[0018] FIG. **5**B illustrates a top-side view of one embodiment of a sensor array of sensor elements for detecting a presence of a conductive object on the sensor array of a touch-sensor slider.

[0019] FIG. **5**C illustrates a top-side view of one embodiment of a two-layer touch-sensor pad.

[0020] FIG. **5**D illustrates a side view of one embodiment of the two-layer touch-sensor pad of FIG. **5**C.

[0021] FIG. **6**A illustrates one embodiment of a sensing device having three buttons and three pins.

[0022] FIG. **6**B illustrates one embodiment of a graph of the sensitivity of each button of FIG. **6**A.

[0023] FIG. **6**C illustrates a graph of a sensitivity of a single touch-sensor button.

[0024] FIG. **6**D illustrates a graph of capacitance measured on a single touch-sensor button.

[0025] FIG. **7**A illustrates one embodiment of a sensing device that has three touch-sensor buttons coupled to one pin.

[0026] FIG. **7**B illustrates a graph of one embodiment of sensitivities of the three touch-sensor buttons of FIG. **7**A.

[0027] FIG. **8**A illustrates one embodiment of a sensing device having two touch-sensor buttons coupled to one pin.

[0028] FIG. **8**B illustrates one embodiment of a sensing device having four touch-sensor buttons coupled to one pin.

[0029] FIG. **9**A illustrates one embodiment of a sensing device having three keyboard keys and three sensor elements.

[0030] FIG. **9**B illustrates a graph of one embodiment of the sensitivities of the three button areas of the sensing device of FIG. **9**A.

DETAILED DESCRIPTION

[0031] Described herein is an apparatus and method for distinguishing a particular button operation from among multiple button operations on a sensing device having multiple sensor elements that are electrically coupled together. The following description sets forth numerous specific details such as examples of specific systems, components, methods, and so forth, in order to provide a good understanding of several embodiments of the present invention. It will be apparent to one skilled in the art, however, that at least some embodiments of the present invention may be practiced without these specific details. In other instances, well-known components or methods are not described in detail or are presented in simple block diagram format in order to avoid unnecessarily obscuring the present invention. Thus, the specific details set forth are merely exemplary. Particular implementations may vary from these exemplary details and still be contemplated to be within the spirit and scope of the present invention.

[0032] Embodiments of a method and apparatus are described to distinguish between multiple button operations on multiple sensor elements of a sensing device that are electrically coupled to each other and to a single pin of a processing device. In one embodiment, the method may include detecting a presence of a conductive object on a sensing device having multiple sensor elements that are electrically coupled, each sensor element corresponding to a button operation, and distinguishing between the multiple button operations. In one embodiment, the apparatus may include a sensing device coupled to a processing device. The sensing device may include a first sensor element that performs a first button operation and a second element that performs a second button operation. The first and second buttons are electrically coupled to detect a presence of a conductive object on the sensing device. The processing device may be configured to distinguish a particular button operation from among the first and second button operations. In effect, the processing device may be configured to determine which button has been activated by the presence of the conductive object using one pin coupled to the two (or more) buttons of the sensing device.

[0033] As described herein, sensitivity of the sensing device is proportional to surface area of the conductive material of the button (button area). One pin that is coupled to multiple buttons may be used to detect multiple button operations if the area differences of these buttons areas are larger enough to create enough sensitivity to distinguish from among the multiple button operations. For example, if the sensitivity range of the first button (T**1**), the second button (T**2**), and the third button (T**3**) are configured to be greater than the threshold level (of detecting a presence of a conductive object), the button operations performed by activating the corresponding buttons (T**1**, T**2**, and T**3**) can be distinguished.

[0034] By using one pin to detect multiple button operations, the power of the electronic system may be reduced. In addition, the scan time of the sensing device may be reduced because multiple buttons may be scanned on one pin, instead of on multiple pins, like in the conventional systems. The embodiments described herein may be used for applications of touch-sensor buttons. Alternatively, the embodiments described herein may be implemented in a keyboard. For example, in a traditional stack-up of a conventional keyboard there are four layers, plastic film layer, insulator layer, pad layer, and routing layer. In one embodiment, multiple keyboard keys may be implemented using multiple buttons areas in the pad layer. The pad layer may operate as a conductive object that is detected by the sensing device. The keyboard keys press against the pad layer, allowing the button area of the pad layer that corresponds to the pressed keyboard key to move towards the routing layer. The routing layer also has conductive material (e.g., button area) that operates as a sensor element to detect the presence of a conductive object, and route the signal from the sensing device. As the button area of the pad layer approaches the button area of the routing layer, the routing layer detects the presence of the button area of the pad layer (e.g., conductive object). Different surface areas may be used between the multiple buttons of the keyboard in order to create different sensitivities ranges for distinguishing between the multiple button operations performed on the keyboard. This embodiment may also be used to reduce the pin count for the keyboard.

[0035] FIG. **2** illustrates a block diagram of one embodiment of an electronic system having a processing device for detecting a presence of a conductive object. Electronic system **200** includes processing device **210**, touch-sensor pad **220**, touch-sensor slider **230**, touch-sensor buttons **240**, host processor **250**, embedded controller **260**, and non-capacitance sensor elements **270**. The processing device **210** may include analog and/or digital general purpose input/output ("GPIO") ports **207**. GPIO ports **207** may be programmable. GPIO ports **207** may be coupled to a Programmable Interconnect and Logic ("PIL"), which acts as an interconnect between GPIO ports **207** and a digital block array of the processing device **210** (not illustrated). The