140, a field sensing receiver 142, a switch 146 and a base coil 144. Each of the three base coils 144 of the base transceivers 126 have orthogonal major axes, yet the base transceivers 126 may otherwise be comprised of the same circuitry. The magnetic field source driver 140 and the magnetic field sensing receiver 142 are alternately coupled to the base coil 144 through the switch 146. The switch 146 toggles the functionality of the base transceiver 126 from that of a magnetic field producer to a magnetic field receiver through its associated base coil 144.

During operation, a first axis of the base transceiver 126 produces a magnetic field through the magnetic field source driver 140, thereby charging the coils 128*a*, 128*b* and 128*c* as a function of their degree of co-linearity with the transmitting base transceiver 126, their relative frequencies, and their distance from the base transceiver 126. Next, the switch 146 toggles and the operation of the base transceiver 126 changes. The field sensing receiver 142 measures the decay as the energy stored in the coils 128*a*, 128*b*, and 128*c* discharges. This process is repeated for each major axis, thereby providing the data necessary to calculate the position and angle of the finger-mounted device 120 with respect to the base unit 122 in three dimensions.

In another embodiment, the base unit 122 includes a single base transceiver 126 for the three coils 128*a*, 128*b*, 128*c*. In this embodiment, the base transceiver 126 includes three independent orthogonally-oriented base coils 144, one for each of the three axes. A portion of the electronics forming the base transceiver 126 is multiplexed between operating on each of the three base coils 144 independently.

Coil 128*a* is in series with a normally closed switch 130 that is opened by pressing the button 132 located at the tip 134 of the finger-mounted device 120. The purpose of the button 132 is to allow the user to select an input option. To select an input option, the user simply presses the button 132. The transient response detected by the magnetic field sensing receiver 142 of the base transceiver 126 when the switch 130 is opened informs the system that the button 132 has been depressed and that the user has selected an input option, i.e. selected a key. While the button 132 is depressed, the coil 128*a* is inoperable. The inoperability of the coil 128*a* does not cause a problem for the system because the system is not expected to operate as long as the user maintains actuation of a specific input option, i.e. a specific key.

The third coil 128*c* is electronically coupled to a finger sensor 136. The finger sensor detects the presence or absence of an additional user finger. To toggle between two different input modes, the user may place a second finger adjacent the finger sensor 136 or remove the second finger from being adjacent to the finger sensor 136, depending on the current location of the second finger. When the additional finger is absent, the electronic system is placed in the first input mode. When the additional finger is present, the electronic system is placed in the second input mode.

In one embodiment, the finger-mounted device 120 includes two finger sensor plates 136*a*, 136*b*. When the additional finger is not contacting the contact sensor plates 136*a* and 136*b*, the electronic system is placed in the first mode. When an adjacent finger 138 contacts sensor plates 136*a* and 136*b*, the capacitance of the body provides a transient response that indicates that the user wants the electronic system placed in the second input mode. In one embodiment, the location of the finger sensor plates 136*a* and 136*b* is slightly distal to the first phalangeal joint of a user's finger when the finger-mounted device 120 is worn on one of the user's fingers. The two use modes may be further identified by the relative measurement provided at either side of transient

FIG. 13 shows another embodiment of a finger-mounted virtual input device 148 capable of being used in multiple input modes. The input device 148 is implemented with magnetotransistors. The finger-mounted device 148 includes at least two magnetotransistors 150 mounted to a hybrid integrated circuit (IC) 152. The magnetotransistors 150 measure the displacement of the input device 148 within the Earth's magnetic field along two axes. To increase robustness in free space, in one embodiment a third magnetotransistor is used. Similar to the input device 120 described above and shown in FIG. 11, a button 154 located at the tip of the input device 148 provides intended actuation data indicating that the user selected one of the input options. Upon start-up, a first press of the button 154 initializes the finger-mounted input device 148 by measuring the local magnetic field and establishing a use orientation for that particular session. Communication with the processor 14 (shown in FIG. 1) is effected through a body local area network (LAN) driven by the hybrid IC 152 and powered by a battery 156.

In one embodiment, the input device 148 also includes the sensor 136 (shown in FIG. 11) located on the side of the finger-mounted device 148, and proximate to an adjacent finger of the user's hand. The sensor 136 determines when the user's adjacent finger is in physical contact with the finger-mounted device 148, as described above in the discussion of FIG. 11. Placing an adjacent finger next to the sensor 136 may be used for various control features. In one embodiment, placing an adjacent finger next to the sensor 136 toggles the electronic system from a first input mode to a second input mode.

Having described preferred embodiments of the invention, it will now become apparent to one of skill in the art that other embodiments incorporating the concepts may be used. It is felt, therefore, that these embodiments should not be limited to disclosed embodiments but rather should be limited only by the spirit and scope of the following claims.

What is claimed is:

1. A method for toggling between a first input mode and a second input mode in an electronic system, comprising the steps of:

providing an electronic system having a first input mode and a second input mode;

providing a sensor in communication with the electronic system, the sensor being capable of distinguishing between a single user finger and a plurality of user fingers;

placing the electronic system in the first input mode upon sensing only the single user finger; and

placing the electronic system in the second input mode upon sensing the plurality of user fingers.

2. The method of claim 1 wherein the step of providing an electronic system further comprises the step of providing an electronic system having a keyboard input mode and a mouse input mode, wherein the step of placing the electronic system in the first input mode further comprises the step of placing the electronic system in the keyboard input mode, and wherein the step of placing the electronic system in the second input mode further comprises the step of placing the electronic system in the mouse input mode.

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