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(54) **Providing additional information corresponding to change of blood flow with a time in ultrasound system**

Bereitstellung von zusätzlichen Informationen in Bezug auf die Änderung des Blutflusses mit der Zeit in einem Ultraschallsystem

Fourniture d'informations supplémentaires correspondant à un changement de débit sanguin en fonction du temps dans un système à ultrasons

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Description

CROSS-REFERENCE TO RELATED APPLICATION

[0001] The present application claims priority from Korean Patent Application No. 10-2010-0123899 filed on December 7, 2010.

TECHNICAL FIELD

[0002] The present disclosure generally relates to ultrasound systems, and more particularly to providing additional information corresponding to a change of blood flow with a time in an ultrasound system.

BACKGROUND

[0003] An ultrasound system has become an important and popular diagnostic tool since it has a wide range of applications. Specifically, due to its non-invasive and non-destructive nature, the ultrasound system has been extensively used in the medical profession. Modern high-performance ultrasound systems and techniques are commonly used to produce two-dimensional or three-dimensional ultrasound images of internal features of a target object (e.g., human organs).

[0004] The ultrasound system may provide ultrasound images of various modes including a brightness mode (B mode) image representing reflection coefficients of the ultrasound signals reflected from a target object of a living body with a 2D (two-dimensional) image, a Doppler mode (D mode) image representing speed of a moving target object with spectral Doppler by using a Doppler effect, a color Doppler mode (C mode) image representing speed of a moving target object with colors by using the Doppler effect, and an elastic mode (E mode) image representing mechanical characteristics of tissues object before and after applying a pressure thereto. Particularly, the ultrasound system may transmit and receive ultrasound signals to and from the living body to thereby form Doppler signals corresponding to a sample volume, which is set on a B mode image. The ultrasound system may further form the D mode image (i.e., Doppler spectrum image) that represents the speed of the moving target object such as blood flow, heart, etc. with Doppler spectrums based on the Doppler signals.

[0005] The ultrasound system may provide the Doppler spectrum image only based on the blood flow information. Thus, it is required to provide additional information corresponding to a change of the blood flow with a time to enhance the convenience of a user.

[0006] EP 1 977 694 discloses an ultrasound system, comprising:user input for setting a sample volume;an ultrasound data acquisition unit configured to acquire first ultrasound data and second ultrasound data corresponding to a living body; and a processing unit configured to form a brightness mode image based on the first ultrasound data, set at least one sample volume on the brightness mode image and form blood flow information corresponding to blood flow in the living body based on the second ultrasound data corresponding to the at least one sample volume, the processing unit being further configured to form additional information corresponding to a change of the blood flow with a time based on the blood flow information.

[0007] US 5,709,211 describes an ultrasonic diagnostic apparatus having a color flow imaging function and a pulse Doppler function.

[0008] A method and an apparatus for adjusting the shape of a region of interest in a frame of imaging data are known from US 6,077,226.

[0009] A further ultrasonic diagnostic apparatus including a tomogram forming means, a color Doppler image forming means, an image processing means and a display means is described in US 2006/0241458 A1.

SUMMARY

[0010] There are provided embodiments for providing additional information corresponding to a change of blood flow with a time in an ultrasound system.

[0011] In one embodiment an ultrasound system comprises the features stated in claim 1.

[0012] In another embodiment, there is provided a method of providing additional information, comprising the features stated in claim 7.

[0013] This summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This Summary is not intended to identify key or essential features of the claimed subject matter, nor is it intended to be used in determining the scope of the claimed subject matter.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014]

FIG. 1 is a block diagram showing an illustrative embodiment of an ultrasound system.

FIG. 2 is a schematic diagram showing an example of a brightness mode image and a sample volume.

FIG. 3 is a block diagram showing an illustrative embodiment of an ultrasound data acquisition unit.

FIG. 4 is a flow chart showing a process of forming a Doppler spectrum image and additional information.

FIG. 5 is a schematic diagram showing an example of the additional information.

FIG. 6 is a schematic diagram showing another example of the additional information.

FIG. 7 is a schematic diagram showing yet another example of the additional information.

DETAILED DESCRIPTION

[0015] A detailed description may be provided with ref-

erence to the accompanying drawings. One of ordinary skill in the art may realize that the following description is illustrative only and is not in any way limiting.

[0016] Referring to FIG. 1, an ultrasound system 100 in accordance with an illustrative embodiment is shown. As depicted therein, the ultrasound system 100 includes a user input unit 110.

[0017] The user input unit 110 is configured to receive input information. In the embodiment, the input information includes sample volume setting information for setting a sample volume SV on a brightness mode image BI, as shown in FIG. 2. However, it should be noted herein that the input information may not be limited thereto. In FIG. 2, reference numeral BV represents a blood vessel. The user input unit 110 includes a control panel, a trackball, a mouse, a keyboard and the like.

[0018] The ultrasound system 100 further includes an ultrasound data acquisition unit 120. The ultrasound acquisition unit 120 is configured to transmit ultrasound signals to a living body. The living body includes target objects (e.g., blood flow, a heart, etc.). The ultrasound acquisition unit 120 may be further configured to receive ultrasound signals (i.e., ultrasound echo signals) from the living body to acquire ultrasound data.

[0019] FIG. 3 is a block diagram showing an illustrative embodiment of the ultrasound data acquisition unit. Referring to FIG. 3, the ultrasound data acquisition unit 120 includes an ultrasound probe 310.

[0020] The ultrasound probe 310 includes a plurality of transducer elements (not shown) for reciprocally converting between ultrasound signals and electrical signals. The ultrasound probe 310 is configured to transmit the ultrasound signals to the living body. The ultrasound probe 310 is further configured to receive the ultrasound echo signals from the living body to output received signals. The received signals are analog signals. The ultrasound probe 310 includes a convex probe, a linear probe and the like.

[0021] The ultrasound data acquisition unit 120 further includes a transmitting section 320. The transmitting section 320 is configured to control the transmission of the ultrasound signals. The transmitting section 320 is further configured to generate electrical signals ("transmitting signals") for obtaining an ultrasound image in consideration of the elements and focusing points. The transmitting section 320 includes a transmitting signal generating section (not shown), a transmitting delay information memory (not shown), a transmitting beam former (not shown) and the like.

[0022] In the embodiment, the transmitting section 320 generates first transmitting signals for obtaining the brightness mode image BI. Thus, the ultrasound probe 310 converts the first transmitting signals into the ultrasound signals, transmits the ultrasound signals to the living body and receives the ultrasound echo signals from the living body to thereby output first received signals. The transmitting section 320 further generates second transmitting signals for obtaining a Doppler spectrum image corresponding to the sample volume SV. Thus, the ultrasound probe 310 converts the second transmitting signals into the ultrasound signals, transmit the ultrasound signals to the living body and receive the ultrasound echo signals from the living body to thereby output second received signals.

[0023] The ultrasound data acquisition unit 120 further includes a receiving section 330. The receiving section 330 is configured to convert the received signals into digital signals. The receiving section 330 is further configured to apply delays to the digital signals in consideration of the elements and the focusing points to thereby output digital receive-focused signals. The receiving section 330 includes an analog-to-digital converter (not shown), a receiving delay time information memory (not shown), a receiving beam former (not shown) and the like.

[0024] In the embodiment, the receiving section 330 converts the first received signals provided from the ultrasound probe 310 into first digital signals. The receiving section 330 further applies delays to the first digital signals in consideration of the elements and the focusing points to thereby output first digital receive-focused signals. The receiving section 330 further converts the second received signals provided from the ultrasound probe 310 into second digital signals. The receiving section 330 further applies delays to the second digital signals in consideration of the elements and the focusing points to thereby output second digital receive-focused signals.

[0025] The ultrasound data acquisition unit 120 further includes an ultrasound data forming section 340. The ultrasound data forming section 340 is configured to form ultrasound data corresponding to the ultrasound image based on the digital receive-focused signals provided from the receiving section 330. The ultrasound data forming section 340 is further configured to perform a signal process (e.g., gain control, etc) upon the digital receive-focused signals.

[0026] In the embodiment, the ultrasound data forming section 340 forms first ultrasound data corresponding to the brightness mode image BI based on the first digital receive-focused signals provided from the receiving section 330. The first ultrasound data include radio frequency data. However, it should be noted herein that the first ultrasound data may not be limited thereto. The ultrasound data forming section 340 further forms second ultrasound data corresponding to the sample volume SV (i.e., Doppler spectrum image) based on the second digital receive-focused signals provided from the receiving section 330. The second ultrasound data include the radio frequency data or in-phase/quadrature data. However, it should be noted herein that the second ultrasound data may not be limited thereto.

[0027] Referring back to FIG. 1, the ultrasound system 100 further includes a processing unit 130 in communication with the user input unit 110 and the ultrasound data acquisition unit 120. The processing unit 130 includes a central processing unit, a microprocessor, a graphic processing unit and the like.

[0028] FIG. 4 is a flow chart showing a process of forming additional information. The processing unit 130 is configure to form the brightness mode image BI based on the first ultrasound data provided from the ultrasound data acquisition unit 120, at step S402 in FIG. 4. The brightness mode image BI is displayed on a display unit 150. Thus, the user sets the sample volume SV on the brightness mode image BI by using the user input unit 110.

[0029] The processing unit 130 is configured to set the sample volume SV on the brightness mode image BI as shown in FIG. 2, based on the input information provided from the user input unit 110, at step S404 in FIG. 4. Thus, the ultrasound data acquisition unit 120 acquires the second ultrasound data corresponding to the sample volume SV.

[0030] The processing unit 130 is configured to form information (hereinafter, "blood flow information") corresponding to a moving target object (i.e., blood flow) in the living body based on the second ultrasound data provided from the ultrasound data acquisition unit 120, at step S406 in FIG. 4. In the embodiment, the blood flow information includes blood flow velocity information, blood flow rate information, blood flow velocity distribution information and the like. The methods of forming the blood flow information are well known in the art. Thus, they have not been described in detail so as not to unnecessarily obscure the present invention.

[0031] The processing unit 130 is configured to form the Doppler spectrum image based on the blood flow information, at step S408 in FIG. 4. The methods of forming the Doppler spectrum image are well known in the art. Thus, they have not been described in detail so as not to unnecessarily obscure the present invention.

[0032] The processing unit 130 is configured to form additional information based on the blood flow information, at step S410 in FIG. 4. The additional information is information for representing a change of the blood flow with a time.

[0033] As one example, the processing unit 130 forms a color map CM as the additional information based on the blood flow information, as shown in FIG. 5. The color map CM is formed by mapping a plurality of blood flow velocities (i.e., height of Doppler spectrum) to colors.

[0034] As another example, the processing unit 130 forms a color Doppler spectrum image PWI as the additional information based on the blood flow information, as shown in FIG. 5. The color Doppler spectrum image PWI is formed by mapping the colors corresponding to the color map CM to the Doppler spectrum image. That is, the color Doppler spectrum image PWI is formed by applying the colors corresponding to the blood flow velocities to pixels of the Doppler spectrum image.

[0035] As yet another example, the processing unit 130 forms a color blood flow velocity image CI as the additional information based on the blood flow information, as shown in FIG. 5. The color blood flow velocity image CI is formed by mapping the blood flow velocity to the color. That is, the color blood flow velocity image CI is formed by mapping the blood flow velocity corresponding to current blood flow information to the color.

[0036] Although it is described that the processing unit 130 forms the color map, the color Doppler spectrum image or the color blood flow velocity image, the processing unit 130 forms at least one of the color map, the color Doppler spectrum image and the color blood flow velocity image.

[0037] As yet another example, the processing unit 130 applies transparency corresponding to the blood flow rate to at least one of the color map, the color Doppler spectrum image and the color blood flow velocity image as the additional information, based on the blood flow information. That is, the processing unit 130 applies the transparency to the colors corresponding to the blood flow velocities based on the blood flow rate.

[0038] As yet another example, the processing unit 130 forms a blood flow velocity distribution image 610 as the additional information based on the blood flow information, as shown in FIG. 6. The blood flow velocity distribution image 610 is an image for representing blood flow velocity distribution based on distribution of spots (i.e., width of Doppler spectrum).

[0039] As yet another example, the processing unit 130 forms numeric information corresponding to the blood flow velocity and variance as the additional information based on the blood flow information.

[0040] Although it is described that the processing unit 130 forms the Doppler spectrum image with the additional information based on the blood flow information, the processing unit 130 forms the additional information based on the blood flow information.

[0041] Also, although it is described that the sample volume SV is set on the brightness mode image BI and the additional information corresponding to the sample volume is provided, at least one sample volume (e.g., two sample volumes SV_1, SV_2 as shown in FIG. 7) is set on the brightness mode image BI and the additional information (e.g., color Doppler spectrum images PWI_1, PWI_2, color blood flow images CI_1, CI_2 and the like) corresponding to each of the sample volumes SV_1, SV_2.

[0042] Referring back to FIG. 1, the ultrasound system 100 further includes a storage unit 140. The storage unit 140 stores the ultrasound data (i.e., first ultrasound data and second ultrasound data) acquired by the ultrasound data acquisition unit 120. The storage unit 140 further stores the input information received by the user input unit 110.

[0043] The ultrasound system 100 further includes the display unit 150. The display unit 150 is configured to display the brightness mode image BI formed by the processing unit 130. The display unit 150 is further configured to display the Doppler spectrum image formed by the processing unit 130. The display unit 150 is further configured to display the additional information formed by the processing unit 130.

Claims

1. An ultrasound system (100), comprising:

a user input unit (110) configured to receive input information for setting two sample volumes on a brightness mode image;
an ultrasound data acquisition unit (120) configured to acquire first ultrasound data and second ultrasound data corresponding to a living body; and
a processing unit (130) configured to form a brightness mode image based on the first ultrasound data, set the two sample volumes on the brightness mode image based on the input information and form blood flow information corresponding to blood flow in the living body based on the second ultrasound data corresponding to the two sample volumes,
wherein the processing unit (130) is configured to form additional information based on the blood flow information, wherein the blood flow information includes blood flow velocity information, blood flow rate information and blood flow velocity distribution information, and the additional information comprises additional information corresponding to a first sample volume included in the two sample volumes and additional information corresponding to a second sample volume included in the two sample volumes,
wherein the processing unit (130) is configured to form a color map corresponding to each of the first sample volume and the second sample volume by mapping a plurality of blood flow velocities corresponding to current blood flow information as the additional information, form a color Doppler spectrum image corresponding to each of the first sample volume and the second sample volume by applying the colors corresponding to the plurality of blood flow velocities to pixels of a Doppler spectrum image as the additional information, and form a color blood flow velocity image corresponding to each of the first sample volume and the second sample volume by mapping blood flow velocities corresponding to current blood flow information as the additional information, and
the color blood flow velocity image is displayed on the two sample volumes,
wherein the processing unit (130) is further configured to form a blood flow velocity distribution image for representing blood flow velocity distribution corresponding to width of Doppler spectrum as the additional information.

2. The ultrasound system (100) of Claim 1, wherein the processing unit (130) is configured to apply transparency to at least one of the color map, the color Doppler spectrum image and the color blood flow velocity image as the additional information based on the blood flow information.

3. A method of providing additional information, comprising:

a) acquiring first ultrasound data corresponding to a living body;
b) forming a brightness mode image based on the first ultrasound data;
c) receiving input information for setting two sample volumes on the brightness mode image;
d) setting the two sample volumes on the brightness mode image based on the input information;
e) acquiring second ultrasound data corresponding to the two sample volumes;
f) forming blood flow information corresponding to blood flow in the living body based on the second ultrasound data wherein blood flow information includes blood flow velocity information, blood flow rate information and blood flow velocity distribution information, and the additional information comprises additional information corresponding to a first sample volume included in the two sample volumes and additional information corresponding to a second sample volume included in the two sample volumes; and
g) forming additional information corresponding to a first sample volume included in the two sample volumes and additional information corresponding to a second sample volume included in the two sample volumes,

wherein the step g) comprises:

forming a color map corresponding to each of the first sample volume and the second sample volume by mapping a plurality of blood flow velocities corresponding to current blood flow information as the additional information;
forming a color Doppler spectrum image corresponding to each of the first sample volume and the second sample volume by applying the colors corresponding to the plurality of blood flow velocities to pixels of a Doppler spectrum image as the additional information;
forming a color blood flow velocity image corresponding to each of the first sample volume and the second sample volume by mapping blood flow velocities corresponding to current blood flow information as the additional information, and the color blood flow velocity image is displayed on the two sample volumes;
forming a blood flow velocity distribution image for representing blood flow velocity distribution corresponding to width of Doppler spectrum as

the additional information.

4. The method of Claim 3, wherein the step g) further comprises:
applying transparency to at least one of the color map, the color Doppler spectrum image and the color blood flow velocity image as the additional information base on the blood flow information.

Patentansprüche

1. Ultraschallsystem (100), welches Folgendes aufweist:

eine Benutzereingabeeinheit (110), die dafür vorgesehen ist, Eingabeinformationen zum Festlegen zweier Probenvolumen auf einem Helligkeitsmodusbild zu empfangen;
eine Ultraschalldatenerlangungseinheit (120), die dafür vorgesehen ist, erste Ultraschalldaten und zweite Ultraschalldaten, die mit einem lebenden Körper korrespondieren, zu erlangen; und
eine Verarbeitungseinheit (130), die dafür vorgesehen ist, ein Helligkeitsmodusbild basierend auf den ersten Ultraschalldaten zu erzeugen, die zwei Probenvolumen auf dem Helligkeitsmodusbild basierend auf den Eingabeinformationen festzulegen und Blutstrominformationen, die mit dem Blutstrom in dem lebenden Körper korrespondieren, basierend auf den zweiten Ultraschalldaten, die mit den zwei Probevolumen korrespondieren, zu erzeugen,
wobei die Verarbeitungseinheit (130) dafür vorgesehen ist, zusätzliche Informationen basierend auf den Blutstrominformationen zu erzeugen, wobei die Blutstrominformationen Blutstromgeschwindigkeitsinformationen, Blutstromverhältnisinformationen und Blutstromgeschwindigkeitsverteilungsinformationen beinhalten, und wobei die zusätzlichen Informationen zusätzliche Informationen, die mit einem ersten Probevolumen, das in den zwei Probevolumen enthalten ist, korrespondieren und zusätzliche Informationen, die mit einem zweiten Probevolumen, das in den zwei Probevolumen beinhaltet ist, korrespondieren, aufweist,
wobei die Verarbeitungseinheit (130) dafür vorgesehen ist, eine Farbkarte, die mit jedem des ersten Probevolumens und des zweiten Probevolumens korrespondiert, durch Aufzeichnen einer Vielzahl von Blutstromgeschwindigkeiten, die mit aktuellen Blutstrominformationen als die zusätzlichen Informationen korrespondieren, ein Farbdoppler-Spektralbild, das mit jedem der ersten Probevolumen und der zweiten Probevolumen korrespondiert, durch Anwenden der Farben, die mit der Vielzahl von Blutstromgeschwindigkeiten korrespondieren, an Pixeln eines Doppler-Spektrumbilds als die zusätzliche Informationen zu erzeugen, und ein Farbblutstromgeschwindigkeitsbild, das mit jedem der ersten Probevolumen und der zweiten Probevolumen korrespondiert, durch Aufzeichnen von Blutstromgeschwindigkeiten, die mit aktuellen Blutstrominformationen als die zusätzlichen Informationen korrespondieren, zu bilden, und
wobei das Farbblutstromgeschwindigkeitsbild auf den zwei Probevolumen angezeigt wird,
wobei die Verarbeitungseinheit (130) des Weiteren dafür vorgesehen ist, ein Blutstromgeschwindigkeitsverteilungsbild zum Repräsentieren einer Blutstromgeschwindigkeitsverteilung, die mit der Breite des Doppler-Spektrums als den zusätzlichen Informationen korrespondiert, zu erzeugen.

2. Ultraschallsystem (100) nach Anspruch 1, wobei die Verarbeitungseinheit (130) dafür vorgesehen ist, an wenigstens einer der Farbkarte, an dem Farbdoppler-Spektralbild und an dem Farbblutstromgeschwindigkeitsbild als dem zusätzlichen Informationen, basierend auf den Blutstrominformationen, eine Transparenz anzuwenden.

3. Verfahren zur Erzeugung zusätzlicher Informationen, welches Folgendes aufweist:

a) Erlangen erster Ultraschalldaten, die mit einem lebenden Körper korrespondieren;
b) Erzeugen eines Helligkeitsmodusbilds basierend auf den ersten Ultraschalldaten;
c) Empfangen von Eingabeinformationen zum Festlegen zweier Probevolumen auf dem Helligkeitsmodusbild;
d) Festlegen der zwei Probevolumen auf dem Helligkeitsmodusbild basierend auf den Eingabeinformationen;
e) Erlangen zweiter Ultraschalldaten, die mit den zwei Probevolumen korrespondieren;
f) Erzeugen von Blutstrominformationen, die mit dem Blutstrom in dem lebenden Körper korrespondieren, basierend auf den zweiten Ultraschalldaten, wobei die Blutstrominformationen Blutstromgeschwindigkeitsinformationen, Blutstromverteilungsinformationen und Blutstromgeschwindigkeitsverteilungsinformationen beinhalten, und wobei die zusätzlichen Informationen zusätzliche Informationen, die mit einem ersten Probevolumen, das in den zwei Probevolumen enthalten ist, korrespondieren, und zusätzliche Informationen, die mit einem zweiten Probevolumen, das in den zweite Probevolumen beinhaltet ist, korrespondieren, auf-

weisen; und

g) Erzeugen zusätzlicher Informationen, die mit einem ersten Probevolumen, das in den zwei Probevolumen enthalten ist, korrespondieren, und zusätzlicher Informationen, die mit einem zweiten Probevolumen, das in den zwei Probevolumen enthalten ist, korrespondieren,

wobei der Schritt g) Folgendes aufweist:

Erzeugen einer Farbkarte, die mit jedem der ersten Probevolumen und der zweiten Probevolumen korrespondiert, und zwar durch Aufzeichnen einer Vielzahl von Blutstromgeschwindigkeiten, die mit den aktuellen Blutstrominformationen als den zusätzlichen Informationen korrespondieren;

Erzeugen eines Farbdoppler-Spektralbilds, das mit jedem der ersten Probevolumen und der zweiten Probevolumen korrespondiert, durch Anwenden der Farben, die mit der Vielzahl von Blutstromgeschwindigkeiten korrespondieren, an Pixeln eines Doppler-Spektralbilds als den zusätzlichen Informationen;

Erzeugen eines Farbblutstromgeschwindigkeitsbilds, das mit jedem der ersten Probevolumen und der zweiten Probevolumen korrespondiert, durch Aufzeichnen von Blutstromgeschwindigkeiten, die mit aktuellen Blutstrominformationen als den zusätzlichen Informationen korrespondieren, und wobei das Farbblutstromgeschwindigkeitsbild auf den zwei Probevolumen angezeigt wird;

Erzeugen eines Blutstromgeschwindigkeitsverteilungsbilds zum Repräsentieren der Blutstromgeschwindigkeitsverteilung, die mit der Breite des Doppler-Spektrums als den zusätzlichen Informationen korrespondiert.

4. Verfahren nach Anspruch 3, wobei der Schritt g) Folgendes aufweist:
Anwenden von Transparenz auf wenigstens eine der Farbkarte des Farbdoppler-Spektralbilds und des Farbblutstromgeschwindigkeitsbilds als den zusätzlichen Informationen basierend auf den Blutstrominformationen.

Revendications

1. Système à ultrasons (100), comprenant :

une unité d'entrée utilisateur (110) configurée pour recevoir des informations d'entrée pour régler deux volumes d'échantillon sur une image en mode luminosité ;

une unité d'acquisition de données ultrasonores (120) configurée pour acquérir des premières données ultrasonores et des secondes données ultrasonores correspondant à un corps vivant ; et

une unité de traitement (130) configurée pour former une image en mode luminosité basée sur les premières données ultrasonores, régler les deux volumes d'échantillon sur l'image en mode luminosité basée sur les informations d'entrée et former des informations de flux sanguin correspondant au flux sanguin dans le corps vivant basées sur les secondes données ultrasonores correspondant aux deux volumes d'échantillon, dans lequel l'unité de traitement (130) est configurée pour former des informations supplémentaires sur la base des informations de flux sanguin, dans lequel les informations de flux sanguin comprennent des informations de vitesse de flux sanguin, des informations de débit sanguin et des informations de distribution de vitesse de flux sanguin, et les informations supplémentaires comprennent des informations supplémentaires correspondant à un premier volume d'échantillon inclus dans les deux volumes d'échantillon et des informations supplémentaires correspondant à un second volume d'échantillon inclus dans les deux volumes d'échantillon,

dans lequel l'unité de traitement (130) est configurée pour former une carte de couleurs correspondant à chacun du premier volume d'échantillon et du second volume d'échantillon en cartographiant une pluralité de vitesses de flux sanguins correspondant aux informations de flux sanguin actuelles en tant qu'informations supplémentaires, former une image couleur à spectre Doppler correspondant à chacun du premier volume d'échantillon et du second volume d'échantillon en appliquant les couleurs correspondant à la pluralité de vitesses de flux sanguin à des pixels d'une image à spectre Doppler en tant qu'informations supplémentaires, et former une image couleur de la vitesse de flux sanguin correspondant à chacun du premier volume d'échantillon et du second volume d'échantillon en cartographiant les vitesses de flux sanguin correspondant aux informations de flux sanguin actuelles en tant qu'informations supplémentaires, et

l'image couleur de vitesse de flux sanguin est affichée sur les deux volumes d'échantillons,

dans lequel l'unité de traitement (130) est en outre configurée pour former une image de distribution de vitesse de flux sanguin destinée à représenter la distribution de vitesse de flux sanguin correspondant à la largeur du spectre Doppler en tant qu'informations supplémentaires.

2. Système à ultrasons (100) selon la revendication 1,

dans lequel l'unité de traitement (130) est configurée pour appliquer une transparence à au moins l'une de la carte en couleurs, de l'image couleur du spectre Doppler et de l'image couleur de la vitesse de flux sanguin en tant qu'informations supplémentaires basées sur les informations de flux sanguin.

3. Procédé de fourniture d'informations supplémentaires, comprenant :

a) l'acquisition de premières données ultrasonores correspondant à un corps vivant ;
b) la formation d'une image en mode luminosité basée sur les premières données ultrasonores ;
c) la réception des informations d'entrée pour régler deux volumes d'échantillon sur l'image en mode luminosité ;
d) le réglage des deux volumes d'échantillons sur l'image en mode luminosité basée sur les informations d'entrée ;
e) l'acquisition de secondes données ultrasonores correspondant aux deux volumes d'échantillons ;
f) la formation d'informations de flux sanguin correspondant au flux sanguin dans le corps vivant basées sur les secondes données ultrasonores dans lequel les informations de flux sanguin comprennent des informations de vitesse de flux sanguin, des informations de débit sanguin et des informations de distribution de vitesse de flux sanguin, et les informations supplémentaires comprennent des informations supplémentaires correspondant à un premier volume d'échantillon inclus dans les deux volumes d'échantillon et des informations supplémentaires correspondant à un second volume d'échantillon inclus dans les deux volumes d'échantillon ; et
g) la formation d'informations supplémentaires correspondant à un premier volume d'échantillon inclus dans les deux volumes d'échantillon et d'informations supplémentaires correspondant à un second volume d'échantillon inclus dans les deux volumes d'échantillon,

dans lequel l'étape g) comprend :

la formation d'une carte de couleurs correspondant à chacun du premier volume d'échantillon et du second volume d'échantillon en cartographiant une pluralité de vitesses de flux sanguins correspondant aux informations de flux sanguin actuelles en tant qu'informations supplémentaires ;
la formation d'une image couleur à spectre Doppler correspondant à chacun du premier volume d'échantillon et du second volume d'échantillon en appliquant les couleurs correspondant à la pluralité de vitesses de flux sanguin à des pixels d'une image à spectre Doppler en tant qu'informations supplémentaires ;
la formation d'une image couleur de la vitesse de flux sanguin correspondant à chacun du premier volume d'échantillon et du second volume d'échantillon en cartographiant les vitesses de flux sanguin correspondant aux informations de flux sanguin actuelles en tant qu'informations supplémentaires, et l'image couleur de vitesse de flux sanguin est affichée sur les deux volumes d'échantillons ;
la formation d'une image de distribution de vitesse de flux sanguin destinée à représenter la distribution de vitesse de flux sanguin correspondant à la largeur du spectre Doppler en tant qu'informations supplémentaires.

4. Procédé selon la revendication 3, dans lequel l'étape g) comprend en outre :
l'application d'une transparence à au moins l'une de la carte en couleurs, de l'image couleur du spectre Doppler et de l'image couleur de la vitesse de flux sanguin en tant qu'informations supplémentaires basées sur les informations de flux sanguin.

FIG. 1

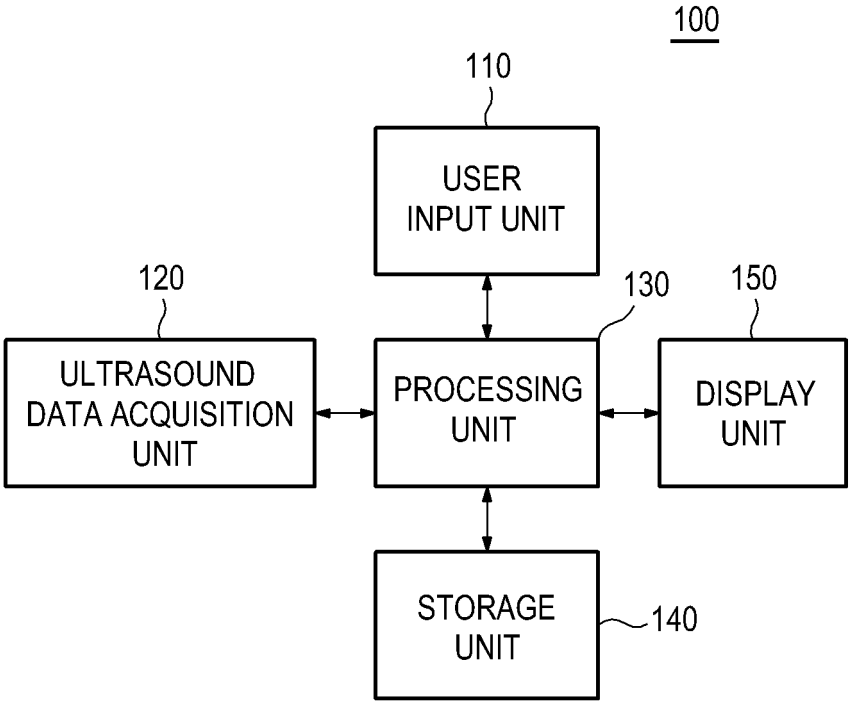

100
110
USER INPUT UNIT
120
130
150
ULTRASOUND DATA ACQUISITION UNIT
PROCESSING UNIT
DISPLAY UNIT
STORAGE UNIT
140

FIG. 2

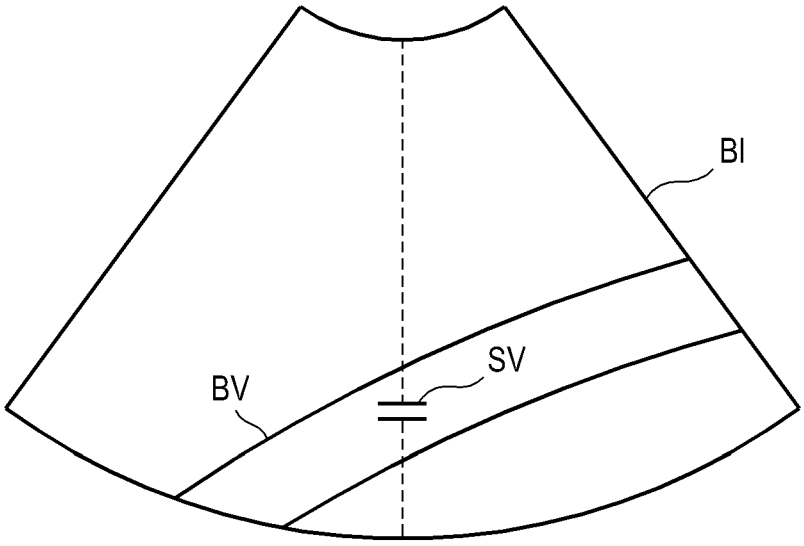

BI
SV
BV

FIG. 3

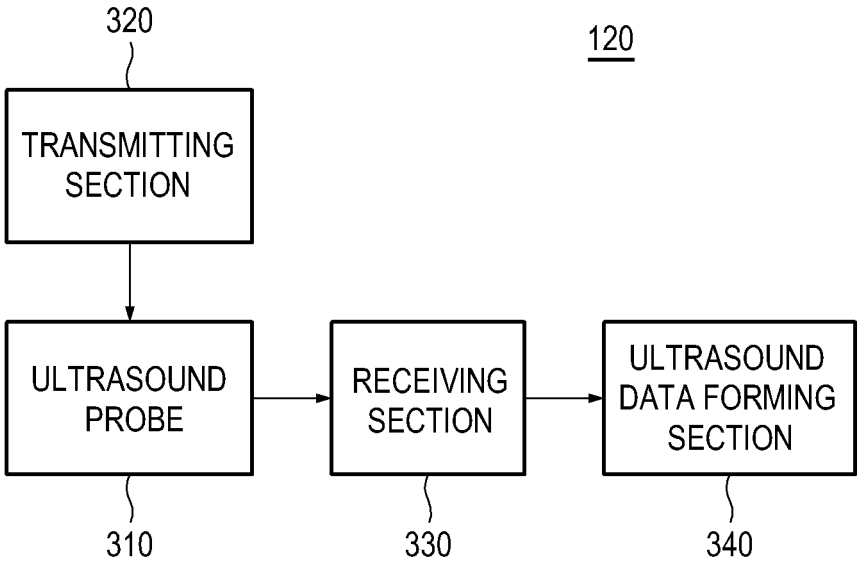

320
120
TRANSMITTING SECTION
ULTRASOUND PROBE
RECEIVING SECTION
ULTRASOUND DATA FORMING SECTION
310
330
340

FIG. 4

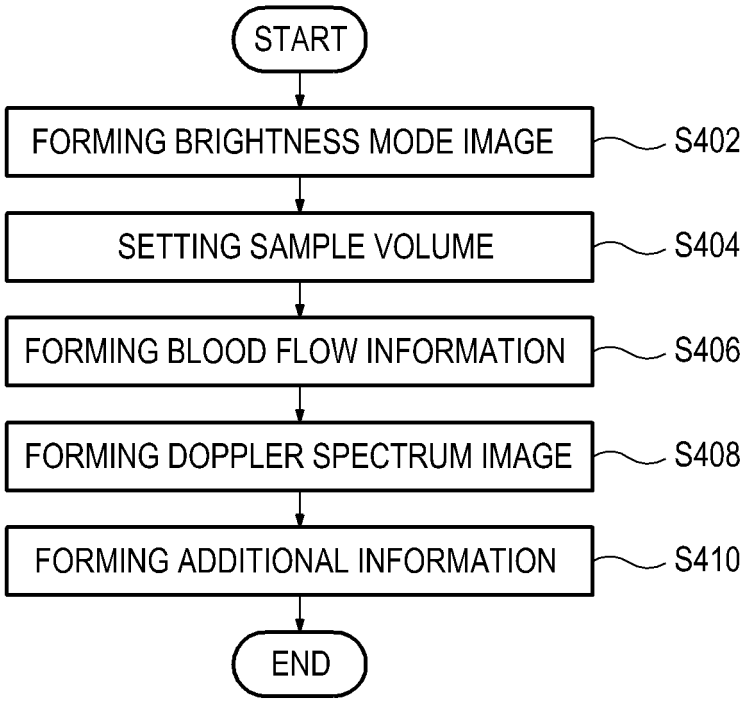

START
FORMING BRIGHTNESS MODE IMAGE
S402
SETTING SAMPLE VOLUME
S404
FORMING BLOOD FLOW INFORMATION
S406
FORMING DOPPLER SPECTRUM IMAGE
S408
FORMING ADDITIONAL INFORMATION
S410
END

FIG. 5

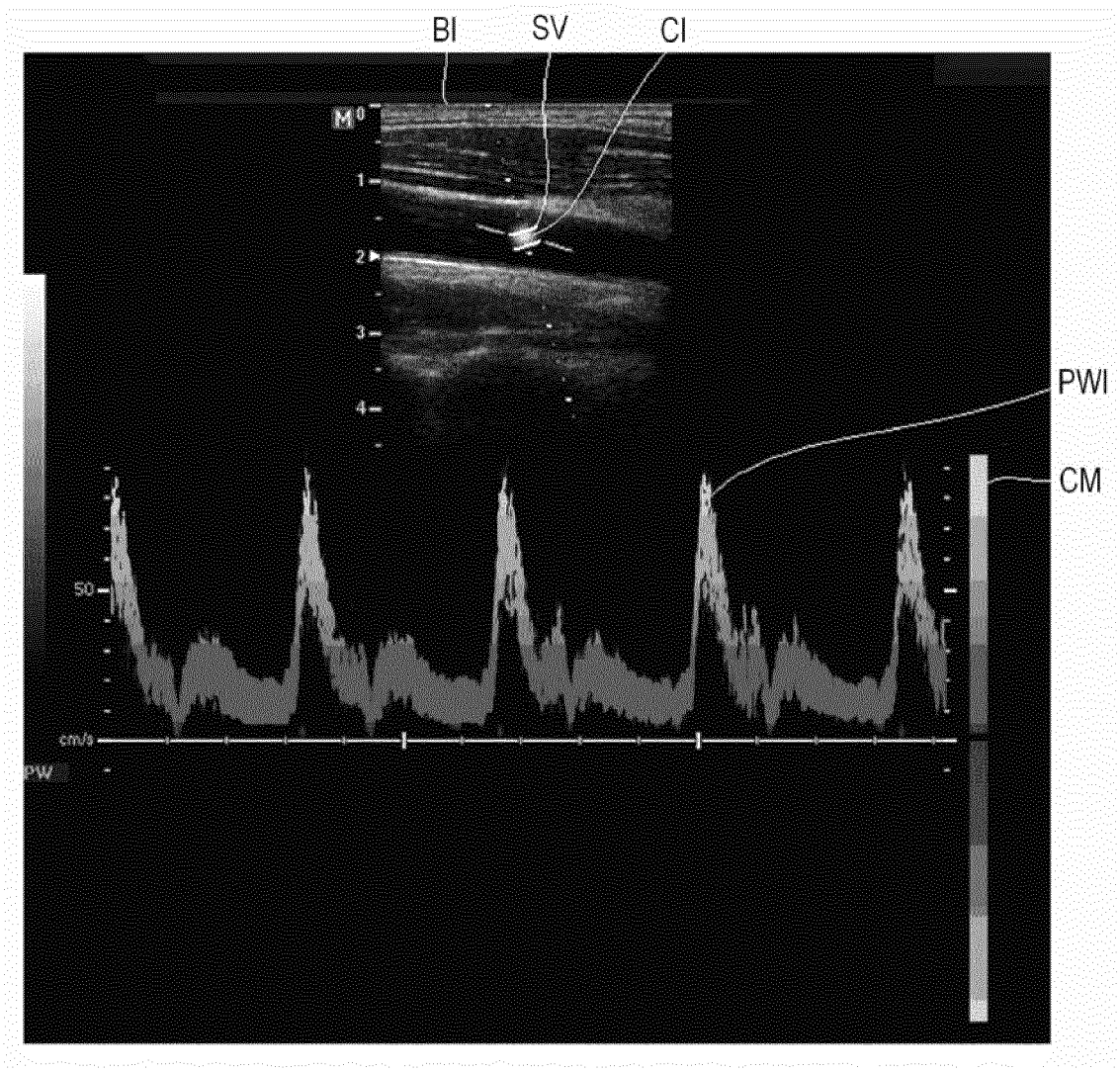


FIG. 6

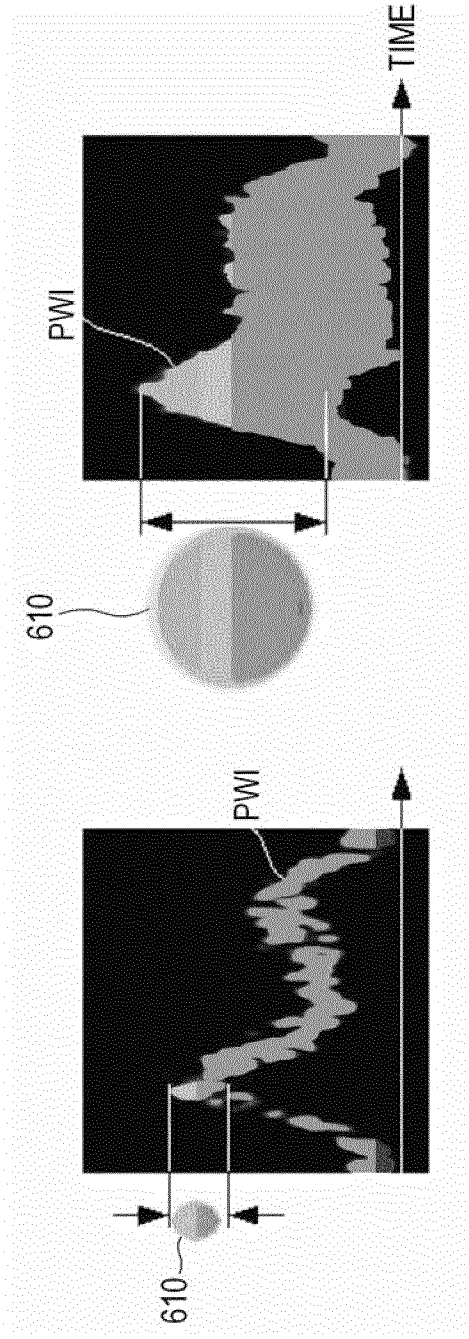
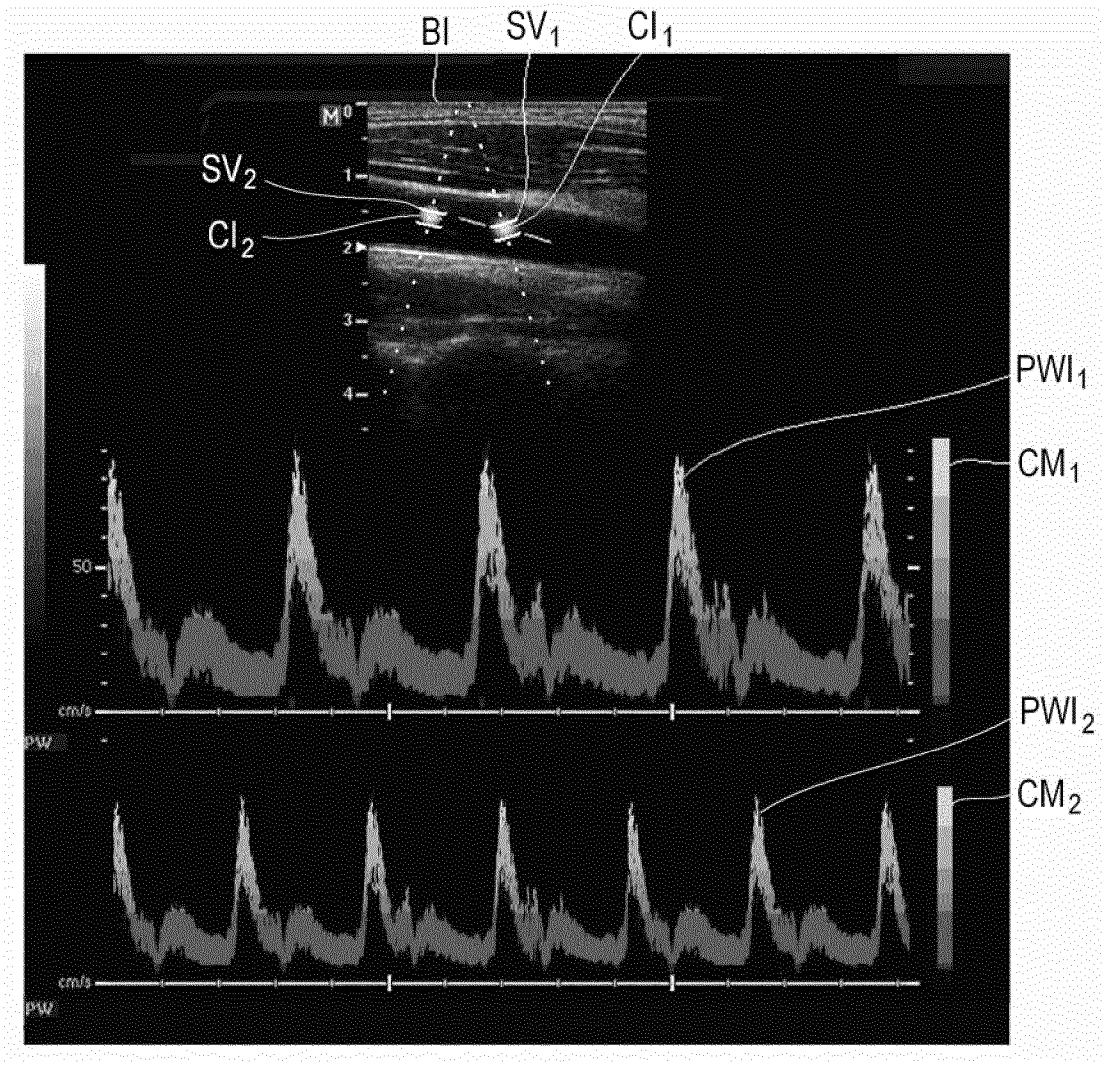


FIG. 7



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- KR 1020100123899 **[0001]**
- EP 1977694 A **[0006]**
- US 5709211 A **[0007]**
- US 6077226 A **[0008]**
- US 20060241458 A1 **[0009]**

专利名称(译)	提供有关超声系统中血流随时间变化的其他信息		
公开(公告)号	EP2462872B1	公开(公告)日	2019-09-18
申请号	EP2011191707	申请日	2011-12-02
[标]申请(专利权)人(译)	三星麦迪森株式会社		
申请(专利权)人(译)	三星MEDISON CO.，LTD.		
当前申请(专利权)人(译)	三星MEDISON CO.，LTD.		
[标]发明人	KIM SUNG HEE LEE SUK JIN		
发明人	KIM, SUNG HEE LEE, SUK JIN		
IPC分类号	A61B8/06		
代理机构(译)	SCHMID，WOLFGANG		
优先权	1020100123899 2010-12-07 KR		
其他公开文献	EP2462872A1		
外部链接	Espacenet		

摘要(译)

提供了用于提供附加信息的实施例。在一个实施例中，超声系统（100）包括：超声数据获取单元（120），被配置为获取对应于活体的第一超声数据和第二超声数据；以及处理单元（130），被配置为基于所述第一超声数据形成亮度模式图像，在所述亮度模式图像上设置至少一个样本量，并基于所述第二超声信号形成与生物体内的血流相对应的血流信息。与所述至少一个样本量相对应的超声数据，所述处理单元还被配置为基于所述血流信息形成与血流随时间的变化相对应的附加信息。

FIG. 1

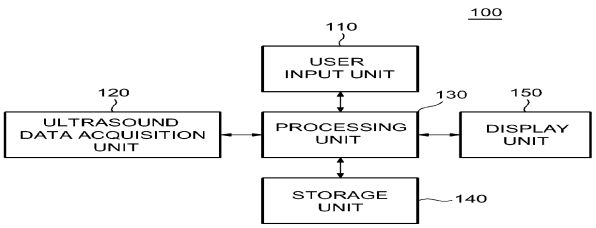

FIG. 2