[0077] In this case, the desire is to select the one and only one key which is intended by the user while suppressing outputs from adjacent keys intersected by the fingerprint. In this 'position-dependent' key suppression invention, the output signal from upper key **12** is favoured over the signal from lower key **14**, albeit in this case that the signal from key **12** is stronger than that from key **14**.

[0078] Referring to FIGS. **8** and **9**, there is shown an array of capacitive keys in a key panel **10** in which a fingerprint represented by outline **22** (in dashed lines) encompasses four different keys **12**, **14**, **16**, **18**. The user's fingerprint **22** has a centroid location A which is just above key **14** and between keys **12**,**14**. An output signal is measured from each of keys **12**, **14**, **16**, **18**, but the signal from key **14** has the maximum strength because the fingerprint outline **22** encompasses the whole of key **14**. As shown in FIG. **9**(*a*), the signal from each of keys **12** and **14** is above a threshold value. Key **14** would initially be the favoured key. However, as shown in FIG. **9**(*b*) in accordance with the invention, the output signal from key **14** is suppressed and the output signal from key **12** is enhanced, so that the upper key **12**'wins' and becomes the user-selected key. In the invention, the signals from keys **14**, **16**, **18** can be suppressed and/or the signal from key **12** can be enhanced. Therefore, the invention allows an upper key (key **12** in FIG. **8**) having a weaker signal to become dominant with respect to a lower key (key **14** in FIG. **8**) having a stronger signal, even if the measured signal from key **12** is below a threshold value. Signal enhancement can be directed to the 'intended' key **12** due to the upper position of the key in the region of keys that are touched. An algorithm may be executed by a controller to enhance or activate the measured signal from key **12**. In an alternative embodiment, the keypad comprising an array of capacitive keys may be in the form of a capacitive touch screen or touch pad.

[0079] Referring to FIG. **10**, there is shown a mobile phone handset **30** comprising an array of capacitive keys in a key panel similar to that shown in FIG. **8**. The corresponding features in FIG. **10** have the same reference numerals as those in FIG. **8**. The output signal from key **12** (representing no. 5 on the key panel) is enhanced with respect to the signal from key **14** (representing no. 8 on the key panel) so that key **12** becomes the user-selected key. The invention is particularly useful where a user inadvertently touches keys **14** and **18**, despite wishing to press the intended key **12**.

[0080] Referring to FIG. **11**, there is shown an array of closely spaced capacitive keys in a key panel **50** which may form part of a mobile phone handset. The keys of the key panel **50** represent numerals 1 to 9. Keys 1, 2 and 3 are located on an upper level designated A of the key panel **50**; keys 4, 5 and 6 are located on a middle level designated B; and keys 7, 8 and 9 are located on a lower level designated C of the key panel. A fingerprint represented by outline **52** (in dashed lines) encompasses 7 different keys 1, 2, 4, 5, 6, 8, 9. The user's fingerprint **52** has a centroid location which is on key number 5. The amount of intersecting surface area between the dashed line and each key area is a reasonable representation of the amount of signal level change each intersected key will receive due to the touch. Often when a user's finger approaches an intended key to be selected, the finger is at an angle to the keys on the key panel. The finger outline **52** illustrates a touch on the key panel **50** which is at an angle to the keys as the finger (not shown) touches the key panel. The intended key to be selected by the user is key number 1 on upper level A. The tip of the finger touches key 1, however the fingerprint also encompasses keys 2, 4, 5, 6, 8 and 9. The output signal from key 5 has the maximum signal strength. The signals from keys 1, 2, 4 and 8 are above a threshold value. Key 5 would initially be the favoured key as it has the highest signal strength, but in accordance with the invention keys 1 and 2 on the upper level A are selected by enhancing their signal strength and suppressing the signals from keys 4, 5, 6, 8 and 9. The invention preferentially selects an upper key based on its position in relation to other keys and based on the angle of touch by a person's finger.

[0081] In this case, the output signal from each of keys 1 and 2 caused by capacitive coupling with a user's finger is above a threshold value and of substantially the same strength. An algorithm may be executed by a controller to ignore the signals from keys 1 and 2 until the user moves his finger away from key 2 to the intended key 1 so that the signal from key 2 is reduced.

[0082] If a user touches two keys on the same level of the key panel, for example keys 7 and 8 on lower level C, then the DI system disclosed in U.S. Ser. No. 11/279,402 (published as US 2006-0192690 A1) may be used to select the desired key.

[0083] In an alternative embodiment, the output signal from the intended key 1 may not need to be enhanced to make it the user-selected key. An algorithm executed by a controller may be able to process the signals from keys 1, 2, 4, 5, 6, 8 and 9 and make key 1 the user-selected key based on the vector of touch illustrated in FIG. **11**. An algorithm can be arranged to process different vectors of touch so as to determine the user-selected key, in this case the key 1 on upper level A.

[0084] There are, of course, many possible variations and extensions of the procedure. For example, one may consider a rare case in which a user brings his or her finger up to a keyboard so that the point of touch is exactly between two keys. In this case, one could modify the depicted process to either select just one of those keys (e.g., by means of a known pseudo-random number selection algorithm, or by sample sequence order) or by suppressing the output of both keys until the user move his or her finger enough that one of the two keys had a higher output than the other.

[0085] Furthermore, although the above description has focussed on capacitive sensing technologies, embodiments of the invention may be based on other coupling mechanisms, e.g. magnetic coupling mechanisms. For example, the sensing areas may be provided by magnetic field sensors and a pointing object may be magnetized do that the magnetic field sensors are sensitive to its proximity. Other non-contact coupling mechanisms could also be used.

[0086] Thus apparatus and methods are described for selecting which of a plurality of simultaneously activated keys in a keyboard based on capacitive sensors is a key intended for selection by a user. In embodiments of the invention keys are preferentially selected as the user intended key based on their positions within the keyboard. Thus a key which is frequently wrongly activated when a user selects another key, e.g. because the key is adjacent the intended key and the user normally passes his finger over it while approaching the desired key, can be suppressed relative to the desired key based on their relative positions. For example, keys may be associated with predefined rankings according to their position within the keyboard and in use keys are preferentially select according to their rankings. Alternatively, signals from the keys may be scaled by