

[0015] FIG. 5 is a flow chart relating to sub-steps of one of the steps of the flow chart of FIG. 4.

DETAILED DESCRIPTION OF THE  
PREFERRED EMBODIMENT OF THE  
INVENTION

[0016] In the drawings, like numerals on different figures are used to indicate like elements throughout.

[0017] In brief, in a mobile telephone with a virtual keyboard and a touch screen, individual virtual keys have their own representative positions. During a selection operation to select a key, where the touch screen is touched becomes the selected position. The distance between the selected position and adjacent representative positions is used to decide a first set of candidate keys. These candidate keys are then used to provide a set of potential words that would result from the input of any one of those keys. A list of candidate words is then produced based on the frequency of use of the words in the set of potential words and the distances between the selected position and the representative position of the keys. Once a key is confirmed as having been selected, the offset between the selected position and the representative position of that key is used to re-calibrate that representative position.

[0018] With reference to FIG. 1 there is illustrated a mobile telephone 10, embodying the invention. The telephone 10, as shown in this embodiment, has a touch screen 12, with an image spilt between a virtual keyboard area 14 and a message area 16. However, as will be apparent to a person skilled in the art, the area and position of the virtual keyboard can be selected a user. Also, Various control buttons 18 exist on the body of the telephone 10.

[0019] A virtual keyboard 20 is displayed in the image in the virtual keyboard area 14. The virtual keyboard 20 is made up of a number of individual selectable portions in the form of virtual keys 22, each of which has its own display area. There are separate keys 22 for every letter of the alphabet (typically in QWERTY arrangement) and for numbers 0-9. There are also keys 22 for punctuation marks, some accented letters, formatting keys, etc. For the purposes of this description, the term "symbol" covers the output from any key of the keyboard at least, whether it is a letter, number, punctuation mark or even just a space.

[0020] In a selection operation, by touching one of the virtual keys 22 of the virtual keyboard 20, the symbol on that key is selected to appear as the next symbol in a message line 24 in the message area 16. A stylus (not shown) is ideally used to select individual virtual keys 22 as it allows greater accuracy of touch or contact on the touch screen 12 than a finger.

[0021] The mobile telephone 10 includes predictive word input technology to help anticipate what the user is trying to input, with reference to a dictionary database. The predictive word input technology supplies a list of words to a list display area 26, which list is displayed in the message area 16, the list containing word choices to offer the user, so that he does not have to type the complete word. The user touches one of the words in the list display area 26 and the selected word then appears in the message line 24.

[0022] FIG. 2 is a schematic view of the touch screen circuit 30. Horizontal and vertical sensors 32, 34 are

arranged to detect the point of contact, the selected position, of a touch on the touch screen 12. This information is supplied as signals  $S_x$ ,  $S_y$  indicative of X and Y co-ordinates to a screen driver circuit 36 to interpret and to react accordingly. For instance if the driver circuit 36 interprets a touch as the selection of a letter, that letter appears in the message line 24 at the appropriate position or a list of words 26 appears for the user to select from. The screen driver circuit 36 has a processor 38 and a memory 40 containing, inter alia: the dictionary database, the current contents of the message line 24 and the X and Y positions of the keys 22 of the virtual keyboard 20. The information in the memory 40 on the positions of the keys 22 includes their representative positions, which is a single X, Y co-ordinate point associated with each key 22, as well as details of their display areas, that is where they extend in the display.

[0023] In this embodiment, touching a key 22 on the virtual keyboard 20 is not simply taken as a selection of that key. There may have been a mistake owing to parallax error and/or inaccurate aim. Instead, the driver circuit 36 uses the selected position relative to the representative positions of the keys to determine possible candidates (candidate keys) for the desired symbol. It also uses the offset between the selected position and the representative positions of the candidate keys and predictive word input technology to derive a list of candidate words. The word choices made available are taken from those that exist in the database dictionary, based upon the letters that have already been input in the current word string and how frequently the potential words are used. This is displayed and the user selects one of them if and as desired.

[0024] FIG. 3 is a close up of an area of the virtual keyboard 20. This area is roughly centred on the letter keys for "t", "y", "g" and "h", each with its own representative position 50t, 50y, 50g, 50h. Assuming the user touches the screen 12 at the point 52, marked with an X, he may, indeed, have wanted to select the letter "h", as the selected position 52 falls within the display area 54h for that letter. On the other hand, he may have been aiming at the "t", "y" or "g" key and missed. After all, the selected position 52 is only just on the "h" key and, due to the staggered alignment of the rows of keys, is actually closer to the centre of the "y" key than to the centre of the "h" key. It is also not much further away from the centres of the "t" and "g" keys.

[0025] In brief, operation of the keyboard proceeds as follows. When a touch is detected at the selected position 52, the horizontal and vertical sensors 32, 34 pass the selected position 52 by way of signals  $S_x$ ,  $S_y$  to the driver circuit 36. The processor 38 makes decisions and causes the display to be updated with a new symbol and a list of other candidate symbols or a list of candidate words. If a candidate symbol or word is chosen by the user or a preceding displayed symbol or string of symbols is in some other way approved (e.g. by the input of a space or line return), the processor 38 then re-calibrates certain representative positions in the memory 40.

[0026] The processor 38 may be a microprocessor or other circuit that is wired to operate according to the described operation. However, it is more likely and will become even more so that it will be embodied in software stored in non-volatile memory. Thus, in that the invention covers apparatus operable to perform certain processes, it includes