electromechanical subsystem **14** includes the necessary structure to operate and interface with the ultrasound scanner **12**.

[0030] Computer **16** includes the necessary hardware and software to interface with and control the electromechanical subsystem **14**, e.g., a microprocessor, a memory and interface cards. The memory stores software instructions that implement various functions of the ultrasound imaging system **10**.

[0031] Touchscreen **18** may be implemented on a monitor wired to the computer **16** or on a portable display device wirelessly coupled to the computer **16**, or both, and provides complete control over the ultrasound imaging system **10** by enabling the formation of command signals by the computer **16** indicative of desired control changes of the ultrasound imaging process. Touchscreen **18** may be a resistive, capacitive, or other touchscreen that provides an indication to the computer **16** that a user has touched the touchscreen **18**, with his finger, a stylus or other suitable device, and a location of the touch. The location of the touch of the touchscreen **18** is associated with a specific control function by the computer **16**, which control function is displayed at the touched location on the touchscreen **18**, so that the computer **16** performs the associated control function, i.e., by generating command signals to control the electromechanical subsystem **14**.

[0032] An important aspect of the invention is that input for controlling the ultrasound imaging system **10** is not required from hard UI components, for example, buttons, a trackball, function keys and TGC potentiometers and the like, nor from separate soft UI components, such as an EL (electro-luminescent) display. All of the control functions performed by such hard and soft UI components are now represented as virtual controls which are displayed on the touchscreen **18** along with the ultrasound images. The need for a separate keyboard for data entry, as well as the other hard UI components has therefore been eliminated.

[0033] FIG. **2** shows a sample of the layout of virtual controls on the touchscreen **18** during operation of the ultrasound imaging system **10**. The touchscreen **18** displays in the available display area or visual field **20** either the ultrasound images in their entirety or the ultrasound images along with one or more superimposed activation areas **22**, **24**, **26** in a portion of the visual field **20**. Activation areas **22**, **24**, **26** represent the usual controls of the ultrasound imaging system **10** which are implemented as on-screen virtual devices, including such hard UI controls as keys, buttons, trackball, and TGC potentiometers.

[0034] Computer **16** is programmable to allow the user to toggle between a full-screen display of the ultrasound images on the visual field **20** or a display of the ultrasound images and selected activation areas **22**, **24**, **26**, which might depend on the imaging mode. When both ultrasound images and activation areas **22**, **24**, **26** share the visual field **20**, computer **16** may be programmed to present a smaller, unobscured image with the activation areas **22**, **24**, **26** placed to one or more sides of the image, or alternatively to present a full size image with activation areas **22**, **24**, **26** superimposed on top of the image, optionally in a semi-transparent manner. These options may be configured by the user as preferences during system setup. Different imaging modes will result in the presentation of different activation areas **22**, **24**, **26** as well as different labels for the activation areas **22**, **24**, **26**.

[0035] When the ultrasound images are displayed on the visual field **20** of the touchscreen **18** with the superimposed activation areas **22**, **24**, **26**, the ultrasound images are displayed live so that control changes effected by touching the activation areas **22**, **24**, **26** are reflected immediately in the viewed images. Since the activation areas **22**, **24**, **26** are in the same visual field **20** as the images, the user does not have to shift his field of view from the image to separate UI components to effect a change, and vice versa in order to view the effects of the control change. User fatigue is thereby reduced.

[0036] The layout and segmenting of the activation areas **22**, **24**, **26** on the visual field **20** of the touchscreen **18** is designed to minimize interference with the simultaneous display of the ultrasound image and its associated graphics. Segmenting relates to, among other things, the placement of the activation areas **22**, **24**, **26** relative to each other and relative to the displayed ultrasound image, and the placement of further controls or portions of controls (e.g., addition activation areas **32**, **36**, **44** described below) when a particular one of the activation areas **22**, **24** is in use. In particular, activation areas **22**, **24**, **26** appear in a segmented area of the visual field **20** when they are needed or when activated by the user (e.g., through the use of persistent controls which do not disappear). Preferably, the activation areas **22**, **24**, **26** are placed in a segmented area to a side of the image or on top of the image, e.g., using opaque (not semi-transparent) widget rendering. Alternatively, the image may be rendered large enough that it occupies at least a portion of the visual field **20** also occupied by activation areas **22**, **24**, **26**. In that case, activation areas **22**, **24**, **26** may be rendered on top of the image, with optional semi-transparency as previously described. The activation areas **22**, **24**, **26** could be placed on the right side of the visual field **20** for right-handed users and on the left side for left-handed users. Right-handed or left-handed operation is a configurable option that may be selected by the user during system setup. Placement of the activation areas **22**, **24**, **26** on only one side of the visual field **20** reduces the possibility of the user's hands obscuring the image during control changes.

[0037] In one layout, activation areas **22**, **24**, **26** are set in predetermined positions and provided with variable labels and images according to the current imaging mode. The UI may be simplified so that only relevant or most recently used controls appear in the activation areas **22**, **24**, **26**, but all pertinent controls can always be accessed by means of nested menus. The amount of nesting is minimized to reduce the number of required touches to perform any specific control function. The placement of nested menus constitutes further segmenting of the visual field **20** devoted to activation areas.

[0038] Each activation area **22** typically includes a label, mark, shape or small graphic image indicative of its function (e.g., a full word such as GAIN, FOCUS, DEPTH, or an abbreviation such as COMP, or a graphic denoting depth change) and when the user touches the touchscreen **18** at the location of a particular activation area **22**, the computer **16** associates the touch with function and causes the ultrasound imaging system **10** to perform the associated function. The label on an activation area might be a function indicative of the display of a category of functions so that performing the associated function causes a pop-up menu of more specific functions to appear. For example, an activation area can be labeled as "GREYSCALE" and when touched causes additional activation areas to appear such as "DEPTH", "SIZE", etc. A mark can be arranged on activation areas which cause menus to appear, such as an arrow.

[0039] In some instances, it is necessary for the user to touch and sweep across the activation area **22** in order to indicate the exact function to be performed, i.e., a sliding