas of the patterns of the target organ in the ultrasonic images gradually decreasing), as shown in FIG. **5**. Therefore, the guiding message **501** may suggest the operator to change the moving direction of the ultrasonic scanner **101**. Thereby, the scanning positions of the ultrasonic scanner **101** being kept away from the position of the target organ may be avoided. In an embodiment, the guiding messages **401** and/or **501** may be generated with reference to the coordinate table **31** of FIG. **3** to obtain the previous direction of movement of the ultrasonic scanner **101** and provide a suggested direction of a next movement.

[0036] In one embodiment, the processor **104** may continuously record the areas of the predicted blocks in the plurality of ultrasonic images. Based on the comparison result of the areas of the prediction blocks, the processor **104** may obtain particular coordinate information (also referred to as target coordinate information). The target coordinate information corresponds to one of the ultrasonic images (also referred to as a target image). The prediction block in the target image has the largest covering range relative to the other prediction blocks in the remaining ultrasonic images. For example, if the target image is the ultrasonic image numbered 3 in FIG. **3**, then the target coordinate information is (x3, y3), and the area of the prediction block in the ultrasonic image numbered 3 is larger than the area of the prediction block in any one of the ultrasonic images numbered 1, 2, 4 and 5.

[0037] In an embodiment, the processor **104** may generate a guiding message (also referred to as a third guiding message) according to the target coordinate information. For example, the processor **104** may generate the third guiding message according to the target coordinate information and the current position of the ultrasonic scanner **101**. The third guiding message may be used to assist the operator in moving of the ultrasonic scanner **101** to a scanning position corresponding to the target coordinate information. After the ultrasonic scanner **101** is moved to the scanning position corresponding to the target coordinate information, the ultrasonic image having the largest prediction block (equivalent to the largest organ pattern of the target organ) (e.g., the ultrasonic image **42** of FIG. **4** or the ultrasonic image **51** of FIG. **5**) may be obtained again. In other words, in an embodiment, the third guiding message may be used to guide the ultrasonic scanner **101** to a scanning position at which the largest organ pattern of the target organ is obtained.

[0038] FIG. **6** is a flow chart of an ultrasonic scanning method according to an embodiment of the disclosure. Referring to FIG. **6**, in step S**601**, an ultrasonic scanning operation is performed on the human body by an ultrasonic scanner to obtain an ultrasonic image. In step S**602**, the ultrasonic image is analyzed by an image recognition module to recognize an organ pattern in the ultrasonic image. In step S**603**, a guiding message is automatically generated according to the identification result of the organ pattern. The guiding message is used to guide the movement of the ultrasonic scanner to scan a target organ of the human body.

[0039] FIG. **7** and FIG. **8** are flow charts of an ultrasonic scanning method according to an embodiment of the disclosure. Referring to FIG. **7**, in step S**701**, an ultrasonic scanning operation is performed on the human body by an ultrasonic scanner to obtain an ultrasonic image. In step S**702**, the ultrasonic image is analyzed by an image recognition module to recognize an organ pattern in the ultrasonic image. In step S**703**, it is determined whether or not an organ pattern appears in the ultrasonic images. If the organ pattern does not appear in the ultrasonic images, the method returns back to the step S**701**. If the organ pattern appears in the ultrasonic image, it is determined in step S**704** whether to track the organ pattern. For example, in step S**704**, whether to track the organ pattern may be determined according to a user operation. If it is determined to track the organ pattern, it means that the current organ pattern is the organ pattern of the target organ and the method goes to step S**801** of FIG. **8** to start tracking. On the other hand, if the organ pattern is not tracked, it means that the operator may not yet move the ultrasonic scanner to the scanning position covering the organ pattern of the target organ, so step S**701** may be repeated.

[0040] Referring to FIG. **8**, in step S**801**, the areas of the prediction blocks in the ultrasonic images and the coordinate information of the ultrasonic images are recorded. In step S**802**, the areas of the plurality of prediction blocks are compared. In step S**803**, it is determined whether the areas of the prediction blocks in the ultrasonic images are gradually increased. If the areas of the prediction blocks in the ultrasonic images are gradually increased, in step S**804**, a first guiding message indicating maintaining the scanning path (or the scanning direction is correct) is generated. Alternatively, if the areas of the prediction blocks in the ultrasonic images are not gradually increased (e.g., gradually decreased), then in step S**805**, a second guiding message indicating changing the scanning path (or the scanning direction is wrong) is generated. After the steps S**804** and S**805**, step S**806** may be performed. In addition, in another embodiment, the step S**806** may also be performed at any time point, and the present disclosure is not limited thereto.

[0041] In the step S**806**, it is determined, based on a user operation, whether the operator wants to move the ultrasonic scanner back to a scanning position that the largest organ pattern is identified. If the user operation, which reflects that the operator wants to move the ultrasonic scanner back to the scanning position that the largest organ pattern is identified, is not received, the method returns to the step S**701** of FIG. **7** to continue the scanning. In addition, if the user operation, which reflects that the operator wants to move the ultrasonic scanner back to the scanning position that the largest organ pattern is identified, is received, in step S**807**, the comparison result of the areas of the previously recorded prediction blocks is looked up to obtain target coordinate information corresponding to a target image. In step S**808**, a third guiding message is generated according to the target coordinate information and the current coordinate position of the ultrasonic scanner.

[0042] However, the steps in FIG. **6** to FIG. **8** have been described in detail above, and will not be described again here. It should be noted that the steps in FIG. **6** to FIG. **8** may be implemented as a plurality of codes or circuits, and the present disclosure is not limited thereto. In addition, the methods of FIG. **6** to FIG. **8** may be used in combination with the above embodiments, or may be used alone, and the disclosure is not limited thereto.

[0043] In summary, after performing an ultrasonic scanning operation on the human body by the ultrasonic scanner to obtain an ultrasonic image, the image recognition module may analyze the ultrasonic image to identify an organ pattern in the ultrasonic image. Then, the guiding message may be automatically generated according to the identification result of the organ pattern. In particular, the guiding message may direct the movement of the ultrasonic scanner to scan the target organ of the human body, thereby reducing the burden on professionals to perform the ultrasonic scanning and/or unsupervised personnel may also easily operate the ultrasonic scanning device for simple scanning.

[0044] It will be apparent to those skilled in the art that various modifications and variations may be made to the disclosed embodiments without departing from the scope or spirit of the disclosure. In view of the foregoing, it is intended that the disclosure covers modifications and variations provided that they fall within the scope of the following claims and their equivalents.

What is claimed is:

1. An ultrasonic scanning method for an ultrasonic scanning device, comprising:

performing an ultrasonic scanning operation on a human body by an ultrasonic scanner to obtain an ultrasonic image;

analyzing the ultrasonic image by an image recognition module to identify an organ pattern in the ultrasonic image; and

generating, automatically, a guiding message according to an identification result of the organ pattern, wherein the guiding message is configured to guide a moving of the ultrasonic scanner to scan a target organ of the human body.

2. The ultrasonic scanning method of claim **1**, wherein the step of generating, automatically, the guiding message according to the identification result of the organ pattern comprises:

generating the guiding message according to the identification result of the organ pattern and coordinate information,

wherein the coordinate information reflects a position of the ultrasonic scanner when the ultrasonic image is obtained.

3. The ultrasonic scanning method of claim **1**, wherein the step of generating, automatically, the guiding message according to the identification result of the organ pattern comprises:

generating the guiding message according to an area of a prediction block in the ultrasonic image,

wherein the prediction block reflects a range of the organ pattern identified by the image recognition module in the ultrasonic image.

4. The ultrasonic scanning method of claim **3**, wherein the ultrasonic image comprises a first image and a second image, the prediction block comprises a first prediction block in the first image and a second prediction block in the second image, and the step of generating, automatically, the guiding message according to the identification result of the organ pattern comprises:

generating the guiding message according to a numerical relationship between an area of the first prediction block and an area of the second prediction block.

5. The ultrasonic scanning method of claim **4**, wherein the step of generating the guiding message according to the numerical relationship between the area of the first prediction block and the area of the second prediction block comprises:

obtaining target coordinate information according to the numerical relationship, wherein the target coordinate information corresponds to a target image in the ultrasonic image; and

generating the guiding message according to the target coordinate information.

6. An ultrasonic scanning device, comprising:

an ultrasonic scanner, configured to perform an ultrasonic scanning operation on a human body to obtain an ultrasonic image; and

a processor, coupled to the ultrasonic scanner and configured to analyze the ultrasonic image by an image recognition module to identify an organ pattern in the ultrasonic image,

wherein the processor is further configured to generate, automatically, a guiding message according to an identification result of the organ pattern, and the guiding message is configured to guide a moving of the ultrasonic scanner to scan a target organ of the human body.

7. The ultrasonic scanning device of claim **6**, wherein the operation of generating, automatically, the guiding message according to the identification result of the organ pattern by the processor comprises:

generating the guiding message according to the identification result of the organ pattern and coordinate information,

wherein the coordinate information reflects a position of the ultrasonic scanner when the ultrasonic image is obtained.

8. The ultrasonic scanning device of claim **6**, wherein the operation of generating, automatically, the guiding message according to the identification result of the organ pattern by the processor comprises:

generating the guiding message according to an area of a prediction block in the ultrasonic image,

wherein the prediction block reflects a range of the organ pattern identified by the image recognition module in the ultrasonic image.

9. The ultrasonic scanning device of claim **8**, wherein the ultrasonic image comprises a first image and a second image, the prediction block comprises a first prediction block in the first image and a second prediction block in the second image, and the operation of generating, automatically, the guiding message according to the identification result of the organ pattern by the processor comprises:

generating the guiding message according to a numerical relationship between an area of the first prediction block and an area of the second prediction block.

10. The ultrasonic scanning device of claim **9**, wherein the operation of generating the guiding message according to the numerical relationship between the area of the first prediction block and the area of the second prediction block by the processor comprises:

obtaining target coordinate information according to the numerical relationship, wherein the target coordinate information corresponds to a target image in the ultrasonic image; and

generating the guiding message according to the target coordinate information.

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摘要(译)

根据本公开的实施例,提供了一种用于超声扫描装置的超声扫描方法。 该超声扫描方法包括:通过超声扫描仪对人体进行超声扫描操作以获得超声图像;以及 通过图像识别模块分析超声图像以识别超声图像中的器官图案; 根据所述器官图案的识别结果自动生成指导消息,所述指导消息用于指导超声扫描仪的运动以扫描人体的目标器官。