

is applied to the device (gesturing, shaking, hand waving, etc.), it is transmitted through the housing to the motion sensor.

[0122] Because motion sensors typically measure all motion, not just intended motion, the intended motion information typically must be separated from the other motion information to produce an accurate command signal. For example, large scale movements such as shaking the device will produce primarily low frequency information. Conversely, small scale movements, such as vibrations, primarily produce high frequency information. The high frequency information can be filtered out thereby leaving only low frequency information indicative of the large scale movements (e.g., shaking). The filtered information can then be converted into a control signal.

[0123] FIG. 24 is a side view, in cross section, of a hand-held electronic device 380. The hand-held device 380 includes an accelerometer 382 that is attached to a housing 384 of the hand-held device 380. When the device 380 is moved about by the user, the accelerometer 382 recognizes the motion and a controller of the hand-held electronic device 380 interprets the motion and thereafter performs an action based on the motion event.

F. Mechanical Actuators

[0124] While one would like to eliminate all surface mounted actuators such as buttons and wheels, it is sometimes impractical. Therefore the hand-held device may include some number of surface mounted actuators. Preferably, these actuators are generic to each of the integrated devices. That is, their meaning is the same regardless of what device functionality is activated. It is also preferred that the surface mounted actuators be placed on surfaces other than the front surface, which houses the viewing region of the display, although this is not required.

[0125] One particularly useful mechanical actuator is a hold switch. The hold switch may be configured to activate and deactivate the primary input means, e.g., the touch screen. This permits a user to prevent unwanted entries, for example, when the device is stored inside a user's pocket. In one implementation, the hold switch may be placed on the top surface out of the way of the grasping hand, but in a position for easy access (as opposed to the bottom surface). The hold switch can not only deactivate the touch screen but also mechanical actuators and other input and other input devices.

[0126] Another particularly useful mechanical actuator is a power switch. When the power switch is turned on, the device is powered up and ready to go. When the power switch is turned off, the device is shut down. In one implementation, the power switch may be placed on the top surface out of the way of the grasping hand, but in a position for easy access (as opposed to the bottom surface).

[0127] Another useful mechanical actuator is a navigation pad. The navigation pad is typically included with many hand-held devices. The functionality of the navigation pad may be changed according to the current operating mode of the device. In the case of a music player, for example, the directional keys may be assigned, play/pause, next, previous, and volume up and down. Other assignable buttons may also be included on the device.

[0128] Still another useful mechanical actuator is a switching actuator. The switching actuator may be configured to change the functionality of the device, i.e., by activating the switching actuator the functionality or state of the device switches from one mode to another. The switching actuator may be widely varied.

[0129] For example, the switching actuator may be a dial or wheel. By incrementally rotating the wheel, the device is incrementally switched from one device to the other (generally in some predetermined order). A full rotation of each device generally cycles through the entire group of integrated devices. The wheel or dial may for example operate like a scroll wheel. Although the placement may be widely varied, the switching wheel may be placed in the upper region of the sides of the device. By placing the wheel here, a users thumb may be used to easily rotate the wheel. For example, the users thumb may be extended from the grasping action so that the wheel can be rotated.

[0130] Alternatively, the switching actuator may be a button. By repetitively pressing on the button, the device is switched from one device to another (generally in some predetermined order). Although the placement may be widely varied, the switching button may be placed in the upper region of the sides of the device. By placing the button here, a users thumb or index finger may be used to easily press the button.

[0131] The hand-held device may also include any commercially available touch pad. Several examples of touch pads may be found in U.S. patent application Ser. No. 10/188,182, titled "Touch Pad for Handheld Device," filed on Jul. 1, 2002, U.S. patent application Ser. No. 10/722,948, titled "Touch Pad for Handheld Device," filed on Nov. 25, 2003, and U.S. patent application Ser. No. 10/643,256, titled "Movable Touch Pad with Added Functionality," filed on Aug. 18, 2003.

[0132] In another embodiment, the hand-held device may include a scroll wheel. Scroll wheels can be used in each functionality to scroll through a window.

G. Microphone

[0133] The hand-held device may also include a microphone that picks-up audio sounds. The microphone may be used in conjunction with a cell phone to transmit sounds, such as the user's voice. The microphone may also be used to record sounds or enter voice commands into the hand-held device. For example, using voice recognition software, the hand-held device may be able to recognize voice commands and generated control signals associated therewith. The microphone may be placed in the bottom surface of the hand-held device or possible in the front lower bezel. This particular configuration is well suited for picking up a user's voice during a phone call.

H. Image Sensor

[0134] A hand-held electronic device may also include an image sensor and lens related components so that the hand-held device can operate like a camera. The image sensor may, for example, include a charge coupled device (CCD) camera.