

switches so that its display size can be substantially increased. In other words, by eliminating physical buttons, keys, or switches from a front surface of an electronic device, additional surface area becomes available for a larger display. Ultimately this strategy would allow a substantially full screen display. As used herein, a full screen display is a display that consumes, or at least dominates, a surface (e.g., front surface) of an electronic device.

[0010] Various embodiments of a multi-functional hand-held device are discussed below with reference to **FIGS. 2-28**. However, those skilled in the art will appreciate that the detailed description given herein with respect to these figures is exemplary and not exhaustive and that many variations on these embodiments are possible.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] The invention may best be understood by reference to the following description taken in conjunction with the accompanying drawings in which:

[0012] **FIGS. 1A-1F** are diagrams of various electronic devices.

[0013] **FIG. 2** is a simplified diagram of a multi-functional hand-held device.

[0014] **FIG. 3** is a perspective view of a substantially full screen hand-held device with a limited number of limited buttons.

[0015] **FIG. 4** is a front view of a hand-held device with at least one button.

[0016] **FIG. 5** is a diagram of a GUI separated into a standard region and a control region.

[0017] **FIG. 6** is a diagram of a GUI separated into a standard region and a control region.

[0018] **FIG. 7** is a diagram of a GUI separated into a standard region and a control region.

[0019] **FIG. 8** is a diagram of a GUI separated into a standard region and a control region.

[0020] **FIG. 9** illustrates an exemplary GUI for a PDA.

[0021] **FIG. 10** illustrates an exemplary GUI for a cell phone.

[0022] **FIG. 11** illustrates an exemplary GUI for a media player.

[0023] **FIG. 12** illustrates an exemplary GUI for a video player.

[0024] **FIG. 13** illustrates an exemplary GUI for a game player.

[0025] **FIG. 14** illustrates an exemplary GUI for a camera.

[0026] **FIG. 15** illustrates an exemplary GUI for a GPS.

[0027] **FIG. 16** illustrates an exemplary GUI for a remote control.

[0028] **FIG. 17** illustrates an exemplary GUI for a hand top.

[0029] **FIG. 18** illustrates an exemplary GUI for a main menu of a multi-functional hand held device.

[0030] **FIG. 19** is a side elevation view, in cross section, of a hand-held device incorporating a force sensitive display.

[0031] **FIG. 20** illustrates an input device that combines touch sensing and force sensing devices to provide x, y and z components when touched.

[0032] **FIG. 21** is a side elevation view of an I/O device that combines a display with touch screen and a force sensing mechanism.

[0033] **FIG. 22** is a side elevation view of an input device.

[0034] **FIG. 23** is a side view, in cross section, of a hand-held device that incorporates a squeeze feature.

[0035] **FIG. 24** is a side view, in cross section, of a hand-held electronic device.

[0036] **FIG. 25** is a block diagram of a touch sensing method.

[0037] **FIG. 26** is a block diagram of touch sensing method.

[0038] **FIGS. 27A-E** are tables representing one example of a touch vocabulary associated with a music player.

[0039] **FIG. 28** is a block diagram of an exemplary multi-functional hand-held device.

DETAILED DESCRIPTION

I. Multi-Functionality

[0040] Electronic device manufacturers have discovered the advantages of combining separate hand-held electronic devices to form multi-function devices. By having a single multi-function device, a user is not burdened with carrying, purchasing, and maintaining multiple devices. Further, the user is not limited in the operations that can be performed, i.e., the user can perform different operations with a single device that would have otherwise required the use of a different devices.

[0041] As used herein, the term "multi-functional" is used to define a device that has the capabilities of two or more traditional devices in a single device. The multi-functional device may, for example, include two or more of the following device functionalities: PDA, cell phone, music player, video player, game player, digital camera, handtop, Internet terminal, GPS or remote control. For each new device functionality that is added to a single device, the complexity and size of the device tends to increase. Therefore, with hand-held devices, there is typically a trade-off between keeping the footprint small and complexity low while still maximizing the functionality of the device.

[0042] In some cases, combining devices may result in redundant hardware components, which allows components to be used for multiple different, device functionalities. In other cases, certain hardware components are distinct to each device and therefore additional space and connectivity must be made available. Furthermore, each device functionality typically has its own programming or application software and, therefore, the multifunction device must be designed with enough memory to accommodate all the various software components.

[0043] A personal digital assistant (PDA) is a mobile hand-held device that provides computing and information