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(54) **SYSTEM AND METHOD TO ILLUSTRATE ULTRASOUND DATA AT INDEPENDENT DISPLAYS**

(75) Inventor: **Menachem Halmann**, Wauwatosa, WI (US)

(73) Assignee: **GENERAL ELECTRIC COMPANY**, Schenectady, NY (US)

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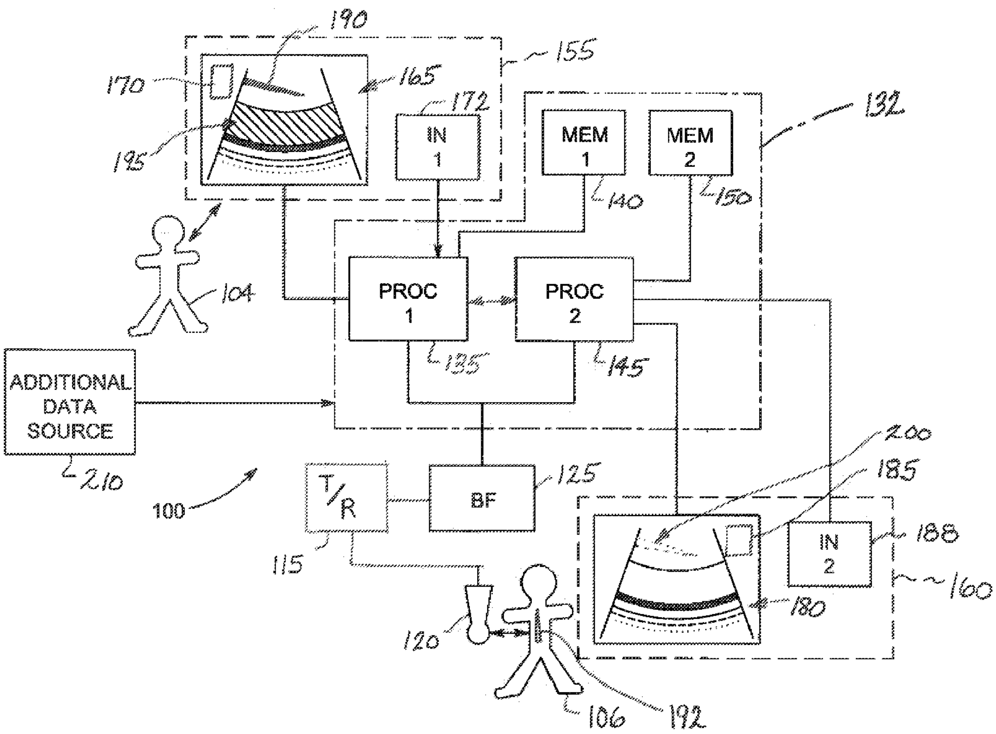
(57) **ABSTRACT**

An ultrasound imaging system is provided that comprises a beamformer, a first processor, and a second processor. The beamformer receives an ultrasound image data acquired by a transducer probe. The first processor processes the ultrasound image data communicated from the beamformer so as to create a first illustration at a first interface to show to a user of the ultrasound imaging system. The second processor processes the ultrasound image data communicated from the beamformer so as to create a second illustration at a second interface to show to a patient of the ultrasound imaging system. The first processor performs different processing steps compared to the second processor such that the first illustration at the first interface is different than the second illustration at the second interface.



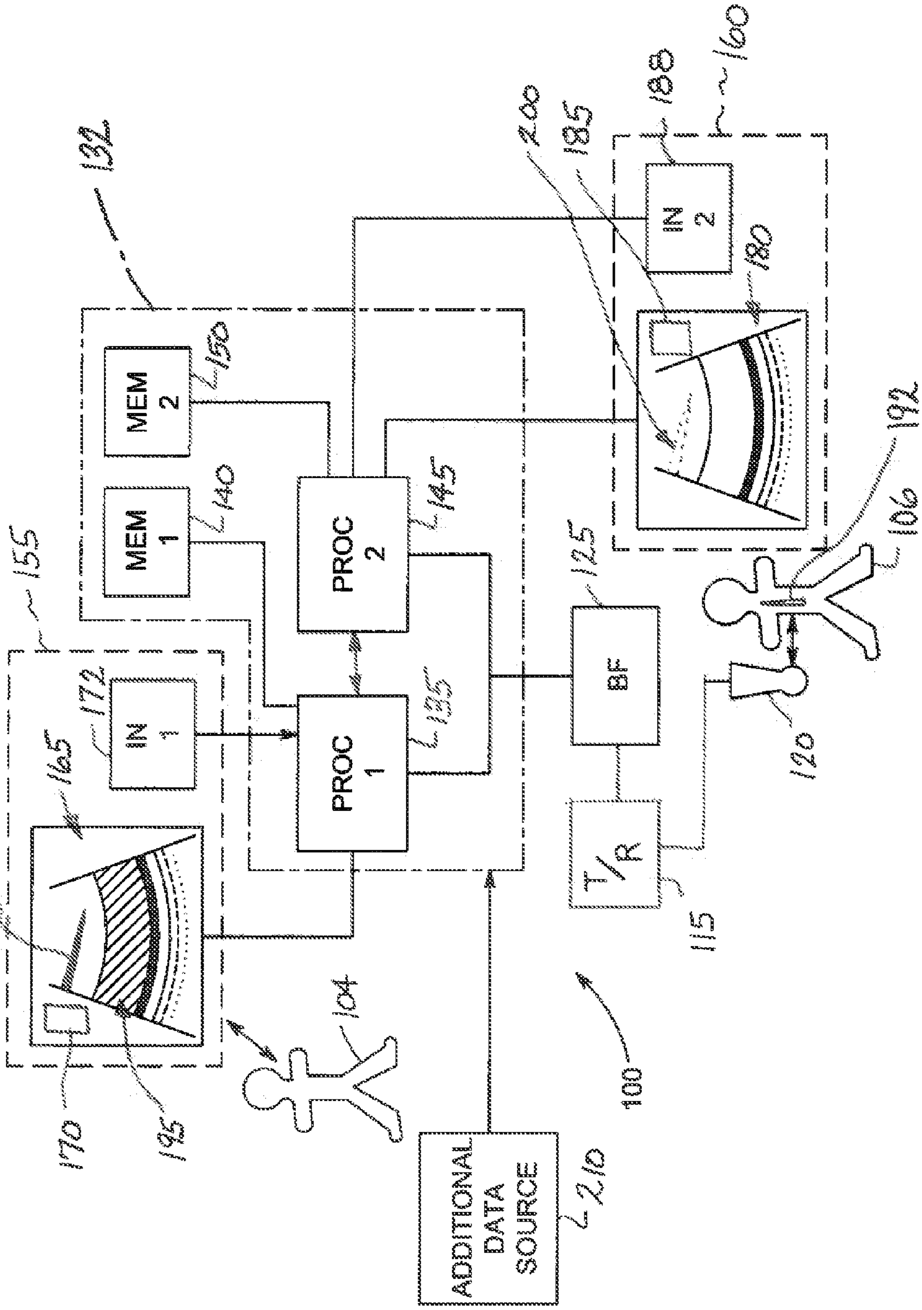

PROC 1
PROC 2
MEM 1
MEM 2
IN 1
IN 2
BF
T/R
ADDITIONAL DATA SOURCE
100
104
106
115
120
125
132
135
140
145
150
155
160
165
170
172
180
185
188
190
192
195
200
210

FIG. 1

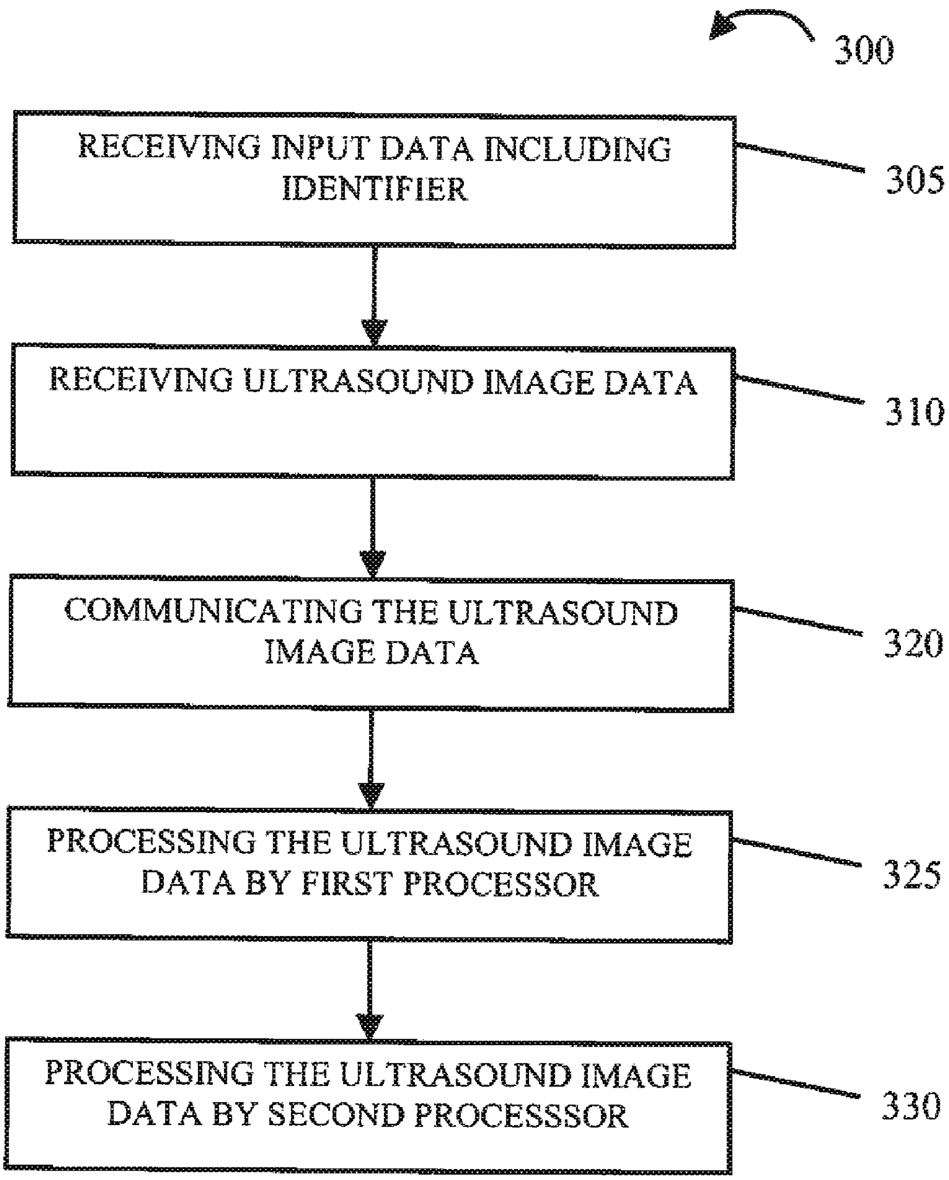

300
RECEIVING INPUT DATA INCLUDING IDENTIFIER
305
RECEIVING ULTRASOUND IMAGE DATA
310
COMMUNICATING THE ULTRASOUND IMAGE DATA
320
PROCESSING THE ULTRASOUND IMAGE DATA BY FIRST PROCESSOR
325
PROCESSING THE ULTRASOUND IMAGE DATA BY SECOND PROCESSSOR
330

FIG. 2

SYSTEM AND METHOD TO ILLUSTRATE ULTRASOUND DATA AT INDEPENDENT DISPLAYS

BACKGROUND

[0001] This invention generally relates to a method of and system for displaying ultrasound data, and more particularly to a system and method of illustrating ultrasound data on multiple visual displays.

[0002] Ultrasound imaging is a medical imaging technique for imaging organs and soft tissues in a human body. Ultrasound imaging uses real time, non-invasive high frequency sound waves to produce a two-dimensional (2D) image. Although, ultrasound imaging provides less anatomical information compared to CT or MRI, ultrasound imaging has several advantages in that patients are not exposed to radiation, studies of moving structures may be provided in real-time, the image scan is quickly performed and is inexpensive.

[0003] Conventional ultrasound imaging systems are known to include a dedicated monitor for displaying some combination of functional data (e.g., alphanumeric, physiological, real-time anatomical image data) associated with imaging during a medical procedure. A drawback of conventional ultrasound imaging systems is that certain functional data is desired for a physician or clinician to perform the medical procedure but may not be desired for display to a patient undergoing the medical procedure.

[0004] Hence there exists a need to provide a method of and system for illustrating graphic images that is readily interchangeable for a respective clinician or medical procedure.

BRIEF DESCRIPTION

[0005] The above-mentioned shortcomings, disadvantages and problems are addressed by the embodiments described herein in the following description of a method and system of illustrating ultrasound image data between a physician or clinician versus that shown to the patient.

[0006] In one embodiment of the subject matter described herein, an ultrasound imaging system is provided. The system comprises a beamformer, a first processor, and a second processor. The beamformer receives an ultrasound image data acquired by a transducer probe. The first processor processes the ultrasound image data communicated from the beamformer so as to create a first illustration at a first interface to show to a user of the ultrasound imaging system. The second processor processes the ultrasound image data communicated from the beamformer so as to create a second illustration at a second interface to show to a patient of the ultrasound imaging system. The first processor performs different processing steps compared to the second processor such that the first illustration at the first interface is different than the second illustration at the second interface.

[0007] In another embodiment of the subject matter described herein, a method is provided, comprising the acts of receiving an ultrasound image data acquired by a transducer probe of an ultrasound imaging system; communicating the ultrasound image data to both a first processor and a second processor; processing the ultrasound image data by the first processor so as to create a first illustration at a first interface to show to a user of the ultrasound imaging system; and processing the ultrasound image data by the second processor so as to create a second illustration at a second interface to show to a patient of the ultrasound imaging system. The ultrasound image data is acquired by a beamformer of the ultrasound imaging system, and the first processor performs different processing steps compared to the second processor such that the first illustration at the first interface is different than the second illustration at the second interface.

[0008] In yet another embodiment of the subject matter described herein, an ultrasound imaging system is provided. The system comprises a beamformer to receive an ultrasound image data acquired by a transducer probe, a first processor to process the ultrasound image data communicated from the beamformer so as to create a first illustration at a first interface to show to a user of the ultrasound imaging system, and a second processor to process the ultrasound image data communicated from the beamformer so as to create a second illustration at a second interface to show to a patient of the ultrasound imaging system. The first processor performs different processing steps compared to the second processor such that the first illustration at the first interface is different than the second illustration at the second interface, and processing by the first processor includes increasing a contrast of image data illustrating a needle inserted into the patient, and wherein the processing by the second processor does not perform processing to increase the contrast of image data illustrating the needle in the creating the second illustration to show the patient.

[0009] Systems and methods of varying scope are described herein. In addition to the aspects and advantages described in this summary, further aspects and advantages will become apparent by reference to the drawings and with reference to the detailed description that follows.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] FIG. **1** shows a schematic diagram of an embodiment of a system in accordance to the subject matter described herein.

[0011] FIG. **2** shows a schematic diagram of an embodiment of a method of operating the system of FIG. **1** in accordance to the subject matter described herein.

DETAILED DESCRIPTION

[0012] In the following detailed description, reference is made to the accompanying drawings that form a part hereof, and in which is shown by way of illustration specific embodiments, which may be practiced. These embodiments are described in sufficient detail to enable those skilled in the art to practice the embodiments, and it is to be understood that other embodiments may be utilized and that logical, mechanical, electrical and other changes may be made without departing from the scope of the embodiments. The following detailed description is, therefore, not to be taken in a limiting sense.

[0013] In this document, the terms "a" or "an" are used, to include one or more than one. In this document, the term "or" is used to refer to a nonexclusive or, unless otherwise indicated.

[0014] FIG. **1** illustrates an embodiment of an ultrasound imaging system **100** having a technical effect to simultaneously provide separate displays of general real-time, acquired ultrasound image data to the physician **104** and the imaged subject or patient **106**, so as to optimally address their specific needs, in accordance to the subject matter described herein.

[0015] One embodiment of the ultrasound imaging system **100** is generally operable to acquire real-time ultrasound imaging data of the patient **106**. Generally, the ultrasound imaging system **100** can include a transmitter/receiver **115** that drives an array of elements, for example, piezoelectric crystals, within a transducer, transducer probe or probe **120** to emit pulsed ultrasonic signals into a body or volume of an imaged subject **122**. A variety probes **120** and geometries transmitting the ultrasound signals from the probe may be used. The ultrasonic signals are back-scattered from anatomical structures in the patient **106**, for example, blood vessels or muscular tissue, to produce echoes that return to the elements of the probe **120** and received at the transmitter/receiver **115**. The transmitter/receiver **115** communicates detection of the back-scattered ultrasound signals to the beamformer **125**. The beamformer **125** generally performs beamforming including translating the echo data detected by the elements of the transducer **120** into ultrasound detection signal (e.g., RF). The beamformer **125** provides the ultrasound detection signal to a controller **130**.

[0016] An embodiment of the controller **130** can generally include a first processor **135** in communication with a first memory **140**, and a second processor **145** in communication with a second memory **150**, that both in combination are operable to process and translate the ultrasound detection signal (e.g. RF signal or IQ data pairs) into a general real-time ultrasound image data for illustration. Each of the processors **135**, **145** can be in communication to execute computer-readable program instructions stored in the memory **140** and **150**, respectively, of the controller **130** to perform translation of the ultrasound detection signal into an ultrasound image data using different processing steps as according to the computer programmable instructions in the memory **140**, **150** for execution by the processors **135**, **145**, respectively. Each of the processors **135**, **145** can be instructed to perform one or more processing operations according to multiple selectable ultrasound modalities on the acquired ultrasound detection information. Acquired ultrasound detection information may be processed in real-time during a scanning session as the echo signals are received. Additionally or alternatively, the ultrasound detection information may be stored temporarily in either memory **140** and **150** during a scanning session and processed in less than real-time in a live or off-line operation. The acquired ultrasound detection data or information or signal not scheduled to for display can immediately be stored in either memory **140** and **150**. The memory **140** or memory **150** may comprise any known data storage medium, for example, a permanent storage medium, removable storage medium, and the like.

[0017] The first processor **135** can be in wired or wireless communication with a first user interface **155** for visualization and interaction with the clinician or user **104**, and provide certain control operations and be configured to receive inputs from the operator or user **104** of the system **100**. In a like manner, the second processor **145** can be in wired or wireless communication with a second user interface **160** for illustration to the patient **106**.

[0018] An embodiment of the first interface **155** can include one or more monitors that present a graphic display **165** of patient information, including diagnostic ultrasound images to the user **104** for review, measurement, diagnosis and analysis. At least a portion of the interface **155** can include a user selectable element **170** with touch sensitive portion or touch sensitive technology to receive input from the user **104**, such as measurements or patient data. The interface **155** may automatically display the generated ultrasound image data in various formats as output from the processor **135**, for example, planes from two-dimensional (2D) and/or three-dimensional (3D) ultrasound data either in real-time or from stored 2D or 3D data-sets of ultrasound detection or image data in the memory **140**. The processing of the ultrasound detection or image data by the processor **135** can be based in part on user inputs, for example, user selections received at the user interface **155**. The first interface **155** may further include input devices **172** such as a keyboard, a touch-screen, a keypad, a joystick, dials, or other conventional input device or combination thereof operable to receive data from the user or clinician for communication to the first processor **135** or memory **140**.

[0019] An embodiment of the second interface **160** can include one or more monitors that present a graphic display **180** of diagnostic ultrasound images to the patient **106**. At least a portion of the interface **160** can include a patient selectable element **185** with touch sensitive portion or touch sensitive technology to receive input from the patient **106**, such as desire to download real-time ultrasound image data to a removable storage medium (e.g., CD, DVD, memory stick, etc.), or to automatically download the display **180** for communication in an email or to post to a social network website. The second interface **160** may automatically display the generated ultrasound image data in various formats as generated by the processor **145**, for example, planes from two-dimensional (2D) and/or three-dimensional (3D) ultrasound data either in real-time or from stored 2D or 3D data-sets of ultrasound detection or image data in the memory **140**. The second interface **160** may further include input devices **188** such as a keyboard, a touch-screen, a keypad, a joystick, dials, or other conventional input device or combination thereof operable to receive data from the patient **106** for communication to the processor **145** or memory **150**.

[0020] In general real-time, the processor **135** can be configured to process the acquired ultrasound image data from the beamformer **125** to create a first display **165** to the user **104** simultaneously in general real-time with the execution of the processor **145** to process the acquired ultrasound image data from the beamformer **125** to create a second display **180** to the patient **106**. Yet, the processor **135** can be configured to process the acquired ultrasound image data from the beamformer **125** with different processing steps or to include different textual information, review, measurement, diagnosis and analysis than compared to the processing of the ultrasound image data by the processor **145**. For example, the processor **135** may process the ultrasound image data in combination with illustration of graphically illustrated user tools, or prompts to or requests by the user at the interface **155**. Examples of a user tool can include performing compounding or cross beam processing of the ultrasound image data in a manner to create an illustration **190** of a highlight of an invasive device such as a needle or probe **192** (e.g., needle or probe that can administer local/regional anesthesia drug, biopsy extraction tool) in contrast to illustration of tissue. Another example of a user tool can include an illustration of a measurement on a developing fetus in the interface **155** in contrast to tissue. Yet another example of user tool can be instructions to the processor **135** to create an illustration **195** of a highlight (see cross-hatch in graphic display **165**) of a detected tumor in contrast to healthy tissue. These user tools described herein are known in the art and not described in detail.

[0021] The processor **145** can be configured to process the ultrasound image data in a different manner without including illustration of user tools or prompts to or requests by the user, in a manner that optimally addresses the specific needs of the patient **106** separate and independent of the needs of the user **104** in regard to user tools described above. For example, the processor **145** can be configured to process the acquired ultrasound image data from the beamformer without combination with user tools as described above. Thereby, the processor **145** communicates to create illustration of the ultrasound image at the interface **160** without showing the illustration **190** of the highlight of the invasive tool (or showing a standard illustration **200** of the invasive tool using standing image processing employed on the surrounding tissue, shown in dashed line in graphic display **180**) or without showing the illustration **195** of the detected tumor. Thereby, the patient does not view these above-described user tools while still able to view illustration of the ultrasound image on the interface **160** in a desired manner. The processor **145** can also be configured to receive a patient instruction from user element **185** at the second interface **160** to automatically download and communicate the display **180** in an email or to share on a social network website.

[0022] Each of the user selectable elements **170** or **185** can be operable to receive input of a type of image processing or a desired setup of the type of illustration on each interface **155**, **160** without application on processing image data for the other interface **160**, **155**, respectively.

[0023] The interfaces **155**, **160** can also be connected in communication to receive input data or image data from another source **210**. for combination with the illustration of ultrasound image data at the interfaces **155**, **160**. The additional data source **210** can include for example a Computed Tomography (CT) imaging system, a magnetic resonance imaging (MRI) imaging system, a electrocardiogram (ECG) system, a Positron Emission Transmission/Computed Tomography (PET/CT) imaging system, a second ultrasound imaging systems, a real-time fluoroscopic imaging system, an endoscopic imaging system, etc. The additional data sources **210** can be operable to generate a signal to create a visual or graphic illustration in combination with the ultrasound image data on the first display for viewing by the clinician **104** or on the second display for viewing by the patient **106**. The additional data sources **210** can also include a workstation operable to receive and/or store one or more pre-recorded or real-time visual illustrations generated by the additional data source and stored for later access by the system **100**. The additional data source **210** can be connected to communicate the visual illustration directly or indirectly to the first display or second display of the system **100**. The visual illustration from the additional data source **210** can include, but is not limited to, a representation of a physiological waveform, an anatomical image, physiological functional image (e.g., ultrasound images, transesophagial ultrasound acquired image, transthoracic ultrasound acquired image, intravascular ultrasound (IVUS) acquired image, alphanumeric data or messages representative of measured data, a software interface or window, and other conventional medical acquired data, and/or combinations thereof) acquired in real-time, pre-recorded, continuous, periodic, or selected manner.

[0024] Embodiments of the controller **130** can be a stand-alone computer (e.g., desktop or laptop, blackberry, etc.) or can include various arrangements or combinations of various types of processors (e.g., microprocessor, programmable logic controller, etc.) or combinations thereof in communication with various types of memory or computer readable mediums (e.g., memory stick, hard-drive, disk, CD, DVD, or other conventional storage medium or combination thereof).

[0025] The interfaces **155** and **160** can also include output devices such as LCD or LED monitors, hand-held display, CRT projector, personal data assistant (PDA), LEDs lights, touch-screens, alarm devices, etc. Examples of touch-screen technology that can be provided on the interface **155**, **160** can include but is not limited to touch sensitive elements such as capacitive sensors, membrane switches, and infrared detectors. Examples of touch-screen technology that can be provided on the interfaces **155** and **160** can include but is not limited to touch sensitive elements such as capacitive sensors, membrane switches, and infrared detectors.

[0026] The interfaces **155**, **160** may automatically display the generated ultrasound image data in various formats as communicated from different processing steps from the processors **135**, **145** respectively. For example, the formats can include planes from two-dimensional (2D) and/or three-dimensional (3D) ultrasound data either in real-time or from stored 2D or 3D data-sets of ultrasound detection or image data in the memory **140**. The processing of the ultrasound detection or image data by the processor **135**, **145** can be based in part on inputs at the interfaces **155**, **160**, respectively, for example, user selections received at the user interface **155**.

[0027] The interface **155**, **160** may further include input devices **172**, **188** respectively operable to receive data from the user or clinician or patient **106**, respectively for communication to the processor **135**, **145** or memory **140**, **150**, respectively. An embodiment of the interface **155** can include the first input device **172** in communication with the first processor **135** and the second input device **188** in communication with the second processor **145**. The input devices **172**, **188** can include a keyboard, a touch-screen, a keypad, a joystick, dials, or other conventional input devices or combination thereof operable to receive data from the user or clinician **104** or the patient **106**.

[0028] It should be understood that the number of interfaces **155**, **160**, and display fields **165**, **180** and input devices **172**, **188** associated therewith can vary, as well as their location e.g., a cart, a wall, a ceiling, etc. or combinations thereof and is not limiting.

[0029] Having described a general construction of the embodiment of the ultrasound imaging system **100**, the following is a general description of a method of operation of the ultrasound imaging system **100** described above. Although the method **300** is described in accordance to the following acts, it should be understood that the sequence of the acts can vary. Also, it should be understood that the following description of acts is not limiting, and that one or more of the described acts may not be needed. It should be understood that each of the described acts can be representative of computer readable program instructions stored in the memory **140**, **150** for execution by the processors **135** or **145**, respectively.

[0030] Assume initially the user or clinician is operable to program the controller **130** via the input **172** at interface **155** with multiple preprogrammed arrangements of the first visual illustration of the acquired ultrasound image data in the first display simultaneous with the second visual illustration of the acquired ultrasound image data in the second display in accordance to at least a step of a medical procedure. Each of the predetermined arrangements of display fields/illustrations **165**, **180** can be stored in the memory **140**, **150** with an identifier either assigned by the user or operator **104** for access by the processors **135**, **145**. In one example, one or more of the multiple pre-programmed arrangements of display fields/illustrations **165**, **180** can be stored with an identifier of a certain medical procedure. In yet another example, one or more of the multiple pre-programmed arrangements of display fields/illustrations **165**, **180** can be stored with an identifier indicative of the user or clinician **104** to execute the medical procedure.

[0031] Act **305** includes the first interface receiving an input data including an identifier associated with one of a plurality of arrangements, wherein each arrangement includes a set of instructions to the first and second processors **135**, **145** to perform the different processing steps to create the first and second display fields/illustrations **165**, **180**, respectively. The identifier can be indicative of a step of a medical procedure, or of a physician name.

[0032] Act **310** includes receiving an ultrasound image data acquired by a transducer probe of an ultrasound imaging system. Act **320** includes communicating the ultrasound image data to both a first processor and a second processor. Act **325** includes processing the ultrasound image data by the first processor **135** so as to create the first display field or illustration **165** at the first interface **155** to show to the user or operator **104** (e.g., physician, clinician) of the ultrasound imaging system **100**. Act **330** includes processing the ultrasound image data by the second processor **145** so as to create the second display field or illustration **180** at a second interface **160** to show to the patient **106** of the ultrasound imaging system **100**. The first and second display fields or illustrations **165**, **180** can both or either include generally real-time acquired ultrasound image data communicated from the beamformer **125**. The first processor **135** can performs different processing steps compared to the second processor **145** such that the first display field or illustration **165** at the first interface **155** is different than the second illustration **180** at the second interface **160**, though each simultaneously display the same ultrasound image data acquired by the beamformer **125**.

[0033] In one example, the processing by the first processor **135** includes increasing a contrast of image data **190** illustrating a needle or probe **192** inserted into the patient **106**, and wherein the processing by the second processor **145** does not perform processing to increase a contrast of image data **200** illustrating the needle or probe **192** in the creating the second display field or illustration **180** to show the patient **106**. In another example, the first ultrasound image data in the first display field or illustration **165** at the first interface **155** to the user or clinician **104** may be better illustrated in color, while the second ultrasound image data in the second display field or illustration **180** at the second interface **160** may be more suitable for illustration to the patient **106** in black and white. In yet another example, the visual illustration for the first display field/illustration **165** may be better illustrated at very higher refresh rate as performed by the first processor **135** compared to the visual illustration for the second display field/illustration **180** or the second display field/illustration **180** may be sufficiently illustrated at lower refresh rate as performed by the second processor **135** for illustration to the patient **106**.

[0034] A technical effect of the described ultrasound imaging system **100** and method **300** provides a first illustration of real-time ultrasound imaging data to a user **104** while simultaneously providing a second illustration of real-time ultrasound imaging data to a patient **106** during a step of a medical procedure employing the ultrasound imaging system **100**. One embodiment of the ultrasound imaging system **100** can be generally operable to acquire real-time ultrasound imaging data of the patient **106**. The described ultrasound imaging system **100** comprises the beamformer to receive the ultrasound image data acquired by the transducer probe; the first processor to process the ultrasound image data communicated from the beamformer so as to create the first illustration at the first interface to show to the user of the ultrasound imaging system; the second processor to process the ultrasound image data communicated from the beamformer **125** so as to create the second illustration at the second interface to show to the patient of the ultrasound imaging system. The first processor **135** performs different processing steps compared to the second processor **145** such that the first display field/illustration **165** at the first interface **155** is different than the second display field/illustration **180** at the second interface **160**. The method **300** describes processing by the first processor **135** to increase a contrast or otherwise enhance visualization of acquired ultrasound image data **190** illustrating a needle or probe **192** inserted into the patient **106**, and wherein the processing by the second processor **145** does not perform processing to increase the contrast or otherwise enhance visualization of image data **200** illustrating the needle or probe **192** in the creating the second display field/illustration **180** to show the patient **106**.

[0035] The first interface **155** is operable to receive an input data including an identifier associated with one of a plurality of arrangements, wherein each arrangement includes a set of instructions to the first and second processors to perform the different processing steps to create the first and second illustrations. The identifier can be indicative of a step of a medical procedure, or indicative of a physician name.

[0036] In various embodiments of the invention, the method of forming an ultrasound image as described herein or any of its components may be embodied in the form of the processor **135**, **145**. Typical examples of the processor **135**, **145** include a general-purpose computer, a programmed microprocessor, a digital signal processor (DSP), a micro-controller, a peripheral integrated circuit element, and other devices or arrangements of devices, which are capable of implementing the steps that constitute the methods described herein.

[0037] As used herein, the term “processor” may include any computer, processor-based, or microprocessor-based system including systems using microcontrollers, reduced instruction set circuits (RISC), application specific integrated circuits (ASICs), logic circuits, and any other circuit or processor capable of executing the functions described herein. The above examples are exemplary only, and are thus not intended to limit in any way the definition and/or meaning of the term “computer”.

[0038] The processors **135**, **145** execute a set of computer readable instructions (e.g., corresponding to the method **300** described herein) that are stored in one or more memories (also referred to as computer usable medium) **140**, **150**. The memories **140**, **150** may be in the form of a database or a physical memory element present in the processors **135**, **145**. The processor **135**, **145** may also hold data or other information as desired or needed. The processor **135**, **145** can be, for example, but not limited to, an electronic, magnetic, optical, electromagnetic, infrared, or semiconductor system, apparatus, device, or propagation medium. More specific examples of the processor **135**, **145** include, but are not limited to, the following: a random access memory (RAM) a read-only memory (ROM), an erasable programmable read-only memory (EPROM or Flash memory), a Hard Disc Drive (HDD) and a compact disc read-only memory (CDROM).

[0039] The set of computer readable program instructions may include various commands that instruct the processing machine to perform specific operations such as the processes of the various embodiments of the invention. The set of computer readable program instructions may be in the form of a software program. The software may be in various forms such as system software or application software. Further, the software may be in the form of a collection of separate programs, a program module within a larger program or a portion of a program module. The software also may include modular programming in the form of object-oriented programming. The processing of input data by the processing machine may be in response to user commands, or in response to results of previous processing, or in response to a request made by another processing machine.

[0040] In various embodiments of the subject matter describe herein, the method **300** can be implemented in software, hardware, or a combination thereof. The method **300** can be provided by various embodiments of the ultrasound imaging system **100**, for example, can be implemented in software by using standard programming languages such as, for example, C, C++, Java, and the like.

[0041] As used herein, the terms "software" can include any computer program stored in memory for execution by the processors **135**, **145**, including RAM memory, ROM memory, EPROM memory, EEPROM memory, and non-volative RAM (NVRAM) memory. The above memory types are exemplary only, and are thus limiting as to the types of memory usable for storage of the computer program.

[0042] It is to be understood that the above description is intended to be illustrative, and not restrictive. For example, the above-described embodiments (and/or aspects thereof) may be used in combination with each other. In addition, many modifications may be made to adapt a particular situation or material to the teachings of the invention without departing from its scope. While the dimensions, types of materials and coatings described herein are intended to define the parameters of the invention, they are by no means limiting and are exemplary embodiments. Many other embodiments will be apparent to those of skill in the art upon reviewing the above description. The scope of the invention should, therefore, be determined with reference to the appended claims, along with the full scope of equivalents to which such claims are entitled. In the appended claims, the terms "including" and "in which" are used as the plain-English equivalents of the respective terms "comprising" and "wherein." Moreover, in the following claims, the terms "first," "second," and "third," etc. are used merely as labels, and are not intended to impose numerical requirements on their objects. Further, the limitations of the following claims are not written in means-plus-function format and are not intended to be interpreted based on 35 U.S.C. §112, sixth paragraph, unless and until such claim limitations expressly use the phrase "means for" followed by a statement of function void of further structure.

[0043] This written description uses examples to disclose the invention, including the best mode, and also to enable any person skilled in the art to make and use the invention. The patentable scope of the invention is defined by the claims, and may include other examples that occur to those skilled in the art. Such other examples are intended to be within the scope of the claims if they have structural elements that do not differ from the literal language of the claims, or if they include equivalent structural elements with insubstantial differences from the literal languages of the claims.

What is claimed is:

1. An ultrasound imaging system, comprising:

a beamformer to receive an ultrasound image data acquired by a transducer probe;

a first processor to process the ultrasound image data communicated from the beamformer so as to create a first illustration at a first interface to show to a user of the ultrasound imaging system; and

a second processor to process the ultrasound image data communicated from the beamformer so as to create a second illustration at a second interface to show to a patient of the ultrasound imaging system,

wherein the first processor performs different processing steps compared to the second processor such that the first illustration at the first interface is different than the second illustration at the second interface.

2. The system of claim **1**, wherein processing by the first processor includes increasing a contrast of image data illustrating a needle inserted into the patient, and wherein the processing by the second processor does not perform processing to increase the contrast of image data illustrating the needle in the creating the second illustration to show the patient.

3. The system of claim **1**, wherein the first interface is operable to receive an input data including an identifier associated with one of a plurality of arrangements, wherein each arrangement includes a set of instructions to the first and second processors to perform the different processing steps to create the first and second illustrations.

4. The system of claim **3**, wherein the identifier is indicative of a step of a medical procedure.

5. The system of claim **3**, wherein the identifier is indicative of a physician name.

6. The system of claim **1**, wherein at least one of the first and second illustrations includes generally real-time detected ultrasound image data communicated from the beamformer.

7. The system of claim **1**, further comprising a user element on the second interface to receive an instruction from the patient to automatically download and communicate the second illustration to share on a social network.

8. A method comprising the acts of:

receiving an ultrasound image data acquired by a transducer probe of an ultrasound imaging system;

communicating the ultrasound image data to both a first processor and a second processor;

processing the ultrasound image data by the first processor so as to create a first illustration at a first interface to show to a user of the ultrasound imaging system; and

processing the ultrasound image data by the second processor so as to create a second illustration at a second interface to show to a patient of the ultrasound imaging system, wherein the ultrasound image data is acquired by a beamformer of the ultrasound imaging system, and wherein the first processor performs different processing steps compared to the second processor such that the first illustration at the first interface is different than the second illustration at the second interface.

9. The method of claim **8**, wherein processing by the first processor includes increasing a contrast of image data illustrating a needle inserted into the patient, and wherein the processing by the second processor does not perform processing to increase the contrast of image data illustrating the needle in the creating the second illustration to show the patient.

10. The method of claim **8**, wherein the first interface receives an input data including an identifier associated with one of a plurality of arrangements, wherein each arrangement includes a set of instructions to the first and second processors to perform the different processing steps to create the first and second illustrations, respectively.

11. The method of claim **10**, wherein the identifier is indicative of a step of a medical procedure.

12. The method of claim **10**, wherein the identifier is indicative of a physician name.

13. The method of claim **8**, wherein at least one of the first and second illustrations includes generally real-time detected ultrasound image data communicated from the beamformer.

14. The method of claim **8**, further comprising providing a user element on the second interface to receive an instruction from the patient to automatically download and communicate the second illustration to share on a social network.

15. An ultrasound imaging system, comprising:

a beamformer to receive an ultrasound image data acquired by a transducer probe;

a first processor to process the ultrasound image data communicated from the beamformer so as to create a first illustration at a first interface to show to a user of the ultrasound imaging system; and

a second processor to process the ultrasound image data communicated from the beamformer so as to create a second illustration at a second interface to show to a patient of the ultrasound imaging system,

wherein the first processor performs different processing steps compared to the second processor such that the first illustration at the first interface is different than the second illustration at the second interface, and

wherein processing by the first processor includes increasing a contrast of image data illustrating a needle inserted into the patient, and wherein the processing by the second processor does not perform processing to increase the contrast of image data illustrating the needle in the creating the second illustration to show the patient.

16. The ultrasound imaging system, further comprising a user element on the second interface to receive an instruction from the patient to automatically download and communicate the second illustration to share on a social network.

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专利名称(译)	用于在独立显示器处示出超声数据的系统和方法		
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摘要(译)

提供了一种超声成像系统，其包括波束形成器，第一处理器和第二处理器。波束形成器接收由换能器探头获取的超声图像数据。第一处理器处理从波束形成器传送的超声图像数据，以便在第一接口处创建第一图示以向超声成像系统的用户显示。第二处理器处理从波束形成器传送的超声图像数据，以便在第二接口处创建第二图示以向患者显示超声成像系统。与第二处理器相比，第一处理器执行不同的处理步骤，使得第一接口处的第一图示与第二接口处的第二图示不同。