

ELECTRONIC DEVICE AND TACTILE TOUCH SCREEN

FIELD OF TECHNOLOGY

[0001] The present application relates to tactile feedback from touch screen devices.

BACKGROUND

[0002] Electronic devices, including portable electronic devices, have gained widespread use and can provide a variety of functions including, for example, telephonic, electronic messaging and other personal information manager (PIM) application functions. Portable electronic devices can include several types of devices including mobile stations such as simple cellular telephones, smart telephones, wireless PDAs, and laptop computers with wireless 802.11 or Bluetooth capabilities. These devices run on a wide variety of networks from data-only networks such as Mobitex and DataTAC to complex voice and data networks such as GSM/GPRS, CDMA, EDGE, UMTS and CDMA2000 networks.

[0003] Devices such as PDAs or smart telephones are generally intended for handheld use and easy portability. Smaller devices are generally desirable for portability. A touch screen input/output device is particularly useful on such handheld devices as such handheld devices are small and are therefore limited in space available for user input and output devices. Further, the screen content on the touch screen devices can be modified depending on the functions and operations being performed.

[0004] Touch screen devices are constructed of a display, such as a liquid crystal display, with a touch-sensitive overlay. These input/output devices suffer from inherent disadvantages relating to user interaction and response, however. In particular, such touch screen devices fail to provide a user-desirable tactile quality for positively indicating input, providing a poor user-experience. For example, audio output and vibrational devices do not provide a desirable tactile quality.

[0005] Improvements in touch screen devices are therefore desirable.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] Embodiments of the present application will now be described, by way of example only, with reference to the attached Figures, wherein:

[0007] FIG. 1 is a top view of a portable electronic device according to one embodiment, with certain hidden features shown in ghost outline for the purpose of illustration;

[0008] FIG. 2 is a sectional side view of the portable electronic device of FIG. 1;

[0009] FIG. 3 is a block diagram of certain components, including certain internal components of the portable electronic device of FIG. 1;

[0010] FIG. 4A is a block diagram showing a portion of the components of FIG. 3, including a shape memory alloy wire shown in a compressed state;

[0011] FIG. 4B is a block diagram similar to FIG. 4, showing the shape memory alloy wire in an extended state;

[0012] FIG. 5 is a top view of the portable electronic device of FIG. 1, showing screen areas in ghost outline;

[0013] FIG. 6 is a sectional side view of the portable electronic device of FIG. 1, showing a touch event at a point on the touch screen display;

[0014] FIG. 7 is a sectional side view of the portable electronic device of FIG. 1, showing a touch event at another point on the touch screen display;

[0015] FIG. 8 is a sectional side view of the portable electronic device of FIG. 1 showing a touch event at yet another point on the touch screen display; and

[0016] FIG. 9 is a flow chart illustrating steps in a method of controlling the electronic device of FIG. 1.

DETAILED DESCRIPTION

[0017] It will be appreciated that for simplicity and clarity of illustration, where considered appropriate, reference numerals may be repeated among the figures to indicate corresponding or analogous elements. In addition, numerous specific details are set forth in order to provide a thorough understanding of the embodiments described herein. However, it will be understood by those of ordinary skill in the art that the embodiments described herein may be practiced without these specific details. In other instances, well-known methods, procedures and components have not been described in detail so as not to obscure the embodiments described herein. Also, the description is not to be considered as limiting the scope of the embodiments described herein.

[0018] The embodiments described herein generally relate to a portable electronic device having a display. Examples of portable electronic devices include mobile, or handheld, wireless communication devices such as pagers, cellular phones, cellular smart-phones, wireless organizers, personal digital assistants, wirelessly enabled notebook computers and the like.

[0019] The portable electronic device may be a two-way communication device with advanced data communication capabilities including the capability to communicate with other portable electronic devices or computer systems through a network of transceiver stations. The portable electronic device may also have the capability to allow voice communication. Depending on the functionality provided by the portable electronic device, it may be referred to as a data messaging device, a two-way pager, a cellular telephone with data messaging capabilities, a wireless Internet appliance, or a data communication device (with or without telephony capabilities). The portable electronic device may also be a portable device without wireless communication capabilities as a handheld electronic game device, digital photograph album, digital camera and the like.

[0020] Referring to FIGS. 1 to 3, a portable electronic device 20 is indicated generally by the numeral 20. The portable electronic device 20 includes a base 22 and a touch screen display 24 that is connected to the base 22 and moveable relative to the base 22. The touch screen display 24 and includes a display device 26 and a touch-sensitive input surface 28 overlying the display device and connected to a controller 30 for determining a touch event to the touch-sensitive input surface 28. A shape memory alloy 32 is disposed between the base 22 and the display device 26 and is configured to change shape in response to conduction of an electric current to cause movement of the display device 26 relative to the base 22. The operational components include a processor 40 between the base 22 and the touch screen display 24. The processor 40 is operatively connected to the controller 30, the display device 26 and the shape memory alloy 32 for causing conduction of current through the shape memory alloy 32 in response to the touch event, resulting in movement of the touch screen display 24 relative to the base 22.