

GRAPHICAL USER INTERFACE FOR DEVICES HAVING SMALL TACTILE DISPLAYS

FIELD OF THE INVENTION

[0001] The present invention relates to user interfaces for electronic devices, particularly but not exclusively, personal digital assistants, mobile phones or mobile computers, that have small display screens and that employ touch sensing as a means of data input.

BACKGROUND OF THE INVENTION

[0002] Until relatively recently, electronic documents and graphical user interfaces have been primarily viewed and manipulated in electronic devices on desktop or laptop consoles with relatively large displays, typically 15" or 17" CRT or flat panel displays or larger and data input has been effected using keyboard and mouse devices.

[0003] Due to increasing focus on compactness of electronic devices, however, the displays, especially in portable electronic devices, are becoming smaller and smaller. Popular electronic devices with a smaller display area include electronic organizers, PDA's (personal digital assistants), and graphical display-based telephones. Also available today are communicators that facilitate various types of communication such as voice, faxes, SMS (Short Messaging Services) messages, e-mail, and Internet-related applications. These products can likewise only contain a small display area. Often such devices do not use a full keyboard or a mouse, rather the display screens of these devices are touch sensitive to allow data input. A wide variety of gesture-based and other user interface techniques have been used and proposed to facilitate data entry through the touch screen.

[0004] For instance, U.S. Pat. No. 5,745,116 describes a user interface for a mobile telephone in which a user performs a manual selection or a gesture selection of a screen object on a screen using a pointing device. After a manual selection, such as a single tap, the electronic device automatically presents a temporary directional palette having palette buttons that explicitly state functions of the electronic device. Each palette button has a unique compass direction relative to the original tap area. By making a second tap on a desired palette button, a novice user learns available functions of the electronic device and their corresponding directional gestures. Alternately, the user may perform a gesture selection of both a screen object and a function, such as making a double tap or drawing a line in the appropriate direction, before the directional palette appears on the screen.

[0005] This and many other known touch sensitive display screens are accompanied by a stylus to enable a more precise location of an input operation on a graphical user interface than would be possible using a finger, which is generally relatively large in comparison with the display device and the images displayed on it.

[0006] However, the use of a stylus has major disadvantages. First the stylus is necessarily a removable component for which a way must be provided of fixing it to the device. In use it is necessary to remove the stylus from its fixed position, hold it like a pen and then replace it in its position after use. It is necessary to take care not to lose it—in fact

with many products a set of replacement styli are provided by the manufacturer. The diameter of the stylus is often very reduced, which adds to the risk of dropping and losing it. Moreover, many users are tempted to use a ballpoint pen or other pointed implement instead of the stylus, which can wear or damage the surface of the touch screen.

[0007] In addition, at least some types of touch pad are based on a grid of resistive elements, the spacing between which is comparable to the size of the stylus and which is usually greater than the pixel resolution of the display. This can lead to unreliability in use since in practice that point of contact between the stylus and the screen can fall in the interstices of the resistive matrix.

[0008] Some products combine a finger input for some operations with the use of a stylus for others. This adds to the difficulty of using the device since the user must continually interchange stylus and finger.

[0009] This invention is intended to mitigate the drawbacks of the prior art by providing an interface for such devices that does not require a stylus, but rather allows input to be effected through small active screen elements using a finger alone.

SUMMARY OF THE INVENTION

[0010] According to the present invention, there is provided apparatus having a touch sensitive display and circuitry responsive to the display to move a cursor according to movement of a finger thereon and effect input operations according to the position of a cursor in relation to a displayed image, the position of the cursor on the displayed image being displaced by a short distance from the point of contact of the finger with the display so that the position of the cursor when an input operation is effected is visible to the user, wherein the input operations comprise at least a first finger tap serving to define the position of the cursor and a second finger tap serving to confirm the position of the cursor as the point of effect desired by the user.

[0011] Large tactile display systems in which a cursor is displayed displaced from the point of contact with a finger are known, for instance U.S. Pat. No. 5,808,605 describes a computer system in which a virtual pointing device is created by detecting a entire hand placed on the touchscreen. Input commands are effected by moving parts of the hand. U.S. Pat. No. 4,812,833 describes a touch panel input device that includes a sensor for detecting that an operators finger has approached towards a touch input key and displaying a cursor for indicating this key.

[0012] The present invention makes use of a similar technique for enabling a cursor to remain visible and combines it with a double tap mechanism to provide a convenient and user-friendly way for small active elements—smaller than a human finger—to be actuated by a finger.

[0013] One advantage of this arrangement in at least some embodiments is that it enables the resolution of the touchpad to be decoupled from the size of the active elements, enabling either the size of the latter to be reduced or more satisfactory operation with a coarser resolution of the touchpad.

[0014] The touchpad needs only to have sufficient resolution to enable an effective point of contact with the finger to