

## MULTIFUNCTIONAL KEYPAD ON TOUCH SCREEN

[0001] This is a continuation-in-part of application no. PCT/US01/04706 filed Feb. 13, 2001, which is a continuation of application Ser. No. 09/518,634 filed Mar. 3, 2000.

### FIELD AND BACKGROUND OF THE INVENTION

[0002] The present invention relates to data input devices and, in particular, it concerns a multifunctional keypad implemented on a touch screen.

[0003] Alphanumeric data entry methods for compact electronic devices pose various problems. Mechanical keypads are one of the most popular methods, but they suffer from large space consumption that in many cases is not practical in compact mobile environments. One solution to the compactness problem is to use a mechanical multifunctional keypad. Several such solutions have been suggested, for example:

[0004] U.S. Pat. No. 4,029,915—S. Ojima, “Miniaturized calculator keyboard switch assembly having universally pivoted key actuators”

[0005] U.S. Pat. No. 5,852,414 S. H. Yu, D. H. Yu “4-way triangle shaped alphanumeric keypad”

[0006] U.S. Pat. No. 5,528,235—E. Lin & W. Lin “multi-status multi-function data processing key & key array”

[0007] U.S. Pat. No. 5,861,823 G. J. Strauch & P. Samola, Data entry device having multifunction keys.

[0008] Another group of solutions that has gained popularity lately in PDA device is the use of a touch screen. Entering alphanumeric text using a touch screen is done either by hand writing recognition or using small keypads referred to in some literature as a “soft keypad”.

[0009] The data entry, in both cases, is done with the aid of stylus since the tip of the finger cannot give the required accuracy.

[0010] Hand writing recognition suffers from high rate of errors that reduce drastically the speed of typing and the convenience of operation. A soft keypad on a PDA screen of typical size suffers from a very small footprint for each key, which requires considerable user concentration and hence degrades the speed and comfort of use. In both cases, the user needs to employ a stylus for data entry. This is inconvenient, particularly in cases where frequent entry of short memos or the like, where the stylus must be retrieved frequently from its storage position.

[0011] There is therefore a need for a compact multifunction keypad which would not require great precision of use and which could be conveniently and effectively operated by use of the finger.

### SUMMARY OF THE INVENTION

[0012] The present invention is a multifunctional keypad implemented using a touch screen, and a corresponding method for operating a keypad.

[0013] According to the teachings of the present invention there is provided, a multifunction keypad comprising: (a) a touch-sensitive surface having defined thereon a plurality of

regions designated as keys; and (b) a processor associated with the touch-sensitive surface and configured to: (i) identify a contact location at which an object comes into contact with the touch-sensitive surface, (ii) determine a selected one of the keys corresponding to the one of the regions within which the contact location is located, (iii) identify a direction of motion of the object across the touch-sensitive surface relative to the contact location, and (iv) select in a manner conditional upon at least the direction of motion one of a plurality of functions associated with the selected key.

[0014] According to a further feature of the present invention, the touch-sensitive surface is a touch-sensitive display screen.

[0015] According to a further feature of the present invention, the processor is configured to select a first of the plurality of functions if the direction of motion falls within a first range of angles and a second of the plurality of functions if the direction of motion falls within a second range of angles non-overlapping with the first range of angles.

[0016] According to a further feature of the present invention, the processor is configured not to select any of the plurality of functions if the direction of motion falls within a third range of angles interposed between the first range of angles and the second range of angles.

[0017] According to a further feature of the present invention, the first range of angles is greater than the second range of angles.

[0018] According to a further feature of the present invention, the processor is further configured to determine a length of motion of the object across the touch-sensitive surface relative to the contact location.

[0019] According to a further feature of the present invention, the processor is configured to select a first of the plurality of functions if the length of motion falls within a first range of lengths in a given direction and a second of the plurality of functions if the length of motion falls within a second range of lengths in the given direction.

[0020] According to a further feature of the present invention, the processor identifies a length of motion below a given value as a touch-and-release condition.

[0021] According to a further feature of the present invention, the processor is configured not to select any of the plurality of functions on occurrence of a touch-and-release condition.

[0022] According to a further feature of the present invention, the processor is configured to select a first of the plurality of functions if the direction of motion falls within a first range of angles, and wherein the processor is configured to select the first function additionally on occurrence of a touch-and-release condition.

[0023] According to a further feature of the present invention, one of the plurality of functions is selected by the processor exclusively on occurrence of a touch-and-release condition.

[0024] According to a further feature of the present invention, a plurality of the keys provide at least four direct functions per key.