

TOUCH SCREEN WITH USER INTERFACE ENHANCEMENT

PRIORITY TO RELATED APPLICATIONS

[0001] The present application claims priority to U.S. Patent Provisional Application Ser. No. 60/291,694, entitled "Touch Screen with User Interface Enhancement", filed on May 16, 2001, which is incorporated herein in its entirety.

BACKGROUND

[0002] The present invention relates to computer interface devices, and more particularly, to a computer touch pad with integrated display device, and enhancements to the portable computer user interface employing same.

[0003] Touch pads are widely used in computer applications, particularly as pointing devices in portable computers. In typical usage, the touch pad is a featureless, finger sensitive surface in a rectangular opening of the palm rest of the computer. The touch pad serves solely as an input device for the computer. The touch pad functions primarily as a cursor pointing device, but some touch pads offer additional functions.

[0004] For example, U.S. Pat. No. 5,543,591 to Gillespie et al. discloses a typical prior art touch pad sensor in which finger tapping gestures in designated regions of the touch surface invoke special commands on the computer. U.S. Pat. No. 5,943,052 to Allen et al. discloses a touch pad in which finger motions in designated regions invoke a scrolling command. These tap regions and scrolling regions have proven useful to expert users but confusing to novice users as the regions are invisible to the eye but different in behavior. Marking the regions with screen-printed icons on the opaque sensor surface can help, but it can also lead to greater confusion if the regions are software configurable.

[0005] A further disadvantage of prior art touch pads is that they use up a significant fraction of the surface area of the computer for a single dedicated input function. Other pointing devices such as isometric joysticks (see, e.g., U.S. Pat. No. 5,521,596 to Selker et al) and force sensing keys (see, e.g., U.S. Pat. No. 4,680,577 to Straayer et al) have been proposed as compact alternatives, but these devices are not as expressive or as easy to use as touch pads.

[0006] Touch screens are also well known in the art. One example of a touch screen is disclosed in U.S. Pat. No. 4,806,709 to Blair. In typical use, the main display screen of a computer is overlaid with or implemented as a touch sensitive input device. This eliminates the need to dedicate separate parts of the surface of the computer for input and output. If the touch screen serves as the main pointing device of the computer, pointing is accomplished by a direct mapping from finger position to selection of a point on the screen beneath the finger. This direct mapping makes touch screens easy to understand and use. However, touch screens are impractical for everyday use as the main display of a computer because the user's arm tires from being continuously held up to touch the screen. If the touch screen is laid flat to avoid arm wear, the arm tends to rest on the touch-sensing surface and, with many touch sensing technologies, this disrupts the ability to sense the finger. Touch screens the size of a main computer display may also be prohibitively bulky or expensive for use in applications that do not require them.

[0007] A transparent touch pad suitable for placement over a display such as an LCD screen has been developed and is disclosed and claimed in co-pending U.S. patent application Ser. No. 09/415,481, filed Oct. 8, 1999, assigned to the same assignee as the present invention. This application discloses a touch screen having the small size and low cost of a conventional touch pad for portable computers and notes that the touch pad and display could be included in a personal computer to enhance the user interface in various ways, but it does not disclose details of the software implementation, nor how such a device can simultaneously function as the pointing device of the computer, nor how this arrangement enhances the user interface.

SUMMARY

[0008] The drawbacks and disadvantages of the prior art are overcome by the touch screen with user interface enhancement.

[0009] The present invention is a graphical user interface in a computing device having a processor running an operating system and a display. The graphical user interface comprises a touch screen and a driver coupling the touch screen to the operating system. The driver can display a plurality of icons on the touch screen, or a plurality of screen images having at least one icon, with each of the icons associated with operations on the display and/or the touch screen. Other embodiments include the touch screen having unactivated and activated states, as well as the presence of an application programming interface that enables an application to display at least one image on the touch screen.

BRIEF DESCRIPTION OF THE DRAWING FIGURES

[0010] Referring now to the figures, wherein like elements are numbered alike:

[0011] **FIG. 1** is a diagram showing a notebook computer system with main display, keyboard, and touch screen;

[0012] **FIG. 2** is a diagram showing an illustrative embodiment of a touch screen in greater detail;

[0013] **FIG. 3** is a diagram illustrating an example default image for use when the touch screen is operating as a conventional touch pad;

[0014] **FIG. 4** is a diagram illustrating an example of a first "iconic" usage mode of the touch screen;

[0015] **FIG. 5** is a diagram illustrating the touch screen image of **FIG. 4** modified to indicate the activated state of the touch screen using a dashed line around each icon that is touch-sensitive in the activated state;

[0016] **FIG. 6A** is a diagram illustrating a portion of the keyboard featuring several keys; **FIG. 6B** is a diagram illustrating one possible arrangement of a special touch sensitive region or second touch sensor could be provided that activates the touch screen when touched;

[0017] **FIG. 7A** is a diagram illustrating small icons that may be smaller than a finger and may be completely obscured by the finger when the finger touches them;

[0018] **FIG. 7B through 7E** illustrate several mechanisms to eliminate the problem of obscuring small icons;