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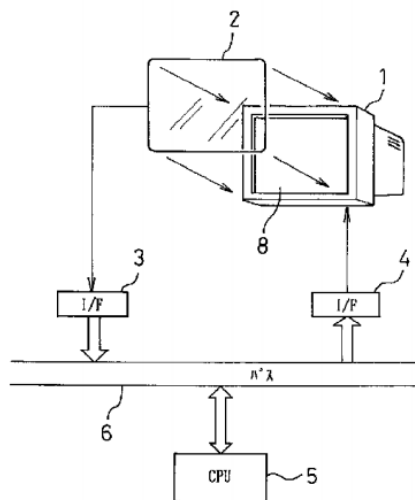
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**(54) (TITLE OF THE INVENTION) METHOD FOR CONTROLLING A SCREEN USING A TOUCH PANEL**

(57) [Abstract]

[Object] The present invention realizes screen scrolling using a screen display that is simpler, faster, and more intuitive, without using icons or the like, thereby reducing operator fatigue and avoiding control lag, etc.

[Configuration] A determination is made as to whether or not a display screen 8 of a CRT 1 is being operated by being touched on the basis of touch location detection information output by a touch panel 2, and if it is determined that a touch location where the display screen 8 has been touched has moved, the display screen 8 is scrolled on the basis of changes to the location detection information at a predetermined timing.



[Claims]

[Claim 1] A method for controlling a screen using a touch panel that scrolls a display screen on the basis of touch location detection information of the touch panel that is disposed in front of the display screen, wherein a determination is made as to whether or not the display screen is being operated by being touched on the basis of touch location detection information output by the touch panel, and if it is determined that a touch location where the display screen has been touched has moved, the display screen is scrolled on the basis of changes to the location detection information at a predetermined timing

[Detailed Description of the Invention]

[0001]

[Industrial Field of Application] The present invention relates to a method for controlling a screen using a touch panel that controls a screen of a CRT or the like, the touch panel being provided in front of the CRT, and being optical, resistive, capacitive, ultrasonic, piezoelectric, or the like.

[0002]

[Prior Art] It is common in control systems that control various types of plants, etc., to display icons or the like for scrolling on screens of CRTs that display various types of control information and the like, and when an operator touches the icons or the like with a finger or a pen, the touch is sensed by an optical, resistive, capacitive, ultrasonic, piezoelectric, or other type of touch panel disposed in front of the CRT to scroll the screen of the CRT.

[0003]

[Problem to be Solved by the Invention] However, in such conventional methods for controlling screens using touch panels, the icons or the like for scrolling have to be displayed on the CRT screen, creating the problem of reducing the useful display area of the screen.

[0004] Moreover, because the operator has to aim for a very small area on the screen when operating the icons, etc., displayed on the CRT, touch input operations must be done with great care, creating the problem of concomitant increased operator fatigue.

[0005] Further, when the operator wishes to scroll the screen only by a particular amount, he or she must continuously touch the icon for a corresponding amount of time, preventing rapid input and creating control lags, etc.

[0006] The present invention was devised in light of these circumstances, and has as an object to provide a method for controlling a screen using a touch panel whereby screen scrolling using a screen display that is simpler, faster, and more intuitive is realized, without

using icons or the like, thereby reducing operator fatigue and avoiding control lag, etc.

[0007]

[Means for Solving the Problem] To attain this object, the present invention is a method for controlling a screen using a touch panel that scrolls a display screen on the basis of touch location detection information of the touch panel that is disposed in front of the display screen, wherein a determination is made as to whether or not the display screen is being operated by being touched on the basis of touch location detection information output by the touch panel, and if it is determined that a touch location where the display screen has been touched has moved, the display screen is scrolled on the basis of changes to the location detection information at a predetermined timing.

[0008]

[Action] In the above configuration, a determination is made as to whether or not the display screen is being operated by being touched on the basis of touch location detection information output by the touch panel, and if it is determined that a touch location where the display screen has been touched has moved, the display screen is scrolled on the basis of changes to the location detection information at a predetermined timing, thereby providing a method for controlling a screen using a touch panel whereby screen scrolling using a screen display that is simpler, faster, and more intuitive is realized, without using icons or the like, thereby reducing operator fatigue and avoiding control lag, etc.

[0009]

[Examples] FIG. 1 is a block diagram showing one example of a control system to which one embodiment of a method for controlling a screen using a touch panel according to the present invention is applied.

[0010] A control system shown in the drawing is provided with a CRT 1, a touch panel 2, two interface circuits (interfaces) 3 and 4, a CPU 5, and a bus 6. The touch panel 2 when the control system is operated by an operator touching a screen 8 on the CRT 1 using a finger 7 (see FIG. 3) and the screen 8 displayed on the CRT 1 is scrolled by the CPU 5 in accordance with the direction and amount of movement of the finger 7.

[0011] The CRT 5 is provided with a vacuum tube or the like having sufficient display capacity to display states of a plant or the like, for example, which is what is controlled by the control system in question. When a display signal is output by the interface circuit 4, this is read and displayed to the screen.

[0012] The touch panel 2 is constituted by an optical, resistive, capacitive, ultrasonic, or other type of panel. When the screen 8 on the CRT 1 is touched by a finger 7 or the like of the operator, the touch panel 2

detects this and generates touch location data, which is supplied to the interface circuit 3.

[0013] The interface circuit 3 receives the touch location data output by the touch panel 2, converts it to touch location data that is in a pre-set format, and sends it to the bus 6 for supply to the CPU 5.

[0014] The CPU 5 reads process signals and the like which are output by the plant or the like which is being controlled to create control screen data that is supplied to the interface circuit 4 via the bus 6. When the touch location data is output by the interface circuit 3, the CPU 5 reads this touch location data via the bus 6 and computes the direction and amount of scrolling of the screen on the basis of changes in the touch location data. The CPU 5 then creates control screen data which has been scrolled on the basis of the computation results and supplies this touch location data to the interface circuit 4 via the bus 6.

[0015] The interface circuit 4 reads via the bus 6 the control screen data that has been output by the CPU 5, converts the control screen data to an image signal and supplies this to the CRT 1 for screen display.

[0016] Next, operation of the present embodiment is described with reference to the flowchart shown in FIG. 2.

[0017] First, the CPU 5 monitors output by the interface circuit 3, imports information indicating whether or not the screen 8 on the CRT 1 has been touched by the finger 7 of an operator or the like, and waits until part of the screen 8 on the CRT 1 has been touched (step ST1).

[0018] When the touch panel 2 detects that the screen 8 on the CRT 1 has been touched by the finger 7 of the operator or the like as shown in FIG. 3 and the touch location data is output by the interface circuit 3, the CPU 5 imports the touch location data and checks whether or not the touch location data is continuously output by the interface circuit 3 for a predetermined fixed amount of time (step ST2).

[0019] If the touch location data is not output for the fixed amount of time by the interface circuit 3, the CPU 5 determines that the operator has input an instruction other than scroll input, and performs a touch input process in accordance with an icon or the like at the coordinates indicated by that touch location data.

[0020] If the touch location data is output for the fixed amount of time or longer by the interface circuit 3 (step ST2), however, the CPU 5 determines that the operator has given a scroll instruction and stores the touch location data as starting coordinates (X1, Y1) (step ST3), and waits until touch location data is output by the interface circuit 3 (step ST4).

[0021] If the finger 7 of the operator that is touching the CRT 1 is moved without moving off of the screen 8, the CPU 5 reads and stores every change in the values of the touch location data output by the touch panel 2 as candidate ending coordinates (X3, Y3).

[0022] The touch panel 2 then detects when the finger 7 of the operator is lifted off of the CRT 1, after which no touch location data is output by the interface circuit 3. The CPU 5 then stores the last candidate ending coordinates (X3, Y3) as official ending coordinates (X2, Y2) (step ST5).

[0023] The CPU 5 then calculates a movement amount ( $\Delta X$ ,  $\Delta Y$ ) by making the computation indicated by the following equations on the basis of the starting coordinates (X1, Y1) and the ending coordinates (X2, Y2) as shown in FIG. 4 (step ST6).

$$[0024] \Delta X = X2 - X1 \quad \dots(1)$$

$$\Delta Y = Y2 - Y1 \quad \dots(2)$$

Next, the CPU 5 cuts out only those parts of the current screen 8 displayed to the CRT 1 which have moved by the movement amount ( $\Delta X$ ,  $\Delta Y$ ) within an entire control screen 10 (see FIG. 3) in the memory, sends those parts to the bus 6 as control screen data for supply to the interface circuit 4, causing the screen 8 corresponding to the control screen data to be displayed to the CRT 1 (step ST7).

[0025] In the present embodiment, the touch panel 2 detects when the screen 8 on the CRT 1 is moved by being touched by the finger 7 or the like of the operator and the screen 8 displayed to the CRT 1 is scrolled by the CPU 5 in accordance with the direction and amount of movement of the finger 7, and therefore scrolling of the screen 8 using screen display is realized that is simpler, faster, and more intuitive, without using icons or the like, thereby reducing operator fatigue and avoiding control lag, etc.

[0026] In the present embodiment the screen 8 on the CRT 1 is scrolled when the finger 7 of the operator is lifted off of the screen 8 on the CRT 1, but it is also possible to continuously scroll the screen 8 on the CRT 1 when the finger 7 of the operator touches the screen 8 on the CRT 1 and is moved over the screen 8 without being lifted off of the screen 8.

[0027] In this case, the CPU 5 of the control system performs scrolling control according to the procedure shown in flowchart in FIG. 5.

[0028] First, the CPU 5 monitors output by the interface circuit 3, imports information indicating whether or not the screen 8 of the CRT 1 has been touched by the finger 7 of an operator or the like, and waits until part of the screen 8 of the CRT 1 has been touched (step ST11).

[0029] When the touch panel 2 detects that the screen 8 of the CRT 1 has been touched by the finger 7 of the

operator or the like and the touch location data is output by the interface circuit 3, the CPU 5 imports the touch location data and checks whether or not the touch location data is continuously output by the interface circuit 3 for a predetermined fixed amount of time (step ST12).

[0030] If the touch location data is not output for the fixed amount of time by the interface circuit 3, the CPU 5 determines that the operator has input an instruction other than scroll input, and performs a touch input process in accordance with an icon or the like at the coordinates indicated by that touch location data.

[0031] If the touch location data is output for the fixed amount of time or longer by the interface circuit 3, however, the CPU 5 determines that the operator has given a scroll instruction and stores the touch location data as starting coordinates (X1, Y1) (step ST13), and checks whether or not the touch location data has been output by the interface circuit 3 (step ST14).

[0032] If the touch location data is continuously output by the interface circuit 3, the CPU 5 checks whether or not the values of the touch location data output by the interface circuit 3 (step ST15), and if the values have changed, the CPU 5 determines that the finger 7 of the operator touching the CRT 5 has been moved without being lifted off of the screen 8 and the values of the touch location data output by the touch panel 2 have changed, and stores new touch location data output by the interface circuit 3 as the ending coordinates (X2, Y2) (step ST16).

[0033] The CPU 5 then calculates a movement amount ( $\Delta X$ ,  $\Delta Y$ ) by making the computation indicated by the following equations on the basis of the starting coordinates (X1, Y1) and the ending coordinates (X2, Y2) (step ST17).

$$[0034] \Delta X = X2 - X1 \quad \dots(3)$$

$$\Delta Y = Y2 - Y1 \quad \dots(4)$$

Next, the CPU 5 cuts out only those parts of the current screen 8 displayed to the CRT 1 which have moved by the movement amount ( $\Delta X$ ,  $\Delta Y$ ) within an entire control screen 10 in the memory, sends those parts to the bus 6 as control screen data for supply to the interface circuit 4, causing the screen 8 corresponding to the control screen data to be displayed to the CRT 1 (step ST18).

[0035] Thereafter, the CPU 5 stores the ending coordinates (X2, Y2) as new starting coordinates (X1, Y1) and returns to the aforementioned touch ending judgment process.

[0036] The touch panel 2 detects when the operator lifts his or her finger 7 from the CRT 5. The CPU 5 repeats the aforementioned screen scrolling process (steps ST14 to ST18) until the touch location data is

no longer output by the interface circuit 3, and stops the scrolling process when the finger 7 of the operator is lifted off of the CRT 1 (step ST14).

[0037] When the screen 8 on the CRT 1 is operated by being touched by the finger 7 of the operator in this manner, the screen of the CRT 1 can be continuously scrolled, thereby making it possible to improve ease of use.

[0038] Moreover, in the present embodiment, an optical, resistive, capacitive, ultrasonic, or other type of touch panel can be used as the touch panel 2, but it is also possible to use a piezoelectric touch panel.

[0039] In this case, the CPU 6 of the control system performs scrolling control according to the procedure shown in flowchart in FIG. 5.

[0040] First, the CPU 5 monitors output by the interface circuit 3, imports information indicating whether or not the screen 8 of the CRT 1 has been touched by the finger 7 of an operator or the like, and waits until part of the screen 8 of the CRT 1 has been touched (step ST21).

[0041] The touch panel 2 detects when the screen 8 on the CRT 1 is touched by the finger 7 of the operator or the like. Once the touch location data is output by the interface circuit 3 together with touch pressure data, the CPU 5 receives this touch location data and the touch pressure data, and checks whether or not the value of the touch pressure data is greater than or equal to a fixed pressure value (step ST22).

[0042] If the value of the touch pressure output by the interface circuit 3 is not greater than or equal to the fixed pressure value, the CPU 5 determines that the operator has input an instruction other than scroll input, and performs a touch input process in accordance with an icon or the like at the coordinates indicated by that touch location data.

[0043] If the value of the touch pressure data output by the interface circuit 3 is greater than or equal to the fixed pressure value, the CPU 5 determines that the operator has given a scroll instruction, stores the touch location data output by the interface circuit 3 as the starting coordinates (X1, Y2) (step ST23) and waits until the touch location data is no longer output by the interface circuit 3 (step ST24).

[0044] If the finger 7 of the operator that is touching the CRT 5 is moved without moving off of the screen 8, the CPU 5 reads and stores every change in the values of the touch location data output by the touch panel 2 as candidate ending coordinates (X3, Y3).

[0045] The touch panel 2 then detects when the finger 7 of the operator is lifted off of the CRT 1, after which no touch location data is output by the interface circuit 3. The CPU 5 then stores the last candidate ending

coordinates (X3, Y3) as official ending coordinates (X2, Y2) (step ST25).

[0046] The CPU 5 then calculates a movement amount ( $\Delta X$ ,  $\Delta Y$ ) by making the computation indicated by the following equations on the basis of the starting coordinates (X1, Y1) and the ending coordinates (X2, Y2) (step ST26).

$$[0047] \Delta X = X2 - X1 \quad \dots(5)$$

$$\Delta Y = Y2 - Y1 \quad \dots(6)$$

Next, the CPU 5 cuts out only those parts of the current screen 8 displayed to the CRT 1 which have moved by the movement amount ( $\Delta X$ ,  $\Delta Y$ ) within an entire control screen 10 in the memory, sends those parts to the bus 6 as control screen data for supply to the interface circuit 4, causing the screen 8 corresponding to the control screen data to be displayed to the CRT 1 (step ST27).

[0048] Thus, even when using a piezoelectric touch panel, the present invention realizes scrolling of the screen 8 using a screen display that is simpler, faster, and more intuitive, without using icons or the like, thereby making it possible to reduce operator fatigue and avoid control lag, etc.

[0049] Moreover, in the aforescribed embodiments, the entire screen 8 on the CRT 1 is scrolled, but it is also possible to divide the screen 8 of the CRT 1 into a scrolling region 15 and a non-scrolling region 16 as shown in FIG. 7 and put ordinary touch-key icons 17 and scrolling icons 18, etc., in the non-scrolling region 16.

[0050] Doing so allows operators unfamiliar with the scrolling control provided by the present invention as described above, i.e., operators familiar with ordinary conventional operations, to scroll the screen 8.

[0051] Furthermore, in the embodiments described above, the entire display screen is scrolled in accordance with how much the screen 8 on the CRT 1 is moved when moved by being touched on the touch location, but it is also possible to turn the page and display a next page screen 8b or a previous page screen when a lower part of a current screen 8a is touched and the touch location is moved left or right, as shown in FIG. 8.

[0052] In this case, when the lower part of the screen 8a is touched and the touch location is moved right, the next page screen 8b is displayed, and when the

lower part of the screen 8a is touched and the touch location is moved left, the previous page screen is displayed.

[0053] A page-turning process can thus be performed smoothly when a screen with text or the like is displayed on the CRT 1.

[0054]

[Effects of the Invention] With the present invention as described above, screen scrolling using a screen display is realized that is simpler, faster, and more intuitive, without using icons or the like, thereby making it possible to reduce operator fatigue and avoid control lag, etc.

[Brief Description of the Drawings]

[FIG. 1] is a block diagram showing one example of a control system to which one embodiment of a method for controlling a screen using a touch panel according to the present invention is applied.

[FIG. 2] is a flowchart showing an example of a scrolling operation in the control system shown in FIG. 1.

[FIG. 3] is a schematic view showing an example of a scrolling operation in the control system shown in FIG. 1.

[FIG. 4] is a schematic view showing an example of a calculating a scrolling amount during a scrolling operation in the control system shown in FIG. 1.

[FIG. 5] is a flowchart showing another embodiment of a method for controlling a screen using a touch panel according to the present invention.

[FIG. 6] is a flowchart showing another embodiment of a method for controlling a screen using a touch panel according to the present invention.

[FIG. 7] is a schematic view showing another embodiment of a method for controlling a screen using a touch panel according to the present invention.

[FIG. 8] is a schematic view showing another embodiment of a method for controlling a screen using a touch panel according to the present invention.

[Explanation of the Reference Numerals]

1 CRT

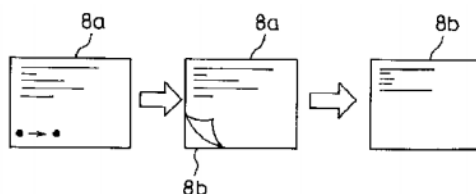
2 Touch panel

3, 4 Interface circuits

5 CPU

6 Bus

FIG. 8



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