

TOUCH PANEL WITH A HAPTICALLY GENERATED REFERENCE KEY

RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Patent Application No. 60/790,962 filed Apr. 11, 2006.

FIELD OF THE INVENTION

[0002] One embodiment of the present invention is directed to a touch panel. More particularly, one embodiment of the present invention is directed to a user interface for a touch panel.

BACKGROUND INFORMATION

[0003] Most standardized keyboards, such as a numeric keypad or a QWERTY (alphanumeric) keyboard, provide a raised area on one or more keys which serves as a reference. In a numeric keyboard, a raised portion, such as a bump, is placed on the top surface of the number “5” key to indicate that the particular button is the reference key. In QWERTY keyboards, raised areas are placed on the “F” and “J” keys to allow the user to easily locate those reference keys by the index fingers. Once the finger(s) is placed on the reference keys, the user is able to use prior knowledge of the locations of the remaining keys to operate the keys in the keyboard without having to look down at the keyboard.

[0004] Touchscreens, touch pads, a touch sensitive monitor, etc., which are collectively known as touch panels, have become more and more popular as input sources for computers and other devices. A touch panel typically includes a touch-sensitive input panel and a display device, usually in a sandwich structure. A touch is sensed by a touch panel when a finger or a stylus comes into contact with the outermost surface of the touch panel. The contact is translated into x and y coordinates of the finger or stylus location on the panel. Some touch panels are transparent overlays placed over a display, while other touch panels, such as touch pads, are nontransparent devices typically used to control cursor movement on a portable computer, for example, or as pen input devices for applications including writing or signature input to a computer. A touch panel can be installed in or near a computer, an automobile, ATM machines, etc.

[0005] However, touch panels generally do not have raised areas as described for the keyboards above. Accordingly, touch panels typically do not have the physical protrusion characteristics to provide the user with reference key information.

[0006] Based on the foregoing, there is a need for a system and method for providing a reference key to a user of a touch panel.

SUMMARY OF THE INVENTION

[0007] One embodiment of the present invention is a touch panel that provides an indication of one or more reference keys and non-reference keys to a user. The touch panel senses a touch and determines the location of the touch. The touch panel then generates a haptic effect if the location is

a reference key, and generates a different haptic effect if the location is a non-reference key.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] FIG. 1 is a block diagram of a touch panel in accordance with one embodiment of the present invention.

[0009] FIG. 2 illustrates the QWERTY keyboard of a touch panel in accordance to one embodiment of the present invention with reference keys “F” and “J”.

[0010] FIG. 3 illustrates a non-standard keyboard portion of a touch panel in accordance to one embodiment of the present invention.

[0011] FIG. 4 is a flow diagram of the functionality performed by a touch panel in order to haptically generate a reference key in accordance with one embodiment of the present invention.

DETAILED DESCRIPTION

[0012] One embodiment of the present invention is a touch panel that generates at least two different force feedback or vibrotactile feedback effects (collectively referred to herein as “haptic effects”) in response to a user contact, such as by a digit of a hand or with a stylus. The first haptic effect (e.g., a vibration) is provided to allow a user to locate one or more reference keys and the second haptic effect is provided to allow the user to locate a surface area of a key other than the reference key(s). With the location of the one or more reference keys established to the user, the remaining keys may be determined from the second haptic effect to locate the surrounding key surface. This is at least partially done utilizing the user’s prior knowledge of the locations of the remaining keys. The user’s knowledge may be based on a standard layout of the surrounding keys, such as with a generic numeric keypad or a QWERTY keyboard. The user’s knowledge may alternatively be based on the user having learned the surrounding key locations of a specific device. As a result, the keyboard/keypad/or other haptically enabled touch panel can be used without requiring the user to continuously maintain eye contact on the surface.

[0013] FIG. 1 is a block diagram of a touch panel 10 in accordance with one embodiment of the present invention. Touch panel system 10 includes a transparent touch sensitive surface 15 that is placed over a video screen 18. Touch sensitive surface 15 is designed and configured to sense the touch of a user’s finger, stylus, or other object, and provide a touch location signal, such as the x and y coordinates, to a haptic controller 20. Touch sensitive surface 15 may be sensitive to, for example, pressure and/or heat through capacitive sensing, pressure sensing, or other means. Video screen 18 generates the keys and other characters and graphical objects that can be viewed by the user through touch sensitive surface 15.

[0014] Controller 20 includes a processor and memory for storing instructions that are executed by the processor. Controller 20 generates two or more haptic effects in response to receiving the touch locations, and can be a general purpose controller/computer that also performs other functions. Controller 20 may be in a location separate from touch sensitive surface 15 and video screen 18, or it may be integrated within those components.

[0015] Touch panel 10 further includes actuators 25-28 located at each corner of touch sensitive surface 15. Actuators 25-28 generate haptic effects in response to signals