touch. For example, the activation area **22** labeled GAIN is touched to both increase and decrease the gain and separate activation areas, one for gain increase and another for gain decrease, are not required. To increase gain, the user sweeps his finger one or more times in an upward direction over the activation area **22** labeled GAIN. Each upwardly directed sweep is detected and causes an increase in gain. On the other hand, to reduce the gain, the user sweeps his finger in a downward direction over the GAIN activation area.

[0040] Computer **16** can detect the sweeping over activation area **22** in order to determine the direction of the sliding touch by detecting individual touches on the touchscreen **18** and comparing the current touched location to the previous touched location. A progression of touched locations and comparison of each to the previous touched location provides a direction of the sliding touch.

[0041] Computer **16** is programmed to display a numerical readout **28** on the touchscreen **18** of the parameter the user is changing, as shown in FIG. **2**. For example, when the GAIN activation area **22** is touched, readout **28** appears and the user can then adjust the gain by sweeping across activation area **26**. However, once the user has stopped changing the gain, i.e., ceased sweeping across the activation area **26**, the computer will cause the readout **28** and activation area **26** to disappear in order to maximize the area of the visual field **20** displaying the ultrasound images. The computer **16** thus controls the appearance and disappearance of activation areas **26** and readouts **28** of parameters the user is changing so that as large an area of the visual field **20** as possible is displaying the ultrasound images.

[0042] More particularly, to change a particular control value, the user may touch or otherwise activate the desired activation area **22** and then the "appearing" activation area **26**. The activated area **22** may indicate it has been activated (to provide an indication as to what parameter is currently being adjusted) by changing its rendered state, such as with a highlight, light colored border outline, or the like. Readout **28** may then display the current (initial, pre-change) numerical value of the control function with the appropriate units. As the user makes changes to the control value via activation area **26**, the readout **28** continuously updates and displays the current numerical value. Once the user has stopped changing the value of the control function, and a short period of time has elapsed since the last change, the readout **28** and activation area **26** may disappear to conserve display area available for displaying the image. Likewise, the activation area **22** returns to its un-selected, un-highlighted state.

[0043] In a similar manner, other settings such as FOCUS and DEPTH can be represented by a single activation area (see FIG. **2**) yet enable changes in multiple directions by allowing the user to sweep his finger in a particular direction, e.g., upward/downward, or alternatively left/right (in the case of activation area **26** being rendered in a horizontal orientation), over the activation area **26** to obtain the desired directional change.

[0044] Although activation areas **22** are shown rectangular and spaced apart from one another, they can be any shape and size and placed adjacent one another. They may contain labels as shown in FIG. **2**, or they may be graphical icons. They may employ colors to indicate their relation to other system functions or to indicate their activated state.

[0045] As shown in FIG. **2**, activation area **26** has the appearance of a "hard" UI component, e.g., a thumbwheel. An advantage of activation area **26** appearing as a thumbwheel is that it provides a user-friendly feedback of the control parameter change to complement the numerical readout and/or change in the ultrasound image being displayed.

[0046] In a technique similar to that of activation area **26** appearing as a thumbwheel, a graphic representing a trackball may be displayed in the middle of an activation area that provides horizontal and vertical touch-and-drag input to system controls. Trackball controls are familiar to users of ultrasound system user interfaces, since most such systems in use today include a trackball for controlling parameters such as placement of a Doppler sample volume on the image, changing of image size or position, rotating the image, selecting amongst stored images, etc. Providing a trackball graphic and the corresponding control functions through an on-screen UI gives the user a migration path from a standard ultrasound scanner user interface with hard controls to the touchscreen UI of the invention.

[0047] Activation area **24** has a circular form and when touched, causes a pie-menu **30** to pop-up on the touchscreen **18** around it. Pie menu **30** provides an advantageous display of multiple activation areas **32** occupying substantially the entire interior of a circle, each activation area **32** being a slice or arcuate segment of the circle, i.e. a sector or a portion of a sector. Activation area **24** can include a general label or mark indicative of the control functions associated with activation areas **32** so that the user will know which activation areas **32** will appear when activation area **24** is touched. After pie menu **30** pops up, activation area **24** at the center of the pie is replaced with an "X" graphic, indicating that touching it will cause the pie menu to be removed, canceling the system change. Upon further selection of an activation area **32** within the pie menu **30**, the activation area **24** at the center of the pie menu **30** may be replaced by a "check" graphic to indicate that it may be used to confirm the selection(s) and cause computer **16** to remove the pie menu **30**.

[0048] Pie menus **30** provide the user with the ability to select one of a plurality of different control functions, each represented by one of the activation areas **32**, in a compact and efficient manner. The possible control functions are very closely packed in the pie shape, but do not overlap and thereby prevent erroneous and spurious selection of an activation area **32**. Also, the computer **16** is programmed to cause the pie menu **30** to appear with its center at the location on the activation area **24** touched by the user. In this manner, the pie menu **30** will pop-up in a position in which the activation areas **32** are all equidistant from the position of the finger when it caused the pie menu **30** to pop up on-screen, i.e., the centers of the activation areas **32** are equidistant from a common point on the touchscreen, namely the center of the activation area **24**. Rapid selection of any activation area **32** is achieved, mitigating the time penalty associated with having to invoke the menu from its hidden state as well as reducing finger or stylus movement to arrive at the desired activation area **32**.

[0049] If the pie menu **30** appears on the visual field **20** for a period of time without a touch of any of the activation areas **32** being detected by the computer **16**, the computer **16** can be programmed to cause the pie menu **30** to disappear in order to maximize the area of the visual field displaying the ultrasound images.

[0050] Instead of pie menu **30** being circular and having four substantially identical activation areas **32** with each extending over a 90° segment as shown, it can also have a