

second position has its source in a simultaneous dual point user input. This determination can be performed by evaluating the properties of the signal transition from the first to the second position signal. This determination can be based on a differentiation between a substantially continuous and a substantially discontinuous signal transition from the first to the second position signal, wherein a substantially discontinuous signal transition indicates a dual point user input and a substantially continuous signal transition indicates single-point user input, i.e. a motion of the input point on the touch based input device.

[0019] If a dual point user input is detected, a third position is generated by (point) reflecting said stored first position on or upon said second position. Said first position and said third position, are then used as coordinates of a said dual point user input.

[0020] The point reflection operation of said first position at said second position visualizes the generation of said third point. The criteria for a dual-point user input is fulfilled, if said second position represents the 'center of mass' position of two actually pressed points on the touch based input device. With center of mass information (second position) and one of two points (i.e. first position), the third position can be calculated.

[0021] The third position can also be obtained by generating a difference signal between the stored first position and the second position, and adding said difference signal to the actual second position. This represents a signal-based generation of the third position. It is supposed that a generation of the third position by calculating the position coordinates of the positions is easier to implement.

[0022] For the above reasons, a device using this method can distinguish between user-input cases with a single pressing point or a dual pressing point. When the separation has been done, the method determines where the second input point is, as the hardware then produces incorrect data.

[0023] This first part of said method can be regarded as a static case, wherein the second point is not moving. The present invention can also be applied, if a movement of the second point is detected. By continuously reflecting the first point at the second (moving) point, a movement of the third point can be calculated. So the first point can serve as a reference point for generating the movement of the third point.

[0024] In another embodiment of the present invention, said method further comprises using said first position as the coordinate for a single point user input, and using the presence of said dual user input for allocating a first function to said first position. So, while pointing to the desired position with a finger, the user can do the equivalent of a mouse 'right-click' by touching anywhere on the touch-device with another finger. This second contact can be used to initiate, for example, the popping up of a position-specific menu. While using a stylus for pointing a second contact can be made with the thumb of the supporting hand.

[0025] In another example embodiment of the present invention said determination, if said second position has its source in a simultaneous dual point user input, is based on the gradient of the position signal from said first position to said second position. The gradient of the position refers to the time derivative of the position, and is proportional to the

speed said point is moving. If the position signal rises up abruptly, the position signal becomes substantially discontinuous, and the gradient increases. A substantially discontinuous signal transition indicates a dual point user input and a substantially continuous signal transition indicates single-point user input, e.g. a motion of a single input point on the touch based input device. Instead of the gradient, the steepness of the signal within the transition area may also be used as a criterion to decide if the transition is discontinuous or not.

[0026] It may be noted that the first position should be stored while the position is substantially static. To implement this, the first position may be stored in a transient memory, to be available after a time period characteristic for a discontinuous signal transition. This timer period can be in the range below $\frac{1}{10}$ second, which is the maximum estimated time required to set down a finger or an input actuator (e.g. a pen) on the touch pad.

[0027] In yet another example embodiment of the present invention said method comprises storing said third position. If said second position is stored, it can be used as a reference position to calculate a movement of the first position if a motion of said second position is detected.

[0028] In another example embodiment of the present invention said method further comprises detecting a motion of said second position, setting one of said first position or said third position as a point of reference, and calculating a motion of said position which is not said point of reference, by reflecting said point of reference of said second position. This represents a dynamic implementation of the method in dual point input mode in case a motion of the 'middle' point is detected. As set forth above, the touch pad can only detect the motion of the middle point or the 'center of gravity' of said dual-point user input. There is only one case in which a motion of the second point can be interpreted in an unambiguous way, that is, when one of the points can be regarded as fixed.

[0029] To use one fixed reference point, this reference point has to be stored. For input features as e.g. string, alt, caps lock and the like user input, the first position can be used as a reference point, as it can be assumed that the position used to press a 'string' input area on the touch screen is not likely to be moved.

[0030] In case of a 'drag-and-drop' user input, it is supposed that that a user first points to an object to be dragged, presses subsequently an input area to activate the 'drag and drop' function, and then moves the object. In this case it can be assumed that the position used to activate the drag and drop feature (i.e. the third position) is not moved on the touch screen, and therefore the calculated third position can be used as a fixed reference position. It may be noted that the setting of the reference point may be performed before a motion of the second position is detected.

[0031] In another example embodiment of the present invention said method further comprises receiving a signal, which indicates if said first position or said third position is to be used as a point of reference. By receiving an information e.g. from a software application running on said user device, both kinds of input features can be implemented in a single device or under a single application. In this case the application can decide on base of the actual positions of the