

[0058] The path of the movement of the touch from the initial contact point on the touch screen until the removal of the finger or the stylus from the touch screen is referred to herein as the “trace”. In FIG. 2a three traces 500, 502, 504 are shown. Trace 500 is completely in zone 302 hence the keypad controller select the character ‘I’ as the selected outcome. Trace 502 is completely in zone 300 so the selected function is ‘H’. Trace 504 although in the beginning of the trace go through zone 306, most of the rest of the trace is in zone 304. In this case the keypad controller decision is preferably set to select the number ‘4’. In some implementation when a mistake should be absolutely avoided, such trace would not accepted by the keypad controller and error indication should be given to the user. To reduce unwanted errors it is also possible to create some forbidden zones as demonstrated in sequel for the 3-way function key in FIG. 3a.

[0059] In FIG. 2b the initial contact point 92 is on the upper left side of the key. Even in such event the configuration of the zones kept the same as in FIG. 2a however the zones 300, 302, 304, 306 are shifted to the up and to the left according to the location of the initial contact point 92. Trace 506 in this example will indicate the letter ‘I’ although the trace is close to the label ‘H’. Trace 508 will indicate the letter ‘H’. The fact that the trace is leaving the border of the key is not relevant to the decision even when the trace go over adjacent keys as well. Trace 510 is going over zone 304 and 306 causing an ambiguity situation. In this case the keypad controller will not activate any function and optionally an error indication may be given to the user.

[0060] In FIG. 3a the implementation detail of key 106, a 3-way multi-function key is given. There are 5 zones defined by five rays 410, 412, 414, 416, 418 emerging from the initial contact point 90. Three zones assigned to the functions as follows: zone 310—delete character backward (known also as backspace), zone 312—ENTER and zone 314—SPACE.

[0061] Zone 316 defined between the rays 414 and 416 is in adjacent to the backspace zone is created as an forbidden zone in order to minimize the error event of activation a backspace function by mistake when trying to activate the ENTER function.

[0062] The upper zone 318 defined between the rays 410 and 418 is forbidden zone since no function is assigned to the upper side of the key. The fact that no function is assigned to the upper side of the key is used to slide ray 410 upwards and create larger zone for the space function. Since the use of space function is very frequent enlarging the space zone give the user more convenient activation of that function. Later on we will see another effective way to give a function activation advantage over the other function in the key. From the example of key 106 it is obvious that controlling the zones configuration can change some design goals of trading false activation with activation convenience.

[0063] Traces 512 reside completely on zone 318 which is a forbidden zone hence the keypad controller will not activate any function and error indication will be given to the user. Trace 514 will associate by the keypad controller to zone 316 which is also a forbidden hence the keypad controller will not activate any function and error indication will be given to the user as well.

[0064] Trace 516 reside on zone 312 hence ENTER function will be activated.

[0065] FIG. 3b show the same key 106 when the initial contact point 94 is in the lower left side of the key. As can be shown in the figure the rays 410, 412, 414, 416, 418 and zone 310, 312, 314, 316, 318 are shifted according to the initial contact point 94 but their constellation is not change. Trace 518 is associated to the function SPACE. In the rest of the document we will always show the initial contact point in the center of the key for sake of clarity and simplicity. It should be noted, however, that the initial contact point can be in any place over the key and the zones and zone boundaries are shifted in the touch screen according to actual initial contact point on the key, as illustrated above with reference to FIG. 2B.

[0066] Referring back to FIG. 1, key 104 is a 4-way soft key that have the following functions: The left one is shift operation which toggle between upper and lower case letter for the next key press duration. When activating this key the label on the key will be highlighted and the letters on all the other keys optionally change to lower case. After one letter activation the letters will change back to capitals and the highlighted label will go back to its normal state. If the upper function (Caps lock) is activated the label ‘a’ will change to A and the letter label will change to lower case until the user will switch back to upper case. The lower function, SYM, change the labels on the keypad to support entry of additional symbols like \$, %, @, &, etc. The right operation on key 104 is dedicated to switch the keypad language. In the figure the label is the familiar symbol for indicating a change to Hebrew language. When this function is activated the letters will change to Hebrew letter according to Israeli standard 4514. The label will change to ‘E’ to indicate the back switch to English keypad. Other languages obviously can be supported as well. The functions on key 104 demonstrate the well-known strength of dynamic labeling used on soft keypad.

[0067] It will be noted in this context that, by use of the shift key, symbol key, language settings or other shift or toggle keys, each multifunction key may actually perform many different functions. Nevertheless, for the purpose of designating the number of functions which can be selected by a key, reference is made to “direct functions”, namely, functions which can be selected directly from the key in its current state.

[0068] The basic alphanumeric data entry is based on the upper 3x4 4-way matrix. The lower function on this key matrix is the standard 12 key phone keypad while the other 3 function in each key is assigned to the Latin letter according to the standard phone letter to number association. According to the standard layout referred to herein as the “telephone-type alphanumeric keypad”, the 26 letters of the alphabet are assigned to the numerals 2-9. Most of the keys thus have one numeral and three letters, totaling four functions. However since the ‘7’ key and the ‘9’ key are associated with four letter each, there is one letter in each of those keys that can not be allocated. In U.S. Pat. No. 5,528,235 the solution was to have 5-ways keys instead of 4-way keys. However, such solution tends to overload the keypad in additional functions that are not essential to basic data entry, produce additional complexity to the user and either enlarge the key size by a factor of approximately 1.5 or reduce the label size in the key by 1.5. All of these disadvantages are a high cost for the five-function demand which is relevant to only 2 out of 12 keys.