ULTRASOUND IMAGING DEVICE AND SCANNING METHOD

Field of the Invention

The present invention relates to the technical field of medical equipment, and in particular to an ultrasound imaging device and a scanning method of the ultrasound imaging device.

Background Art

Medical imaging device plays a relatively important role in modern society. Medical imaging device can see the internal tissue structure of the subject (such as humans and animals) in a non-invasive way, such as blood vessels, heart, lung, bladder or other parts, which greatly helps the doctor's diagnosis. There are many existing medical imaging device, such as X-ray imaging device, magnetic resonance imaging device, positron emission tomography scanning equipment, etc. The rays of X-ray imaging device and positron emission tomography scanning equipment have certain radiation. In addition, the scanning cost of the above-mentioned imaging device is high, the portability is poor, and it is also difficult to achieve real-time scanning.

Ultrasound imaging device uses ultrasound to image the subject. Since sound has no radiation, there is no limit on the number of times the ultrasound imaging device can be used for the same subject. The size of the ultrasound imaging device is small, it can be set next to the bed, and it can also be easily moved from one position to another. The image acquisition of the ultrasound imaging device can also be achieved in real time. The scanning doctor can see the cross-sectional image of the subject's body in real time when scanning the subject. Compared with other imaging device, the scanning cost of ultrasound imaging device is also lower.

Ultrasound imaging device includes A-ultrasound, B-ultrasound, C-ultrasound, etc. A-ultrasound emits a beam of ultrasound and calculates the distance by the time of emission and return. For example, it can be used to measure the thickness of certain parts. B-ultrasound can form a black and white extended ultrasound imaging,

through which the tissue structure in the subject can be seen. In order to measure the blood flow information in the subject, the blood flow distribution information of the subject can be seen through the C mode. In order to obtain more information about the blood flow, such as blood flow velocity, the Doppler spectrum at the sampling gate position can be obtained by setting a sampling gate on the ultrasound imaging. When in use, you can first turn on the "C" mode on the B-ultrasound imaging to see the blood flow position on the B-ultrasound. Then set the sampling gate at the required position and turn on PW (pulse Doppler) to obtain a pulse Doppler spectrum. The blood flow information at the sampling gate can be known through the pulse Doppler spectrum.

In the prior art, it is sometimes necessary to set multiple sampling gates. Figure 1 is only an exemplary illustration. In actual use, there are no restrictions on the number of transducer elements of the ultrasound probe, the type of ultrasound probe, the number of sampling gates on the ultrasound imaging, etc.

In Figure 1, the ultrasound probe 1' is provided with several transducer elements 11', and the ultrasound imaging 2' is provided with a blood vessel 21'. For the needs of use, four sampling gates (22', 23', 24', 25') need to be set on the blood vessel 21'. When in use, it is necessary to collect the pulse Doppler information of the four sampling gate positions in a time-sharing manner, and the sampling repetition cycle of any one of the positions must wait until the sampling gates at other positions have finished scanning. The more positions that need to be collected, the longer time the sampling repetition cycle is and the lower the sampling rate is. Figure 2 is a schematic diagram of sampling gate 22' when sampling, Figure 3 is a schematic diagram of sampling gate 23' when sampling, Figure 4 is a schematic diagram of sampling gate 24' when sampling, and Figure 5 is a schematic diagram of sampling gate 25' when sampling. After the above acquisition is completed, synthesis is performed to generate the ultrasound imaging in Figure 1. In actual use, each sampling gate corresponds to a Doppler spectrum diagram. For the sake of simplicity, in the above figure, the Doppler spectrum diagram corresponding to the sampling gate is not schematically drawn in the figure.

In the above-mentioned scanning, the scanning efficiency is low and the frame rate of the ultrasound imaging is also low.

Summary of the invention

The purpose of this application is to overcome the deficiencies in the prior art and provide an ultrasound imaging device that can improve the sampling rate.

To achieve the above technical objectives, this application provides a scanning method for an ultrasound imaging device, wherein the ultrasound imaging device includes an ultrasound probe which includes a first group of transducer elements for generating an ultrasound imaging of a first region and a second group of transducer elements for generating an ultrasound imaging of a second region, the scanning method including:

performing an initial scan on the subject to obtain initial ultrasound data, and processing the initial ultrasound data to generate an initial ultrasound imaging, wherein the first region of the ultrasound imaging and the second region of the ultrasound imaging are part of the initial ultrasound imaging;

setting a sampling gate on the initial ultrasound imaging, if the sampling gate is set for the first region of the ultrasound imaging, the sampling gate of the second region is set for the first region of the ultrasound imaging, and the sampling gate of the second region is set for the second region of the ultrasound imaging. If the sampling gate is not set for the second region of the ultrasound imaging, the first group of transducer elements transmits signals, the second group of transducer elements does not transmit signals, the first region of the ultrasound imaging is continuously refreshed, and the second region of the ultrasound imaging remains unchanged;

if the first region of the ultrasound imaging is not set for the sampling gate, and the second region of the ultrasound imaging is set for the sampling gate, the second group of transducer elements transmits signals, the first group of transducer elements does not transmit signals, the first region of the ultrasound imaging remains unchanged, and the second region of the ultrasound imaging is continuously

refreshed;

if the first region of the ultrasound imaging and the second region of the ultrasound imaging are both set for the sampling gate, the first group of transducer elements and the second group of transducer elements transmit signals alternately, and the first region of the ultrasound imaging and the second region of the ultrasound imaging are continuously refreshed.

Further, it is determined whether the position of the subject or the ultrasound probe has changed. If the position has changed, the scanning is restarted.

Further, the first group of transducer elements is composed of a number of adjacently set transducer elements, the second group of transducer elements is composed of a number of adjacently set transducer elements, and the first group of transducer elements and the second group of transducer elements are adjacently set.

Further, the number of channels of the ultrasound probe is 64, the number of transducer elements of the ultrasound probe is 128, wherein the number of transducer elements of the first group of transducer elements is 64, and the number of transducer elements of the second group of transducer elements is 64.

Further, the number of channels of the ultrasound probe is 64, the number of transducer elements of the ultrasound probe is 192, and the ultrasound probe also includes a third group of transducer elements arranged adjacent to the second group of transducer elements, wherein the number of transducer elements of the first group of transducer elements is 64, the number of transducer elements of the second group of transducer elements is 64, and the number of transducer elements of the third group of transducer elements is 64.

Further, the first region of the ultrasound imaging or the second region of the ultrasound imaging is provided with at least two sampling gates.

Further, the initial ultrasound imaging is provided with a first sampling gate and a second sampling gate, if the first sampling gate and the second sampling gate are used to obtain blood flow information of the same blood vessel, the distance between the first sampling gate and the second sampling gate is less than the set threshold, and the first sampling gate and the second sampling gate are both located in the first

region of the ultrasound imaging or the second region of the ultrasound imaging, then the first sampling gate and the second sampling gate are merged into one sampling area.

Further, the ultrasound probe is a linear array probe.

Further, the first group of transducer elements and the second group of transducer elements emit plane waves or wide beams.

Further, the beams emitted by the first group of transducer elements and the second group of transducer elements improve the signal-to-noise ratio of the ultrasound imaging by deflecting the beams.

Further, the signal-to-noise ratio of the ultrasound imaging is provided by increasing the emission voltage of the first group of transducer elements and the second group of transducer elements.

To achieve the above technical objectives, the present invention also provides a scanning method of an ultrasound imaging device, the ultrasound imaging device includes an ultrasound probe, the number of channels of the ultrasound probe is C, and the number of transducer elements of the ultrasound probe is E, which includes:

using the ultrasound probe to perform an initial scan on the subject to obtain initial ultrasound data, and processing the initial ultrasound data to generate an initial ultrasound imaging;

setting a sampling gate on the initial ultrasound imaging, and determining the transducer elements to be activated according to the position of the sampling gate.

Further, the sampling gates are located in multiple positions. If the multiple sampling gates are all located in the ultrasound imaging formed by C adjacent transducer elements, the transducer elements corresponding to the sampling gates are activated; if the multiple sampling gates are not all located in the ultrasound imaging formed by C adjacent transducer elements, the transducer elements are grouped, each group contains C adjacent transducer elements, and each group of transducer elements is activated alternately so that the sampling gates are located on the generated ultrasound imaging.

Further, the ends of two groups of transducer elements in adjacent groups

overlap or are connected, and the activated transducer elements can form a continuous and continuously refreshed ultrasound imaging.

Further, during the scan, the ultrasound imaging corresponding to the activated transducer elements is continuously refreshed, and the area corresponding to the inactivated transducer elements uses the initial ultrasound data obtained by these transducer elements during the initial scan to generate the ultrasound imaging in the area.

Further, during the scan, the ultrasound imaging corresponding to the activated transducer elements is continuously refreshed, and the intermediate ultrasound data obtained by the inactivated transducer elements after the set time is scanned. The area corresponding to the inactivated transducer elements uses these transducer elements to generate the ultrasound imaging in the area according to the intermediate ultrasound data.

To achieve the above technical objectives, the present invention also provides an ultrasound imaging device, which includes:

an ultrasound probe, the number of channels of the ultrasound probe is C, the number of transducer elements of the ultrasound probe is E, and the ultrasound probe is used to perform an initial scan on the subject to obtain initial ultrasound data;

a data processing module, the data processing module processes the initial ultrasound data to generate an initial ultrasound imaging;

a display module, the initial ultrasound imaging is displayed on the display module, and a sampling gate is set on the initial ultrasound imaging;

an association module, which determines the transducer elements to be activated according to the positions of the set sampling gates.

Furthermore, the display module is a touch screen display.

Furthermore, the positions of the sampling gates are multiple, and if the multiple sampling gates are all located in the ultrasound imaging formed by C adjacent transducer elements, the transducer elements corresponding to the sampling gates are activated; if the multiple sampling gates are not all located in the ultrasound imaging formed by C adjacent transducer elements, the transducer elements are grouped, each

group contains C adjacent transducer elements, and each group of transducer elements is activated alternately so that the sampling gates are located on the generated ultrasound imaging.

Furthermore, during the scanning period, the ultrasound imaging corresponding to the activated transducer elements is continuously refreshed, and the area corresponding to the inactivated transducer elements uses the initial ultrasound data obtained by these transducer elements during the initial scanning to generate the ultrasound imaging in the area.

The scanning method of the ultrasound imaging device of the present invention determines the transducer elements of the ultrasound probe to be activated according to the position of the sampling gate, and flexibly sets it to improve the sampling rate of the ultrasound imaging device.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic diagram of setting multiple sampling gates on an ultrasound imaging in the prior art.

FIG. 2 is a schematic diagram of scanning the first sampling gate in FIG. 1.

FIG. 3 is a schematic diagram of scanning the second sampling gate in FIG. 1.

FIG. 4 is a schematic diagram of scanning the third sampling gate in FIG. 1.

FIG. 5 is a schematic diagram of scanning the fourth sampling gate in FIG. 1.

FIG. 6 is a system schematic diagram of the ultrasound imaging device of the present invention.

FIG. 7 is a schematic diagram of scanning the first group of transducer elements in the first embodiment of the present invention.

FIG. 8 is a schematic diagram of scanning the second group of transducer elements in the first embodiment of the present invention.

FIG. 9 is a combined diagram of the first group of transducer elements and the second group of transducer elements after scanning in the first embodiment of the present invention.

FIG. 10 is a schematic diagram of setting the activation ultrasound element

according to the sampling gate position in the second embodiment of the present invention.

DETAILED DESCRIPTION

In order to make the above-mentioned purposes, features and advantages of the present invention more obvious and easy to understand, the specific implementation methods of the present invention are described in detail below in conjunction with the accompanying drawings. In the following description, many specific details are set forth to facilitate a full understanding of the present invention. However, the present invention can be implemented in many other ways different from those described herein, and those skilled in the art can make similar improvements without violating the connotation of the present invention, so the present invention is not limited to the specific embodiments disclosed below.

In order to make the drawings concise, each figure only schematically shows the parts related to the present invention, and they do not represent the actual structure of the product. In addition, in order to make the drawings concise and easy to understand, in some figures, only one of the components with the same structure or function is schematically drawn, or only one of them is marked. In this article, "one" not only means "only one", but also means "more than one".

It should also be further understood that the term "and/or" used in the present invention specification and the attached claims refers to any combination of one or more of the associated listed items and all possible combinations, and includes these combinations.

In the description of the present invention, the terms "first", "second", etc. are only used to distinguish the description and cannot be understood as indicating or implying relative importance.

In order to more clearly illustrate the embodiments of the present invention or the technical solutions in the prior art, the specific implementation of the present invention will be described below with reference to the accompanying drawings. Obviously, the drawings described below are only some embodiments of the present

invention. For ordinary technicians in this field, other drawings and other implementations can be obtained based on these drawings without creative work.

As shown in Figure 6, the present invention provides an ultrasound imaging device, which includes an ultrasound probe 1 with transducer elements, a data processing module 20 connected to the ultrasound probe 1, a display module 30 and an association module 40. In order to control the transmission and reception of the transducer elements of the ultrasound probe 1, the ultrasound imaging device is also provided with a transmitting module and a receiving module. When in use, the transmitting module controls the transducer elements of the ultrasound probe 1 to vibrate, generate ultrasound waves, and transmit them in the direction of the subject. The sound moves inside the subject and is reflected at the interface between two different tissues. The reflected sound is received by the transducer elements of the ultrasound probe 1 and converted into an electrical signal. The electrical signal is converted from an analog signal to a digital signal. The data processing module 20 processes the signal (ultrasound data) to generate an ultrasound imaging. The ultrasound imaging is displayed on the display module 30. The display module 30 can be a touch screen or a non-touch screen. In this embodiment, the number of channels of the ultrasound probe 1 is C, and the number of transducer elements of the ultrasound probe 1 is E, wherein E>C.

The number of channels of the ultrasound probe 1 is C, and the number of transducer elements of the ultrasound probe 1 is E, wherein E>C, and the ultrasound probe 1 is used to perform an initial scan of the subject to obtain initial ultrasound data.

The data processing module processes the initial ultrasound data to generate an initial ultrasound imaging.

The initial ultrasound imaging is displayed on the display module, and a sampling gate is set on the initial ultrasound imaging.

The association module determines the transducer elements to be activated according to the position of the set sampling gate.

In one embodiment, the number of channels of the ultrasound probe 1 is 64, and

the number of transducer elements of the ultrasound probe 1 is 128, wherein the number of transducer elements of the first group of transducer elements is 64, and the number of transducer elements of the second group of transducer elements is 64. The first group of transducer elements and the second group of transducer elements are arranged adjacent to each other.

In another embodiment, the number of channels of the ultrasound probe 1 is 64, the number of transducer elements of the ultrasound probe 1 is 192, and the ultrasound probe 1 further includes a third group of transducer elements arranged adjacent to the second group of transducer elements, wherein the number of transducer elements of the first group of transducer elements is 64, the number of transducer elements of the second group of transducer elements is 64, and the number of transducer elements of the third group of transducer elements is 64. The above is only an exemplary description. In actual use, two adjacent groups of transducer elements can be arranged at intervals, or can be arranged with their ends connected, or can be arranged with their ends partially overlapping.

As shown in Figures 7 and 8, the transducer elements 11 of the ultrasound probe 1 are divided into two groups, namely, a first group of transducer elements 3 and a second group of transducer elements 4. In this embodiment, the ends of the two groups of transducer elements are connected end-to-end. The number of transducer elements in each group is the same as the number of channels of the ultrasound probe 1. The first group of transducer elements 3 is used to generate a first-region ultrasound imaging 5, and the second group of transducer elements 4 is used to generate a second-region ultrasound imaging 6. The first-region ultrasound imaging 5 and the second-region ultrasound imaging 6 are combined to form a complete ultrasound imaging 2. A blood vessel 21 is provided on the ultrasound imaging 2. In this embodiment, the first group of transducer elements 3 and the second group of transducer elements 4 are two groups of transducer elements that are pre-set and will not change. In actual use, it can also be set to three or more groups of transducer elements, and the specific number of groups is not limited. In this embodiment, only two groups of transducer elements are used for exemplary illustration. In order to

improve the sampling rate, each group of transducer elements emits a plane wave or a wide beam. In order to improve the signal-to-noise ratio of the ultrasound imaging, the ultrasound beam improves the signal-to-noise ratio of the ultrasound imaging by deflecting the beam, or provides the signal-to-noise ratio of the ultrasound imaging by increasing the emission voltage of the first group of transducer elements and the second group of transducer elements, or both are used together.

During scanning, the ultrasound probe 1 is used to perform an initial scan on the subject to obtain initial ultrasound data, and the initial ultrasound data is processed to generate an initial ultrasound imaging 2. The first region 5 of the ultrasound imaging and the second region of the ultrasound imaging 6 are part of the initial ultrasound imaging 2. In this embodiment, the first region 5 of the ultrasound imaging 5 and the second region 6 of the ultrasound imaging are combined to form a complete initial ultrasound imaging 2. In other embodiments, the ultrasound imaging formed by combining the first region of the ultrasound imaging 5 and the second region 6of the ultrasound imaging may also be only a part of the initial ultrasound imaging 2. Ultrasound imaging device is used to determine the setting area of the sampling gate.

A sampling gate is set on the initial ultrasound imaging 2. When the display module 30 is a touch screen, the sampling gate can be set by touching. When the display module 30 is a non-touch screen, the sampling gate can be set by a roller or a touch pad on the console.

As shown in Figure 7, if the first region 5 of the ultrasound imaging is set with a sampling gate (22, 23), and the second region 6 of the ultrasound imaging is not set with a sampling gate, the first group of transducer elements 3 transmits a signal, the second group of transducer elements 4 does not transmit a signal. The first region 5 of the ultrasound imaging is continuously refreshed, and the second region 6 of the ultrasound imaging remains unchanged. In this embodiment, the area (second region of the ultrasound imaging) corresponding to the inactivated transducer elements (i.e., the second group of transducer elements) uses the initial ultrasound data obtained by these transducer elements during the initial scan to generate the ultrasound imaging in the area. Through the above settings, while increasing the sampling rate of the pulse

Doppler spectrum image, a complete ultrasound imaging can also be observed.

When obtaining the Doppler spectrum image, it is necessary to avoid the movement of the ultrasound probe or the subject. When the user finds that the ultrasound probe or the subject has moved, the user can choose to re-scan. A sensor may also be set on the ultrasound probe or the object to prompt the user to re-scan when the sensor detects that the movement of the ultrasound probe or the object exceeds a set threshold. The user can choose whether to re-scan as needed.

In order to obtain a better complete ultrasound imaging, a preset time may be set, such as 5S. After the preset time, the second group of transducer elements 6 begin to scan and the intermediate ultrasound data is obtained, and the second regional ultrasound imaging 6 uses the intermediate ultrasound data to generate an ultrasound imaging in the region.

In this embodiment, the first sampling gate 22 and the second sampling gate 23 are used to obtain blood flow information of the same blood vessel 21. If the distance between the first sampling gate 22 and the second sampling gate 23 is less than the set threshold, and the first sampling gate 22 and the second sampling gate 23 are both located in the first regional 5 of the ultrasound imaging, the first sampling gate 22 and the second sampling gate 23 are merged into one sampling gate. When in use, if the distance between two connected sampling gates is very close, it can be considered that the blood flow information at the two sampling gates is the same. By merging two adjacent sampling gates into one sampling area, the number of sampling gates can be reduced, and the number of pulse Doppler spectra can also be reduced, which makes the ultrasound imaging more concise and clear.

Figure 8 shows that the first region 5 of the ultrasound imaging is not set with a sampling gate, and the second region of the ultrasound imaging is set with a sampling gate. The second group of transducer elements 4 transmits signals, the first group of transducer elements 3 does not transmit signals, the first region 5 of the ultrasound imaging remains unchanged, and the second region 6 of the ultrasound imaging is continuously refreshed. The scheme in Figure 8 is similar to the scheme in Figure 7, except that the position of the sampling gate is changed.

Figure 9 shows that the first region 5 of the ultrasound imaging and the second region 6 of the ultrasound imaging are both set with sampling gates (22, 23, 24, 25). The first region 5 of the ultrasound imaging is set with the first sampling gate 22 and the second sampling gate 23, and the second region 6 of the ultrasound imaging is set with the third sampling gate 24 and the fourth sampling gate 25. The first group of transducer elements 3 and the second group of transducer elements 4 transmit signals alternately, and the first region 5 of the ultrasound imaging and the second region 6 of the ultrasound imaging are continuously refreshed.

In this embodiment, the first group of transducer elements 3 is composed of several adjacent transducer elements, and the second group of transducer elements 4 is composed of several adjacent transducer elements. The first group of transducer elements 3 and the second group of transducer elements 4 are adjacently arranged. The end of the first group of transducer elements 3 and the end of the second group of transducer elements 4 are connected end-to-end, and the number of the first group of transducer elements 3 and the number of the second group of transducer elements 4 are respectively the same as the number of channels of the ultrasound probe 1. In other embodiments, the end of the first group of transducer elements 3 and the end of the second group of transducer elements 4 are overlapped, and the sum of the number of the first group of transducer elements 3 and the number of the second group of transducer elements 4 is less than 2 times the number of channels of the ultrasound probe 1.

Preferably, the ultrasound probe 1 is a linear array probe.

Figure 10 is a second embodiment of the present invention, in which the ultrasound imaging device includes an ultrasound probe 1, the number of channels of the ultrasound probe is C, and the number of transducer elements of the ultrasound probe 1 is E, wherein E>C. In other embodiments, E may also be equal to C or less than C.

During scanning, an ultrasound probe is used to perform an initial scan on the subject to obtain initial ultrasound data, and the initial ultrasound data is processed to generate an initial ultrasound imaging.

A sampling gate (a first sampling gate 22 and a second sampling gate 23) is set on the initial ultrasound imaging, and the transducer elements to be activated are determined according to the positions of the sampling gates. The sampling gate is located on the blood vessel 21. In this embodiment, the activated ultrasound element is the third group of transducer elements 6. The transducer elements to be activated are determined according to the position and number of the sampling gates.

There are multiple positions of the sampling gates. If multiple sampling gates are located in the ultrasound imaging formed by C adjacent transducer elements, the transducer elements corresponding to these sampling gates are activated. As shown in FIG10, the first sampling gate 22 and the second sampling gate 23 can be located in the regional ultrasound imaging formed by the third group of transducer elements 6. At this time, the third group of transducer elements 6 can be activated. The number of the third group of transducer elements 6 is less than or equal to the number of channels of the ultrasound probe 1. Preferably, the number of the third group of transducer elements 6 is equal to the number of channels of the ultrasound probe 1.

When $C \geqslant E$, $N = 1$, and only one set of plane waves needs to be emitted to cover the entire scanning range. This is the most favorable situation. The transmission time required to set 1 PW sampling position to set N sampling positions is the same. The reason why traditional alternating transmission affects the PW sampling rate is that the maximum sampling rate $S=S_max/M$, S_max is the maximum sampling rate of a single PW sampling position, and M is the number of PW sampling positions. The advantage of the present invention lies in the case where the number of sampling positions in an area is greater than 1.

When the number of sampling gates is multiple, the distance between the two leftmost and rightmost sampling gates in the width direction is calculated. If the distance is less than or equal to the width of C adjacent transducer elements, a group of C adjacent transducer elements can be activated. This group of transducer elements can be obtained in the following way. When in use, the user selects the leftmost sampling gate and the rightmost sampling gate, and the transducer element corresponding to the leftmost sampling gate, the transducer element corresponding to

the rightmost sampling gate, and the transducer elements between them are activated.

If the multiple sampling gates are not all located in the ultrasound imaging formed by C adjacent transducer elements, the transducer elements are grouped. Each group contains C adjacent transducer elements, and each group of transducer elements is activated alternately so that the sampling gate is located on the generated ultrasound imaging. The multiple groups of transducer elements can be obtained in the following manner: the leftmost and rightmost sampling gates are selected, the transducer elements corresponding to the leftmost sampling gate, the transducer elements corresponding to the rightmost sampling gate, and the transducer elements between them are activated, and the activated transducer elements are grouped into a group of C adjacent transducer elements (a first group of transducer elements). The transducer elements not belonged to the first group of transducer elements are grouped to form another group.

The ends of the two groups of transducer elements in the adjacent groups overlap or are connected end-by-end, and the activated transducer elements can form a continuous and continuously refreshed ultrasound imaging.

The present invention does not limit the number of PW sampling positions, whether the FPGA directly processes the PW sampling information of multiple positions, or transmits data in any way to the CPU or GPU for software processing, which is within the scope of protection.

Although the emission of plane waves or wide beams increases the PW sampling rate compared to traditional focused emission, it also reduces the signal-to-noise ratio and penetration. The simplest way to compensate for the emission energy is to increase the emission power, provided that it does not affect the safe output.

For the compensation method of plane waves and wide beams, the system usually cannot provide sufficient emission power. In this case, we need to compensate for the decrease in signal-to-noise ratio through signal processing. One of the methods is to set multiple scanning angles for cyclic scanning through deflection synthesis.

The above embodiments only express several implementation methods of the present invention, and the description is relatively specific and detailed, but it cannot be understood as a limitation on the scope of the patent application. It should be pointed out that for ordinary technicians in this field, without departing from the concept of the present invention, several deformations and improvements can be made, which all belong to the scope of protection of the present invention. Therefore, the scope of protection of the patent of this application shall be based on the attached claims.

Claims:

1. A scanning method for an ultrasound imaging device, the ultrasound imaging device including an ultrasound probe which includes a first group of transducer elements for generating an ultrasound imaging of a first region and a second group of transducer elements for generating an ultrasound imaging of a second region, the scanning method comprising:

performing an initial scan on the subject to obtain an initial ultrasound data, the initial ultrasound data being processed to generate an initial ultrasound imaging which includes the first region of the ultrasound imaging and the second region of the ultrasound imaging;

setting a sampling gate on the initial ultrasound imaging, if the first region of the ultrasound imaging is set with a sampling gate, and the second region of the ultrasound imaging is not set with a sampling gate, the first group of transducer elements transmits a signal, the second group of transducer elements does not transmit a signal, the first region of the ultrasound imaging is continuously refreshed, and the second region of the ultrasound imaging remains unchanged;

if the first region of the ultrasound imaging is not set with a sampling gate, and the second region of the ultrasound imaging is set with a sampling gate, the second group of transducer elements transmits a signal, the first group of transducer elements does not transmit a signal, the first region of the ultrasound imaging remains unchanged, and the second region of the ultrasound imaging is continuously refreshed;

if the first region of the ultrasound imaging and the second region of the ultrasound imaging are both set with sampling gates, the first group of transducer elements and the second group of transducer elements transmit signals alternately, and the first region of the ultrasound imaging and the second region of the ultrasound imaging are continuously refreshed.

2. The scanning method according to claim 1, wherein it is judged whether the

position of the subject or the ultrasound probe is changed, and if the position is changed, the scanning is restarted.

3. The scanning method according to claim 1, wherein the first group of transducer elements are composed of a number of adjacent transducer elements, the second group of transducer elements are composed of a number of adjacent transducer elements, and the first group of transducer elements and the second group of transducer elements are adjacent to each other.

4. The scanning method according to claim 3, wherein the number of channels of the ultrasound probe is 64, the number of transducer elements of the ultrasound probe is 128, wherein the number of the first group of transducer elements is 64, and the number of the second group of transducer elements is 64.

5. The scanning method according to claim 3, wherein the number of channels of the ultrasound probe is 64, the number of transducer elements of the ultrasound probe is 192, and the ultrasound probe further includes a third group of transducer elements adjacent to the second group of transducer elements, wherein the number of the first group of transducer elements is 64, the number of the second group of transducer elements is 64, and the number of the third group of transducer elements is 64.

6. The scanning method according to claim 1, wherein the first region of the ultrasound imaging or the second region of the ultrasound imaging is provided with at least two sampling gates.

7. The scanning method according to claim 6, wherein the initial ultrasound imaging is provided with a first sampling gate and a second sampling gate, if the first sampling gate and the second sampling gate are used to obtain blood flow information of the same blood vessel, the distance between the first sampling gate and the second sampling gate is less than the set threshold, and the first sampling gate and the second sampling gate are both located in the first region or the second region,

then the first sampling gate and the second sampling gate are merged into one sampling area.

8. The scanning method according to claim 1, wherein the ultrasound probe is a linear array probe.

9. The scanning method according to claim 1, wherein the first group of transducer elements and the second group of transducer elements emit plane waves or wide beams.

10. The scanning method according to claim 9, wherein the beams emitted by the first group of transducer elements and the second group of transducer elements improve the signal-to-noise ratio of the ultrasound imaging by deflecting the beams.

11. The scanning method according to claim 9, wherein the signal-to-noise ratio of the ultrasound imaging is improved by increasing the transmission voltage of the first group of transducer elements and the second group of transducer elements.

12. A scanning method for an ultrasound imaging device, the ultrasound imaging device comprising an ultrasound probe, the number of channels of the ultrasound probe being C, the number of transducer elements of the ultrasound probe being E, wherein E>C, the scanning method comprising:

performing an initial scan on the subject to obtain an initial ultrasound data, and processing the initial ultrasound data to generate an initial ultrasound imaging;

setting a sampling gate on the initial ultrasound imaging, and determining the transducer elements to be activated according to the position of the sampling gate.

13. The scanning method according to claim 12, wherein the sampling gate has multiple positions, and if the multiple sampling gates are all located in the ultrasound imaging formed by C adjacent transducer elements, the transducer elements corresponding to the sampling gates are activated; if the multiple sampling gates are

not all located in the ultrasound imaging formed by C adjacent transducer elements, the transducer elements are grouped, each group contains C adjacent transducer elements, and each group of transducer elements is activated alternately so that the sampling gate is located on the generated ultrasound imaging.

14. The scanning method according to claim 13, wherein the ends of two groups of transducer elements in adjacent groups overlap or are connected, and the activated transducer elements can form a continuous and continuously refreshed ultrasound imaging.

15. The scanning method according to claim 12, wherein during the scanning period, the ultrasound imaging corresponding to the activated transducer elements is continuously refreshed, and the area corresponding to the inactivated transducer elements uses the initial ultrasound data obtained by these transducer elements during the initial scanning to generate the ultrasound imaging.

16. The scanning method according to claim 12, wherein during the scanning period, the ultrasound imaging corresponding to the activated transducer elements is continuously refreshed, and the inactivated transducer elements scans after a set time to obtain an intermediate ultrasound data, and the imaging region corresponding to the inactivated transducer elements uses the intermediate ultrasound data to generate the ultrasound imaging.

17. An ultrasound imaging device, which comprises:

an ultrasound probe, wherein the number of channels of the ultrasound probe is C, the number of transducer elements of the ultrasound probe is E, and the ultrasound probe is used to perform an initial scan on the subject to obtain initial ultrasound data;

a data processing module, wherein the data processing module processes the initial ultrasound data to generate an initial ultrasound imaging;

a display module, wherein the initial ultrasound imaging is displayed on the display module, and a sampling gate is set on the initial ultrasound imaging;

an association module, wherein the transducer elements to be activated are determined according to the position of the set sampling gate.

18. The ultrasound imaging device according to claim 17, wherein the display module is a touch screen display.

19. The ultrasound imaging device according to claim 17, wherein there are multiple positions of the sampling gates, and if the multiple sampling gates are all located in the ultrasound imaging formed by C adjacent transducer elements, the transducer elements corresponding to the sampling gates are activated; if the multiple sampling gates are not all located in the ultrasound imaging formed by C adjacent transducer elements, the transducer elements are grouped, each group contains C adjacent transducer elements, and each group of transducer elements is activated alternately so that the sampling gates are located on the generated ultrasound imaging.

20. The ultrasound imaging device according to claim 17, wherein during the scanning period, the ultrasound imaging corresponding to the activated transducer elements is continuously refreshed, and the area corresponding to the inactivated transducer elements uses the initial ultrasound data obtained by these transducer elements during the initial scanning to generate the ultrasound imaging in the area.