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(54) **SYSTEM AND METHOD FOR PROVIDING
ULTRASOUND IMAGES OF A TARGET
OBJECT THROUGH A WIRELESS
COMMUNICATION NETWORK**

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(57) **ABSTRACT**

The present invention relates to a system for providing an ultrasound image of a target object, including: ultrasound diagnostic equipment for acquiring ultrasound data from the target object; an image converter for converting ultrasound data into mobile ultrasound data having a data format, which is suitable for transmission through a wireless communication network; and a mobile server for transmitting the mobile ultrasound data through the wireless communication network.

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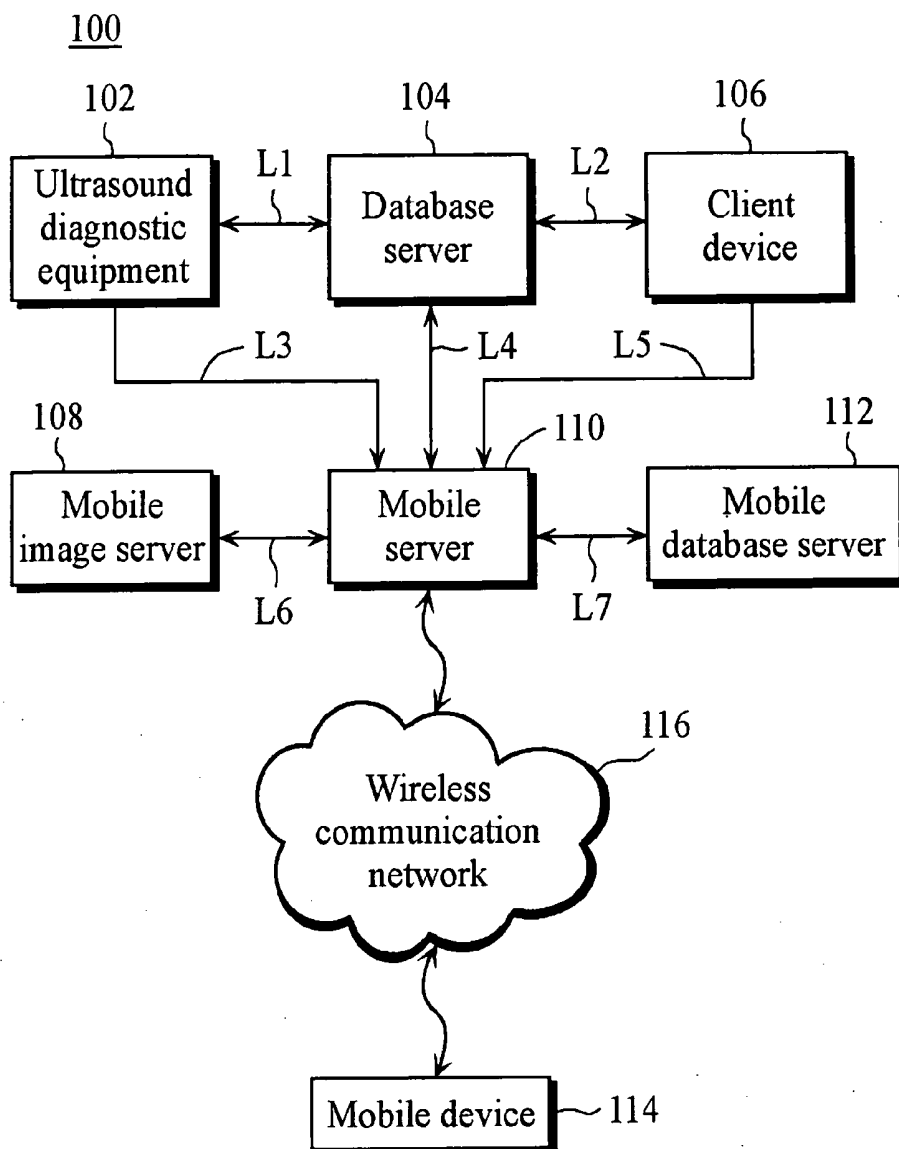


Fig. 1

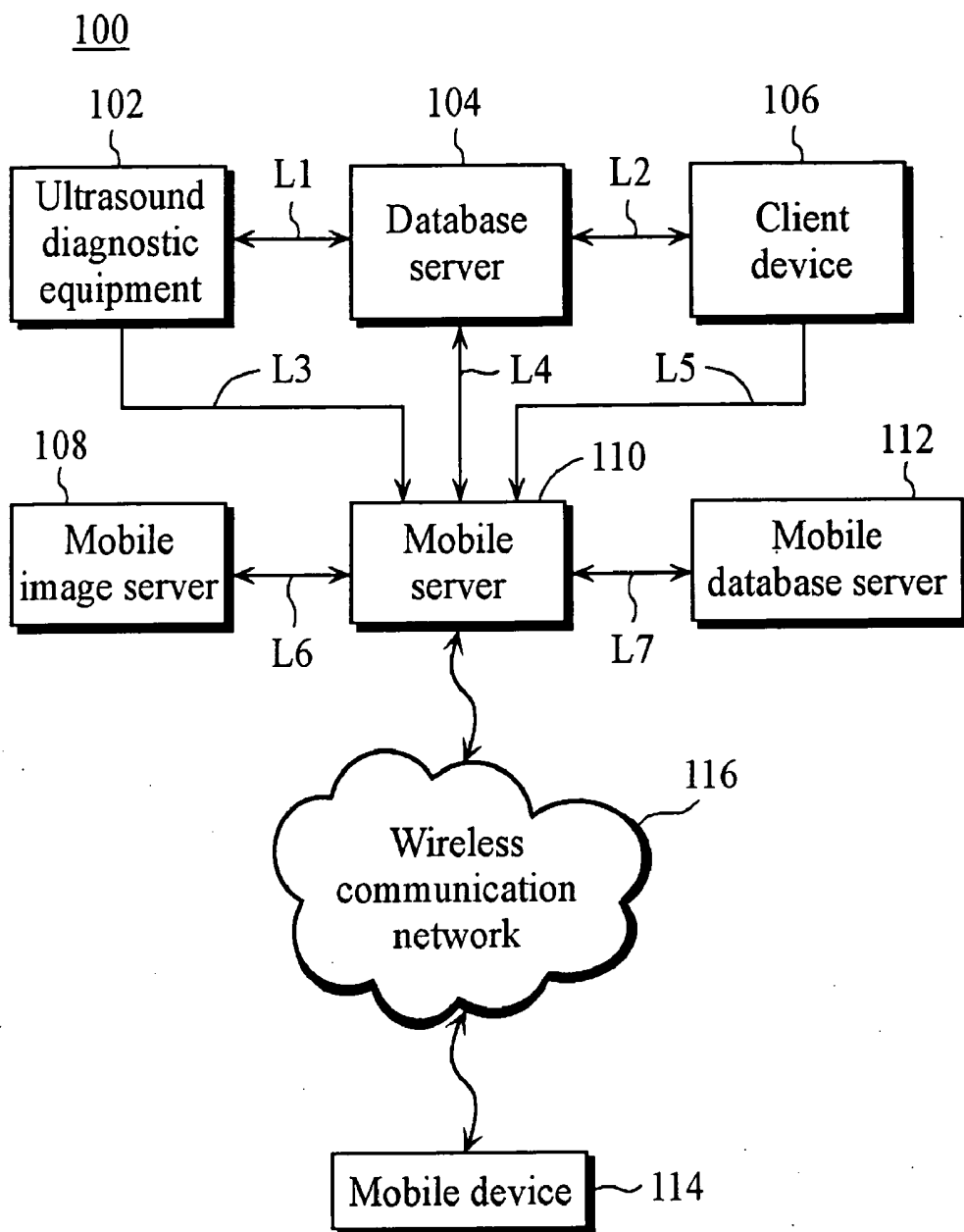


Fig. 2

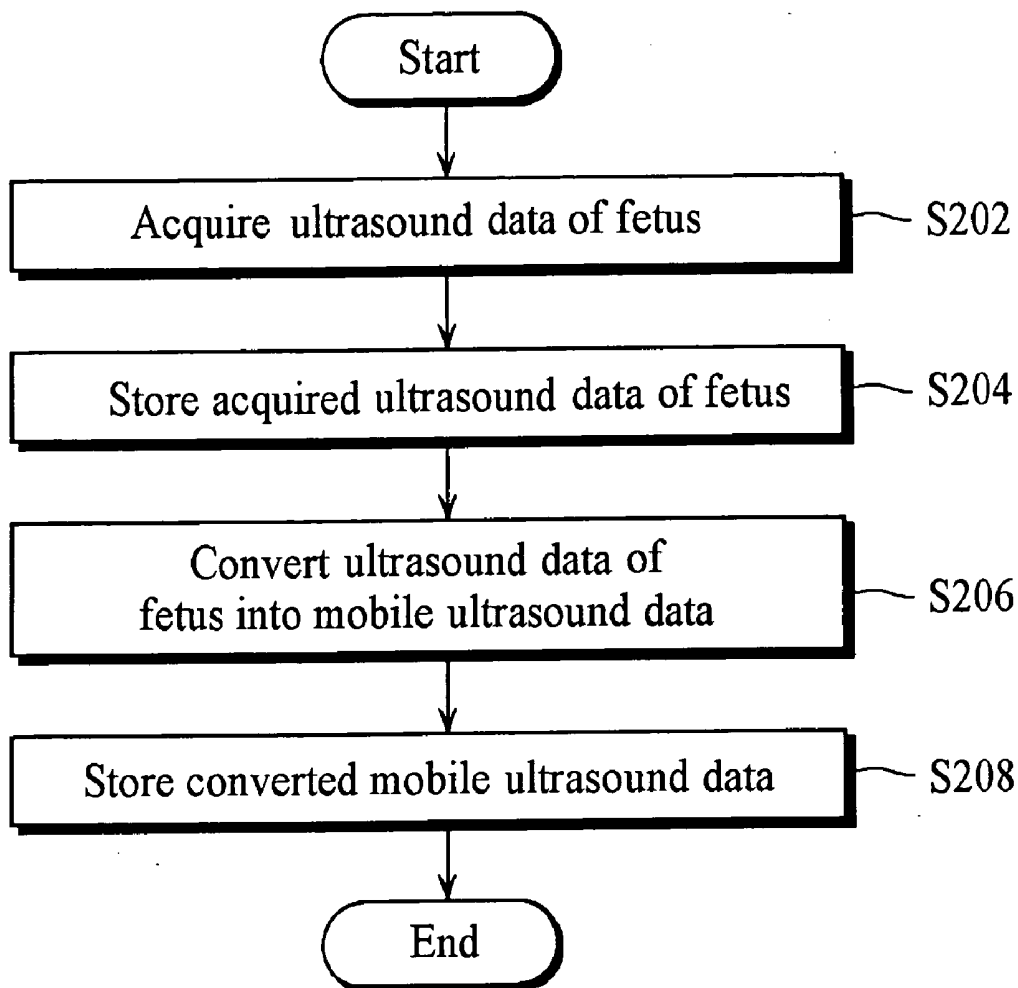
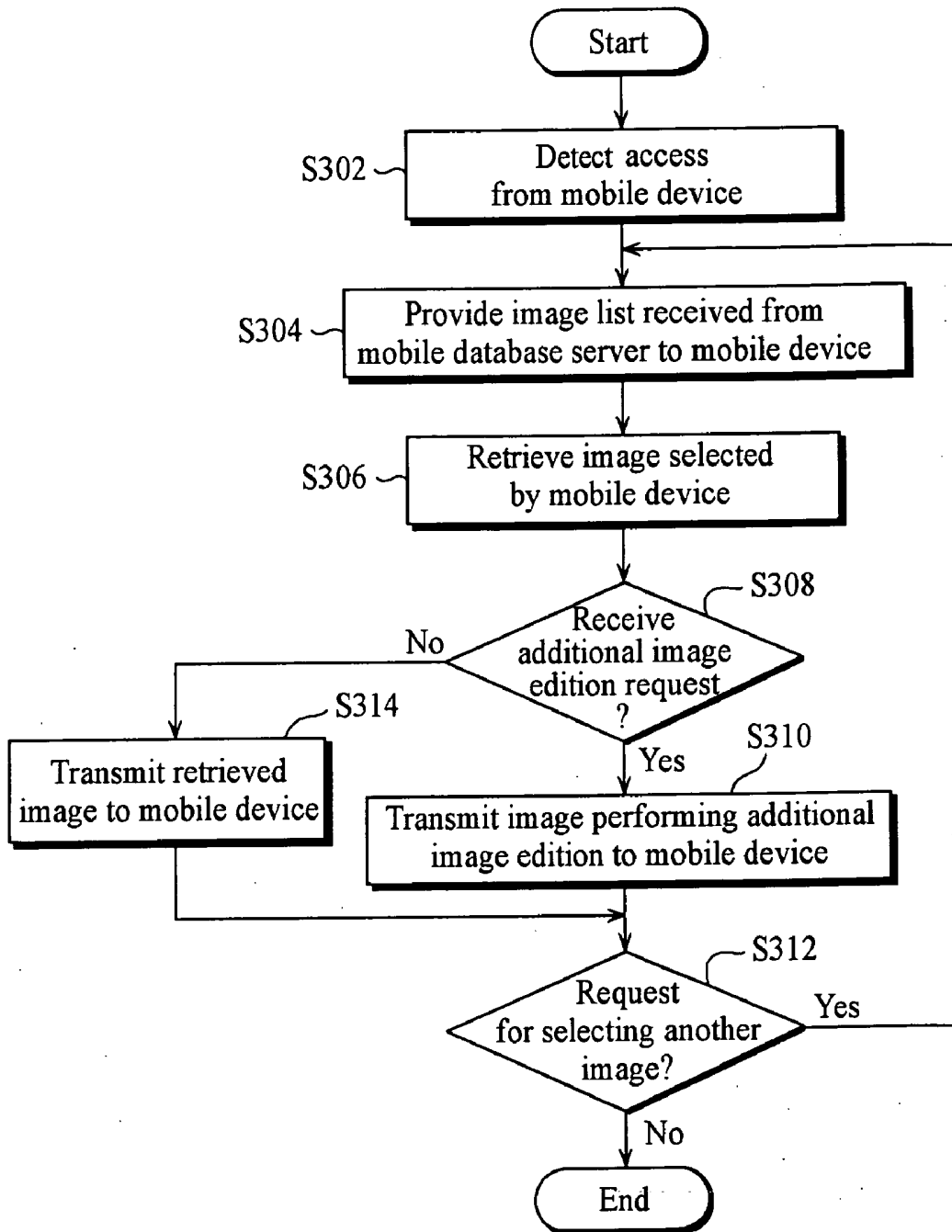


Fig. 3



**SYSTEM AND METHOD FOR PROVIDING
ULTRASOUND IMAGES OF A TARGET OBJECT
THROUGH A WIRELESS COMMUNICATION
NETWORK**

FIELD OF THE INVENTION

[0001] The present invention generally relates to a system for providing an ultrasound image, and more particularly to a system and a method for providing 2D or 3D ultrasound images of a target object through a wireless communication network.

BACKGROUND OF THE INVENTION

[0002] Various technologies for acquiring an ultrasound image of a fetus have been researched by using ultrasound diagnostic equipment. Also, there are various efforts for managing the acquired ultrasound image of the fetus in order to provide the ultrasound image of the fetus to a pregnant woman and/or her family. Research of the ultrasound diagnostic equipment has been focused into a technology for storing and converting ultrasound data associated with the acquired ultrasound image of the fetus. Recently, a service for providing the ultrasound image of the fetus, which is acquired from the ultrasound diagnostic equipment, to the pregnant woman and/or her family is limitedly performed through a wire communication network. When the above service is performed, a computer connected to the wire communication network set up at a predetermined place should be used. Therefore, there is a problem in that it is extremely inconvenient to see the ultrasound image of the fetus since the place for seeing the ultrasound image is limited and predetermined.

SUMMARY OF THE INVENTION

[0003] It is an objective of the present invention to provide to a system and a method for providing 2D or 3D ultrasound images of a target object through a wireless communication network.

[0004] In accordance with an aspect of the present invention, there is provided a system for providing an ultrasound image of a target object, including: ultrasound diagnostic equipment for acquiring ultrasound data from the target object; a converter for converting ultrasound data into mobile ultrasound data having a data format, which is suitable for transmission through a wireless communication network; and a mobile server for transmitting the mobile ultrasound data through the wireless communication network.

[0005] In accordance with another aspect of the present invention, there is provided a method for providing an ultrasound image of a target object, including the steps of: a) acquiring ultrasound data from the target object; b) converting the ultrasound data into mobile ultrasound data having a data format, which is suitable for transmission through a wireless communication network; and c) transmitting the mobile ultrasound data through the wireless communication network.

[0006] In accordance with yet another aspect of the present invention, there is provided a method for providing an ultrasound image of a fetus, including the steps of: a) acquiring ultrasound data of fetus; b) storing the ultrasound

data in a first storing unit, wherein the ultrasound data includes data associated with 2-dimensional or 3-dimensional ultrasound images of the fetus, medical information of the pregnant woman and the fetus and a heart beating sound; c) converting the ultrasound data of the fetus into mobile ultrasound data having a data format, which is suitable for transmission through a wireless communication network, wherein the mobile ultrasound data includes data associated with mobile ultrasound images of the fetus, mobile medical information of the pregnant woman and the fetus and a mobile heart beating sound; d) storing the mobile ultrasound data in a second storing unit; e) transmitting the mobile ultrasound data to a mobile device; and f) displaying the ultrasound image on the mobile device based on the mobile ultrasound data.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] The above and other objects and features of the present invention will become apparent from the following description of preferred embodiments given in conjunction with the accompanying drawings, in which:

[0008] **FIG. 1** is a block diagram showing a system for providing an ultrasound image of a fetus through a wireless communication network in accordance with the present invention;

[0009] **FIG. 2** is a flow chart for generating the mobile ultrasound image data of the fetus in accordance with the present invention; and

[0010] **FIG. 3** is a flow chart showing a process for transmitting the mobile ultrasound data of the fetus to a mobile device in accordance with the present invention.

**DETAILED DESCRIPTION OF THE PRESENT
INVENTION**

[0011] **FIG. 1** is a block diagram showing a system for providing an ultrasound image of a fetus through a wireless communication network in accordance with the present invention.

[0012] Referring to **FIG. 1**, the system **100** of the present invention includes an ultrasound diagnostic equipment **102**, a database server **104**, a client device **106**, a mobile image sever **108**, a mobile server **110**, a mobile database server **112** and a mobile device **114**. The mobile server **110** and the mobile device **114** communicate with each other through a wireless communication network **116**. Although ultrasound diagnostic equipment **102** and database server **104** are separately configured in **FIG. 1**, it is apparent to a person skilled in the art that data server **104** can be built in the ultrasound diagnostic equipment **102**. Even if it is exemplarily described that mobile image server **108**, mobile server **110** and mobile database server **112** are separately configured in **FIG. 1** in accordance with the present invention, it is also apparent to a person skilled in the art that mobile image server **108** and mobile database server **112** can be configured within mobile server **110**.

[0013] Ultrasound diagnostic equipment **102**, which is a conventional ultrasound image device, acquires ultrasound data associated with an ultrasound image (i.e., a 2-dimensional (2D) or 3-dimensional (3D) ultrasound image) of a fetus from a pregnant woman. Ultrasound diagnostic equipment **102** transmits the acquired ultras data to database

server **104** through a communication line **L1**. Thereafter, the ultrasound data are stored in one of the databases managed by the database server **104**. An operation of database server **104** will be described later in detail. Ultrasound diagnostic equipment **102** may directly transmit the acquired ultrasound data, which is associated with the ultrasound image of the fetus, to the mobile server **110** through a communication line **L3**. The ultrasound data of the fetus includes data associated with not only ultrasound image but also medical information of the pregnant woman and the fetus and heartbeat sound of the fetus (i.e., Doppler sound).

[0014] Client device **104** includes a computing device such as a computer, a personal data assistant (PDA), a web pad, a mobile phone or the like. Client device **106** is connected to database server **104** through a communication line **L2**. Client device **106** retrieves the ultrasound data associated with the fetus stored in a plurality of databases managed by database server **104**. The retrieved ultrasound data are stored in a storage space provided in client device **106**. In order to transmit the retrieved or stored data associated with the fetus to mobile device **114**, client device **106** transmits the data to mobile server through a communication line **L5**.

[0015] As mentioned above, the database server **104** includes a plurality of databases for storing the ultrasound data of the fetus. Each database stores the ultrasound data of the fetus transmitted from the ultrasound diagnostic device **102**. The ultrasound data stored in the plurality of databases includes image data associated with the 2D or 3D ultrasound images of the fetus. Database server **104** retrieves the ultrasound data associated with ultrasound images of the fetus in response to requests from mobile server **110** and client device **106**. It then transmits the retrieved ultrasound data of the fetus to the mobile server **110** and client device **106** through communication lines **L2** and **L4**.

[0016] Mobile server **110** transmits the ultrasound data of the fetus, which is to be transmitted in response to the request from mobile device **114** to mobile image server **108** through a communication line **L6**. Mobile server **110** receives mobile ultrasound data, which are converted from the ultrasound data of the fetus in mobile image server **108**. Thereafter, mobile server **110** transmits the mobile ultrasound data to mobile database server **112** so as to be stored in mobile database server **112**. Mobile server **110** transmits the mobile ultrasound data to mobile device **114** in response to the request from mobile device **114**. Before retrieving the ultrasound data, mobile server **110** may perform a user certification procedure for a user of mobile device **114** through a predetermined user certification algorithm. Since the user certification procedure is already well known, a detailed description thereof will be omitted herein.

[0017] The mobile image server **108** converts the ultrasound data transmitted from mobile server **110** into the mobile ultrasound data having a data format which is suitable for being transmitted to mobile device **114**. The mobile ultrasound data includes data associated with mobile ultrasound images of the fetus, mobile medical information of the pregnant woman and the fetus and a mobile heart beating sound. Mobile image server **108**, as mentioned above, transmits the mobile ultrasound data to mobile database server through mobile server **110** for storing the mobile ultrasound data in the mobile database server **112**. When the

user requests to edit the ultrasound image, the mobile ultrasound image can be edited in mobile image server **112** by superposing various clip art images or inserting letters to a selected mobile ultrasound image in response to an image edit request, which is inputted through mobile server **110**, from mobile device **114**.

[0018] Mobile database server **112** manages a plurality of databases. Each database stores mobile ultrasound data received from mobile server **110** to mobile image server **108**. Mobile database server **112** retrieves mobile ultrasound data stored in the plurality of databases in response to a request from mobile server **110**. It then transmits the retrieved mobile ultrasound data to mobile server **110**. Also, each database included in mobile database server **112** stores lists associated with the mobile ultrasound data, respectively. When mobile data server transmits the mobile ultrasound data to mobile server **110**, the list associated with mobile ultrasound data is also provided to mobile device **114** through mobile server **110**.

[0019] Mobile device **114** is a mobile computing device such as a mobile phone to be accessed in mobile server **110** through wireless communication network **116**. Mobile device **114** includes an instruction input unit and a display unit (not shown). The instruction input unit inputs instructions for requesting mobile ultrasound data transmission to mobile server **110**. The display unit receives the mobile ultrasound data from mobile server **110** and displays the mobile ultrasound image based on the received mobile ultrasound data. Also, mobile device **114** further includes an audio playing unit (not shown) for playing the heart beating sound based on sound data of the fetus included in the mobile ultrasound data.

[0020] FIG. 2 is a flow chart for generating the mobile ultrasound image data of the fetus in accordance with the present invention. Hereinafter, a process for generating the mobile ultrasound data of the fetus will be described by referring to FIGS. 1 and 2.

[0021] Ultrasound diagnostic equipment **102** acquires the ultrasound data of the fetus from the pregnant woman at step **S202**. Database server **104** stores the ultrasound data acquired from ultrasound diagnostic equipment **102** at step **S204**. As described above, the ultrasound data includes data associated with not only 2D or 3D ultrasound image of the fetus but also medical information of the pregnant woman and the fetus and the heart beating sound of the fetus.

[0022] Mobile server **110** transmits the ultrasound data of the fetus, which is outputted from database server **104**, to mobile image server **108** through communication line **L6** at step **S206**. Thereafter, mobile image server **108** converts the transmitted ultrasound data of the fetus into the mobile ultrasound data, which have a data format suitable for being transmitted to mobile device **114** through wireless communication network **116**, by using a predetermined image conversion algorithm. Next, mobile server **110** transmits the mobile ultrasound data transmitted from mobile image server **108** through communication line **L7**, thereby storing the mobile ultrasound data to mobile database server **112**.

[0023] FIG. 3 is a flow chart showing a process for transmitting the mobile ultrasound data of the fetus to mobile device **114** in accordance with the present invention. Hereinafter, the process for transmitting the mobile ultrasound data to mobile device **114** will be described in detail by referring to FIGS. 1 to 3.

[0024] Mobile server 110 detects whether mobile device 114 is accessed through wireless communication network 116 at step S302. At this step S302, mobile server 110 performs a user certification process for the user of mobile device 114 by using a conventional certification algorithm.

[0025] Next, the mobile server 110 transmits the list associated with mobile ultrasound data received from mobile database server 112 to mobile device 114 through wireless communication network 116 at step S304. Mobile device 114 transmits an image request signal for requesting an image selected by the user to mobile server 110. Mobile server 110 retrieves the selected image from mobile database server 112 in response to the image request signal at step S306.

[0026] The mobile server 110 checks whether an additional image edition request is received from mobile device 114 at step S308. If it is determined that the additional image edition request is not received, the process proceeds to step S314. Mobile server 110 transmits the mobile ultrasound data associated with the image retrieved at step S306 to mobile device through wireless communication network 116. This is so that the mobile device 114 displays the mobile ultrasound image based on the received mobile ultrasound data.

[0027] Meanwhile, if it is determined that the additional image edition request is received at step S308, the process proceeds to step S310. In order to perform the requested additional image edition at step S310, the mobile ultrasound data associated with the mobile ultrasound image retrieved at step S310 are transmitted to mobile image server 108. After editing the mobile ultrasound image received from mobile image server 108, mobile image server 108 transmits the edited mobile ultrasound data to mobile server 110. The additional image edition, as mentioned above, means inserting the clip art image or letters on the mobile ultrasound image. The mobile ultrasound data including data, which the additional image edition has been performed, are transmitted to mobile device 114 through wireless communication network 116. Mobile device 114 displays the mobile ultrasound image and plays the heart beating sound based on the received mobile ultrasound data from mobile server 110.

[0028] Mobile server 110 checks whether the image selection request signal for selecting another images is received from mobile device 114 at step S312. If it is determined that the image selection request signal is received, the process returns to step S304 for performing above process again. On the other hand, if it is determined that the image selection request signal is not received, the process is completed in accordance with the present invention.

[0029] As described in above, since the mobile ultrasound data are transmitted to the mobile device such as the mobile phone by converting the data format of the 2D or 3D ultrasound image data to be displayed on the mobile device, there is an effect that the pregnant woman or her family can see the ultrasound image of fetus transmitted through wireless communication network regardless of restriction of space and time. Also, since the clip art image or letters can be inserted in the ultrasound image of the fetus in accordance with the present invention, there is an effect that the ultrasound image can be edited to pregnant woman's taste.

[0030] While the present invention has been described and illustrated with respect to a preferred embodiment of the

invention, it will be apparent to those skilled in the art that variations and modifications are possible without deviating from the broad principles and teachings of the present invention which should be limited solely by the scope of the claims appended hereto.

What is claimed is:

1. A system for providing an ultrasound image of a target object, comprising:

means for acquiring ultrasound data from the target object;

means for converting the ultrasound data into mobile ultrasound data having a data format, which is suitable for transmission through a wireless communication network; and

means for transmitting the mobile ultrasound data through the wireless communication network.

2. The system as recited in claim 1, wherein the target object is a fetus.

3. The system as recited in claim 2, wherein the ultrasound data includes data associated with 2-dimensional ultrasound images of the fetus, 3-dimensional ultrasound images of the fetus, medical information of a pregnant woman and the fetus and a heart beating sound.

4. The system as recited in claim 3, further comprising a mobile device for displaying a mobile ultrasound image and playing a heart beating sound based on the mobile ultrasound data.

5. The system as recited in claim 4, further comprising:

a first database for storing the ultrasound data of the fetus; and

a second database for storing the mobile ultrasound data converted from the ultrasound data.

6. The system as recited in claim 5, further comprising means for editing a mobile ultrasound image based on the mobile ultrasound data by inserting clip art images or letters.

7. A method for providing an ultrasound image of a target object, comprising the steps of:

a) acquiring ultrasound data from the target object;

b) converting the ultrasound data into mobile ultrasound data having a data format, which is suitable for transmission through a wireless communication network; and

c) transmitting the mobile ultrasound data through the wireless communication network.

8. The system as recited in claim 7, wherein the target object is a fetus.

9. The system as recited in claim 8, wherein the ultrasound data includes data associated with 2-dimensional ultrasound images of the fetus, 3-dimensional ultrasound images of the fetus, medical information of a pregnant woman and the fetus and a heart beating sound.

10. The method as recited in claim 9, further comprising the steps of:

d) storing the ultrasound data of the fetus; and

e) storing the mobile ultrasound data converted from the ultrasound data.

11. A method for providing an ultrasound image of a fetus, comprising the steps of:

- a) acquiring ultrasound data of fetus;
- b) storing the ultrasound data in a first storing unit, wherein the ultrasound data includes data associated with 2-dimensional images of the fetus, 3-dimensional ultrasound images of the fetus, medical information of the pregnant woman and the fetus and a heart beating sound;
- c) converting the ultrasound data of the fetus into mobile ultrasound data having a data format, which is suitable for transmission through a wireless communication network, wherein the mobile ultrasound data includes data associated with mobile ultrasound images of the fetus, mobile medical information of the pregnant woman and the fetus and a mobile heart beating sound;
- d) storing the mobile ultrasound data in a second storing unit;
- e) transmitting the mobile ultrasound data to a mobile device; and
- f) displaying the ultrasound image on the mobile device based on the mobile ultrasound data.

12. The method as recited in claim 11, wherein the second storing unit includes a list associated with the mobile ultrasound data.

13. The method as recited in claim 12, wherein the step e) includes the steps of:

- e1) transmitting the list to the mobile device;
- e2) selecting one of mobile ultrasound images in the mobile device;
- e3) retrieving a selected mobile ultrasound image in the second storing unit; and
- e4) transmitting a retrieved mobile ultrasound image to the mobile device.

14. The method as recited in claim 13, wherein the step e4) includes the step of e41) checking whether a additional image edition request for the retrieved mobile ultrasound image is received from the mobile device.

15. The method as recited in claim 14, wherein, if it is determined that the additional image edition request is received at step e41), the retrieved mobile ultrasound image is edited by inserting predetermined clip art images or letters.

16. The method as recited in claim 14, wherein, if it is determined that the additional image edition request is not received at step e41), the retrieved mobile ultrasound image is transmitted to the mobile device.

* * * * *

专利名称(译)	用于通过无线网络提供目标对象的超声图像的系统和方法		
公开(公告)号	US20050215900A1	公开(公告)日	2005-09-29
申请号	US11/082771	申请日	2005-03-18
申请(专利权)人(译)	MEDISON CO. , LTD.		
当前申请(专利权)人(译)	MEDISON CO. , LTD.		
[标]发明人	KIM SUNG NAM		
发明人	KIM, SUNG NAM		
IPC分类号	A61B5/00 A61B8/00 A61B8/14		
CPC分类号	A61B8/565 A61B8/00		
优先权	1020040018227 2004-03-18 KR		
外部链接	Espacenet USPTO		

摘要(译)

本发明涉及一种用于提供目标对象的超声图像的系统，包括：用于从目标对象获取超声数据的超声诊断设备；图像转换器，用于将超声数据转换成具有数据格式的移动超声数据，该数据格式适合于通过无线网络传输；移动服务器，用于通过无线网络发送移动超声数据。

