

between a touch on the display panel 101 and the approach to the display panel 101, the controller 18 also determines a level difference between the signal reception intensity S1 obtained when the finger approaches the display panel 101 and the signal reception intensity S2 obtained when the finger touches the display panel 101.

[0044] Even when several positions on the display panel 110 are touched or approached, the touch detection can be achieved using the construction shown in FIG. 3. For example, one finger approaching the position T1 and another finger approaching the position T6 produce a received signal intensity having a characteristic S3 shown in FIG. 4B. The characteristic S3 has two peaks of received signal intensity that decrease in the respective proximities of T1 and T6 compared to the substantially flat characteristic S0. When these two fingers touch the respective positions, the received signal intensity characteristic S4 is reduced further. The controller 18 therefore computes the positions of the peaks to find the positions being touched or approached by the two fingers. The same method can be applied even when at least three positions are simultaneously approached or touched.

[0045] The PDA 100 including the back-surface touch sensor 120 for detecting the approach or touch of fingers is operated shown in, for example, FIG. 5. A user holds the PDA 100 single-handed so as to face the front surface of the display panel 110. At least one finger of a hand holding the PDA 100 places on the back surface of the PDA 100 to touch the concave 100a of the display panel 100 with the finger.

[0046] Touching in this manner causes the controller 18 to determine the touch position via a circuit connected to the electrodes disposed in the back-surface touch sensor 120. A display panel 110 displays, for example, a plurality of operation buttons 111 (hereinafter, referred to as "the operation buttons 111"). In addition, a touch position pointer 112, such as a cross-shape pointer, is displayed on the position of the display panel 110 that corresponds to the touch position that is determined by the controller 18. The touch position pointer 112 may take any other shape as long as the center thereof can be recognized. The operation buttons 111 are displayed so that as shown in FIG. 1, a function assigned to each button can be recognized with characters or graphics. The approach position may be also displayed in the same manner as the touch position displayed.

[0047] When the touch position pointer 112 and one of the operation buttons 111 are overlapped, the controller 18 determines that the button at the overlapped position is operated, and the controller 18 issues the operation command corresponding to the button at the overlapped position from the terminal 19. When the operation command can be processed, the controller 18 executes the operation command.

[0048] Next, a process executed by the controller 18 in response to detection of a touch and an approach will be described with reference to the flowchart in FIG. 6. Initially, the controller 18 determines whether a touch input mode is set as an operation mode (step S11). When the controller 18 determines that the touch mode is set (this indicates that, for example, the operation buttons 111 or the like are displayed), the controller 18 determines whether the back-surface touch sensor 120 detects a touch (step S12).

[0049] When the determination at step S12 is affirmative, the controller 18 causes the touch position pointer 112 to be

displayed at the corresponding position directly above the detected touch position in the display panel 110 (step S13).

[0050] The controller 18 determines whether the center of the touch position pointer 112 is overlapped with one of the operation buttons 111 (step S14). When the determination at step S14 is affirmative, the controller 18 determines that one of the operation buttons 111 corresponding to the overlapped position is pressed and then executes the input process corresponding to the pressed button (step S15).

[0051] When the determination at S11 is negative, when a touch is not detected at step S12, when the center of the touch position is not overlapped with the display area of any of the operation buttons 111, and when the step S15 is executed, the process proceeds back to step S11.

[0052] Since the input process using the touch input is performed in accordance with the determinations of the controller 18, although a touch on the front surface of the display panel 110 is not required, the input process can be achieved in the same manner as known touch panels. In this case, since the finger or the like touches the back surface of the device, the user can operate with recognizing characters and graphics displayed on the display panel 110 and without hiding them with the finger, thus improving the operability of the display panel 110. In addition, the touch position on the back surface of the device can be confirmed with the touch position pointer 112. Therefore, although a touch occurs on the back surface, since the correspondence between the touch position pointer 112 on the front surface and the touch position on the back surface can be easily recognized, the disposition of the sensor on the back surface does not deteriorate the operability.

[0053] Although the PDA 100 is operated single-handed in the operation example in FIG. 5, the PDA 100 may be operated with both hands. As shown in FIG. 7A, a data processing terminal 200 is provided with a relatively large display panel 210 on the front surface. In the data processing terminal 200, touching the back surface of the data processing terminal 200 can be detected by the back-surface touch sensor 120, and a plurality of operation buttons 211 (hereinafter, referred to as "operation buttons 211") are displayed on the display panel 210.

[0054] When one finger f1 of one hand h touches at a position on the back surface corresponding to one of the operation buttons 211, a touch is detected, causing a touch position pointer 212 to display on the corresponding position of the display panel 210. When the center of the touch position pointer 212 is overlapped with one of the operation buttons 211, a function corresponding to the touched button of the operation buttons 211 is executed.

[0055] The back-surface touch sensor of the data processing terminal 200 can detect a plurality of positions simultaneously. As shown in FIG. 7C, touch position pointers 213 and 214 corresponding to the respective touch positions of a finger f2 of a left hand Lh and a finger f3 of a right hand Rh on the back surface may be displayed with the data processing terminal 200 held with a left hand Lh and a right hand Rh. When a plurality of positions is touched simultaneously, a particular input operation may be performed on the data processing terminal 200 so that the two touch positions move apart in the respective arrow directions in FIG. 7C (or the reverse operation). For example, when the