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(54) **MOBILE PHONE AND METHOD**

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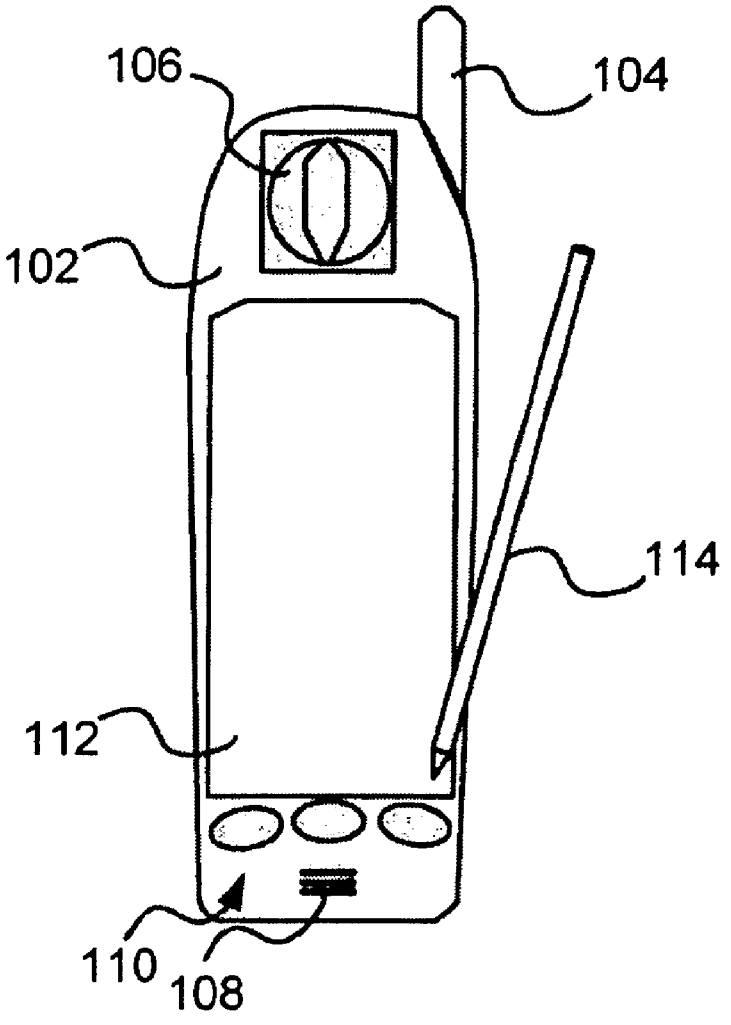
(57) **ABSTRACT**

A method for inputting characters to a mobile communication apparatus is disclosed. The method includes enabling input of strokes representing a first character in a first area of a touch sensitive display; determining the first character from the strokes; determining one or more candidates of characters for word association with the first character; presenting the one or more candidates on the display; and enabling selection among the one or more candidates. A mobile communication apparatus includes means for inputting characters is also disclosed.



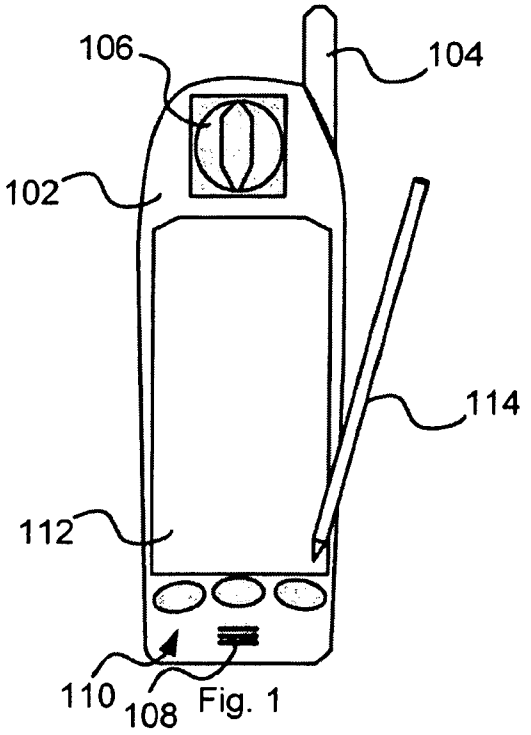


Fig. 1

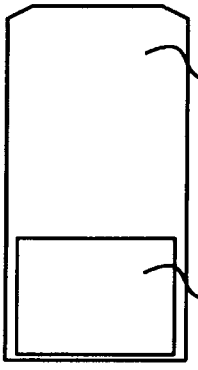


Fig. 2

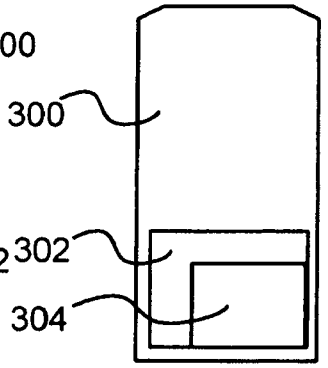


Fig. 3

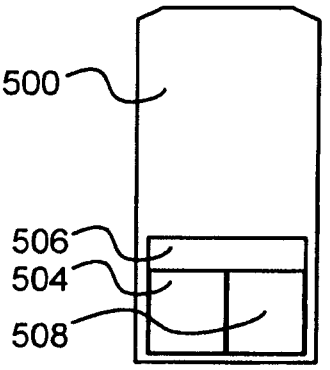


Fig. 5

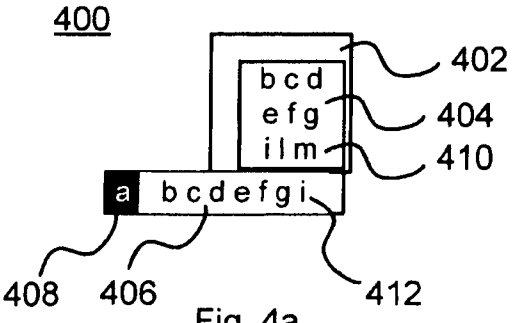


Fig. 4a

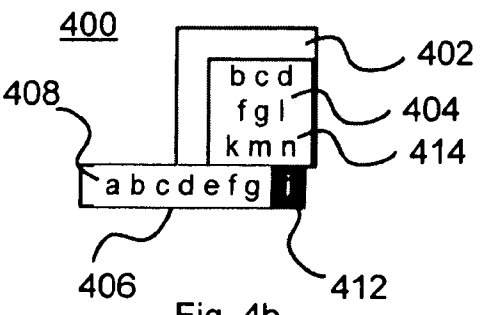


Fig. 4b

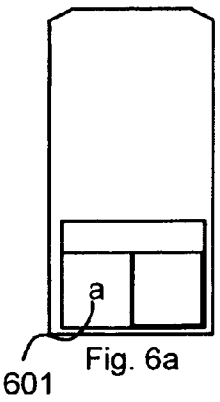


Fig. 6a

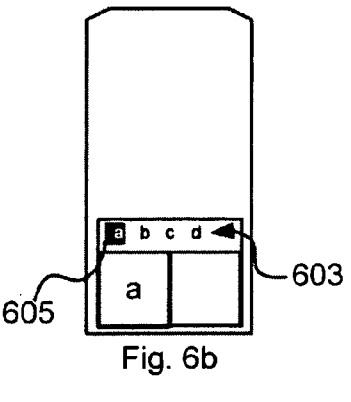


Fig. 6b

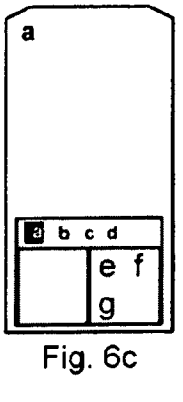


Fig. 6c

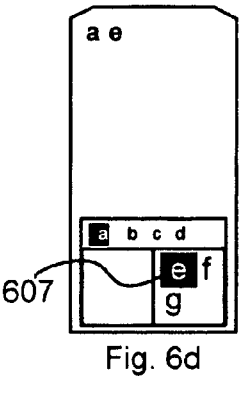


Fig. 6d

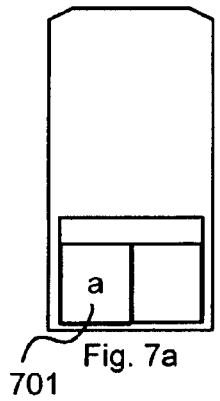


Fig. 7a

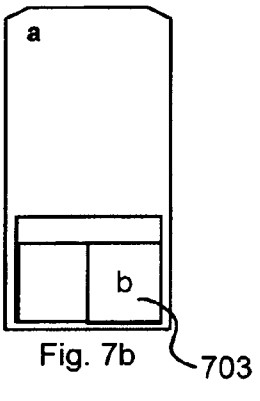


Fig. 7b

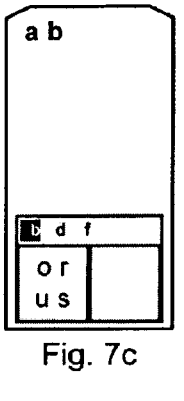


Fig. 7c

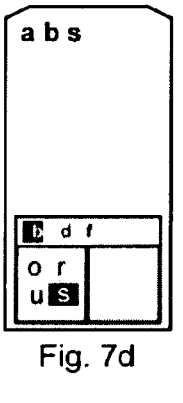


Fig. 7d

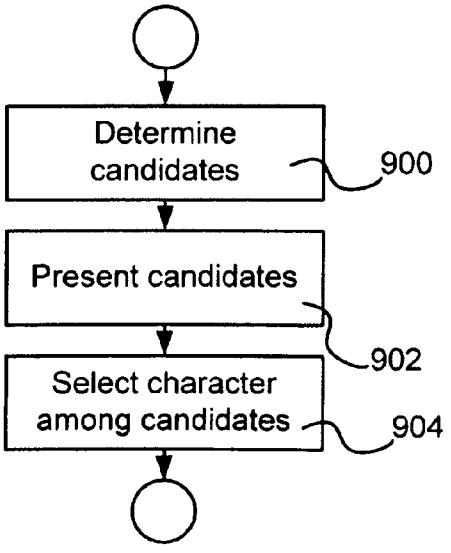


Fig. 9

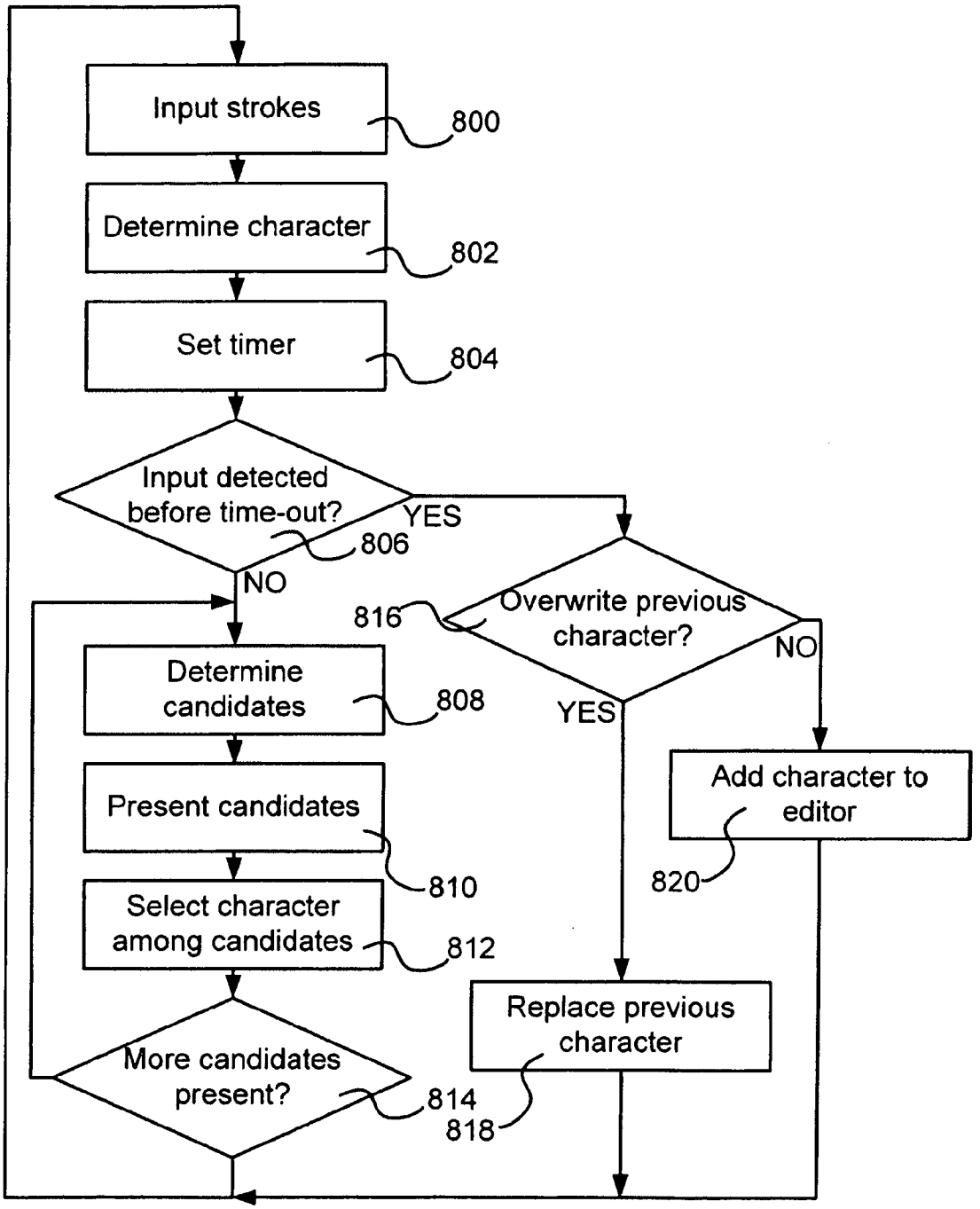

Input strokes
800
Determine character
802
Set timer
804
Input detected before time-out?
YES
806
NO
816
Overwrite previous character?
NO
YES
Determine candidates
808
Present candidates
810
Select character among candidates
812
Add character to editor
820
Replace previous character
818
More candidates present?
814

Fig. 8

MOBILE PHONE AND METHOD

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation of, and claims the benefit of and priority to U.S. patent application Ser. No. 10/978,954, filed Nov. 1, 2004, now allowed, which the disclosure of which is incorporated by reference herein in its entirety.

BACKGROUND

[0002] 1. Field

[0003] The disclosed embodiments relate to a method for inputting characters to a mobile communication apparatus, and such a mobile communication apparatus.

[0004] 2. Brief Description of Related Developments

[0005] There are several ways to input characters in a mobile communication apparatus. In a mobile communication apparatus comprising a touch sensitive display, it is possible to virtually write characters on the screen with a stylus. A processor of the apparatus then interprets the written character, and the interpreted character is input.

[0006] The input of information to a mobile communication apparatus by virtually writing on the screen of the mobile communication apparatus is a very feasible way to input information, since most users are familiar with normal writing. However, the interpretation of an input character is not 100% accurate, e.g. due to personal handwriting. Further, some characters may be relatively complex to write, and also complex to interpret. An example of this is some Chinese characters. Therefore, the user desires a facilitated way of inputting information.

SUMMARY

[0007] The disclosed embodiments provide an improved input method and an improved mobile communication apparatus.

[0008] According to a first aspect of the disclosed embodiments a method for inputting characters to a mobile communication apparatus, comprises enabling input of strokes representing a first character in a first area of a touch sensitive display; determining the first character from the strokes; and detecting if further characters are input within a predetermined time period, and if no further characters are detected within the time period performing the steps of: determining one or more candidates of characters for word association with the first character; presenting the one or more candidates on the display; and enabling selection among the one or more candidates.

[0009] An advantage of this is that a user that writes characters fast will be able to do so, until the user do not manage to write fast. Then, the user will get help by the presentation of likely characters to follow. Thus, the user will experience an input method that adapts to the input skills of the user. A further advantage of this is that computing power is saved when a user do not need help with likely characters to follow.

[0010] The input area may comprise a first and a second input area, wherein the input method may comprise:

[0011] enabling input of further characters in the first and second areas alternately; and

[0012] enabling correction of a character by inputting a character in the same of the first and second areas as the preceding character. An advantage of this is that the user is enabled to make up her mind, or correct an incorrect input or incorrect interpretation of an input character.

[0013] The input of a character may be performed in one of the first and second areas and the presentation of candidates is performed in the other of the first and second areas.

[0014] An advantage of this is that space is saved on the display.

[0015] An input may be determined to be a stroke if the input is within the input area, and determined to be a selection if the input is outside the input area.

[0016] An advantage of this is that it is easily determined by the mobile communication apparatus which kind of input it is, and it is more clear for a user how to choose between writing and selection.

[0017] The step of determining the first character from the strokes may comprise: determining one or more candidates of characters being likely to be the input character; presenting the one or more candidates on the display; and enabling selection among the one or more candidates.

[0018] An advantage of this is that the writing is facilitated for the user.

[0019] The presenting of candidates of likely characters may be performed in a presentation area of the display, and the selection may be performed by pointing at a character to be selected in the presentation area.

[0020] A second aspect of the disclosed embodiments is directed to a mobile communication apparatus comprising a touch sensitive display; a receiver structured and arranged to input strokes representing a first character in an input area of the touch sensitive display; a processor structured and adapted to determine the first character from the strokes; a first detector structured and arranged to produce a first signal in dependence on presence of input in the input area; a timer adapted to start every time the first signal switches from indicating presence of input to indicating no input, and time out after a predetermined time; and a second detector structured and adapted to produce a second signal in dependence on if further characters are input before the timer times out, wherein the processor is structured and arranged to, when the second signal indicates no further input character, determine one or more candidates of characters for word association with the first character; present the one or more candidates on the display; and receive a selection among the one or more candidates.

[0021] A third aspect of the disclosed embodiments is directed to a computer program arranged to perform the method according to the first aspect of the disclosed embodiments when downloaded into and run on a mobile communication apparatus.

[0022] The advantages of the second and third aspects of the disclosed embodiments are essentially similar to those of the first aspect of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023] The novel features of the disclosed embodiments are set forth in the appended claims. The invention itself, however, as well as preferred mode of use, further aspects and advantages thereof, will best be understood by reference to the following detailed description of an illustrative embodiment when read in conjunction with the accompanying drawings, wherein:

[0024] FIG. **1** shows a mobile communication apparatus according to an embodiment;

[0025] FIG. **2** shows a general display image of a mobile communication apparatus with a touch sensitive display for character input;

[0026] FIG. **3** shows a display image of a display screen according to an embodiment;

[0027] FIGS. **4***a* and **4***b* illustrates a part of a screen view according to an embodiment;

[0028] FIG. **5** shows a display image of a display screen according to a further embodiment;

[0029] FIGS. **6***a*-**6***d* are screen views of an example of input of characters to a mobile communication apparatus;

[0030] FIGS. **7***a*-**7***d* are screen views of further an example of input of characters to a mobile communication apparatus;

[0031] FIG. **8** is a flow chart showing a method according to an embodiment; and

[0032] FIG. **9** is a flow chart showing an embodiment of determining an input character.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

[0033] FIG. **1** shows a mobile communication apparatus **100**, according to an embodiment of the disclosed embodiments, comprising a main body **102** on which an antenna **104**, a speaker **106**, a microphone **108**, a plurality of keys **110**, and a display screen **112** is present, and a stylus **114** used for input on the screen **112**, which is touch sensitive. The stylus **114** can normally be put in a groove (not shown) of the main body **102** when not used. The mobile communication apparatus comprises any features known in the art, such as messaging, browsing, calendar, etc. Further, the mobile communication apparatus comprises functions for input by virtual writing on the touch sensitive screen **112** by the stylus **114**. The features of input of the mobile communication apparatus will be described in more detail below.

[0034] To illustrate the basic features of virtual writing on a touch sensitive display, FIG. **2** shows a display image of a display screen **200**, with a designated field **202** for input of characters with a stylus. A character is input by a user using the stylus in the field **202** as would have been done with a normal pen on paper. Then, the mobile communication apparatus interprets the character by strokes detected on the touch sensitive display, and preferably displays the character on the screen **200**. The user can then input further characters in turn in the field **202**, and the interpretation of the characters are displayed in turn as characters on the screen **200**.

[0035] FIG. **3** shows a display image of a display screen **300** according to an embodiment of the disclosed embodiments, with a designated first field **302** for input of characters. A second field **304** associated with the first field **302**, and preferably placed within the first field **302**, is designated for selection of alternatives presented in connection with the input. The second field can be placed in the lower right corner, as depicted in FIG. **3**, as a character in e.g. Chinese normally begin with a stroke up to down or left to right. For other types of characters, and their way of being written, the second field **304** can be properly placed within the first field **302**. The placing of the second field **304** within the first field **302** is due to the normally limited available space on a screen of a mobile communication apparatus. However, if this is not a constraint, the fields **302**, **304** can be placed arbitrarily.

[0036] When the first pen-down is detected in the first field **302**, but out of the second field **304**, a character input by strokes should be interpreted. When an input character is recognized, the character is displayed on the screen and characters associated with the recognized character are displayed in the second field **304**. Associated characters can be characters forming a word together with the first input character. If the next pen-down is within the second field **304**, a character of the displayed associated characters at the pen-down point is selected accordingly, and displayed together with the character inputted by virtual writing. If the next pen-down is in the first field **302**, but out of the second field **304**, a second character input by strokes should be interpreted, and displayed on the screen, e.g. in a text editor, next to the preceding input character. Thereby, the user is able to continue virtual writing until the user wants to use the feature of selecting among the associated characters. To save computing power, or simply not disturbing the user, a predetermined, and preferably user selectable, delay can be applied before associated characters are determined and displayed. The user selectable delay can be anything from no delay to infinity, i.e. the function is disabled. It is feasible that after an associated character is selected, further associated characters can be presented for further selection. The further associated characters can be characters forming a word with the preceding characters input by virtual writing and selection.

[0037] The interpretation of the character input by virtual writing is not 100% accurate. Therefore it is preferable that two or more likely recognized characters are presented to the user, with the most likely as a default. Associated characters displayed in the second field **304** are thus associated with the default character. If another character than the default character is selected among the most likely characters, a new set of associated characters are presented, being associated with the selected character. FIGS. **4***a* and **4***b* illustrates a part of a screen view **400** comprising first and second fields **402**, **404**. The view further comprises a third field **406**, which presents a plurality of likely characters inputted by virtual writing. A default character **408** is marked in FIG. **4***a* as being the most likely. Field **404** in FIG. **4***a* presents a set **410** of associated characters to the marked default character **408**. The user may find that the character she intended to input is another among the presented likely characters. The user can then select, e.g. by tapping with the stylus on the correct character **412** in the third field **408**. The correct character then becomes marked, as depicted in FIG. **4***b*. A new set **414** of associated characters, associated with the correct character **412**, is presented in the second field **404**, as depicted in FIG. **4***b*. The user is then able to select among the characters associated to the character she really intended to input.

[0038] FIG. **5** shows a display image of a display screen **500** according to a further embodiment of the disclosed embodiments, with designated first and second fields **502**, **504** for input of characters. A third field **506** associated with the first and second fields **502**, **504** is designated for selection of alternatives presented in connection with the input. The use of the fields **502**, **504**, **506** will be illustratively described by examples in FIGS. **6***a*-**6***d* and **7***a*-**7***d*.

[0039] FIGS. **6***a*-**6***d* are screen views of an example of input of characters to a mobile communication apparatus having a touch sensitive display by virtual writing by a stylus, using input fields similar to what presented in FIG. **5**.

[0040] In FIG. **6***a*, a user writes a character **601** in the first field. The writing is interpreted and in FIG. **6***b*, a plurality of likely characters **603** are presented in the third field, with the most likely character **605** marked as a default character. The user recognizes the character **605** as the correct character and in FIG. **6***c*, the correct character **605** is presented on the screen, e.g. for a text editing application or a messaging application. The default character is either presented directly, or after a delay, or upon selection by the user. In FIG. **6***c*, a plurality of associated characters are presented in the second field. Associated characters are characters likely to follow a preceding character, and can e.g. form a word with the preceding character. In FIG. **6***d*, the user selects one of the characters presented in the second field, and the selected character **607** is inserted in the presented text on the display.

[0041] FIGS. **7***a*-**7***d* are screen views of a further example of input of characters to a mobile communication apparatus

having a touch sensitive display by virtual writing by a stylus, using input fields similar to what presented in FIG. **5**.

[0042] In FIG. **7***a*, a user writes a first character **701** in the first field. The user is a skilled writer, and immediately writes a second character **703** in the second field, as depicted in FIG. **7***b*. The first character **701** is then immediately presented in the text on the display, as being an accepted default character. The user then do not immediately write a third character in the first field, as would be possible for the fast writing user. Instead, the likely characters are presented in the third field, with the most likely character marked as a default character. The user recognizes the marked character as the correct character and in FIG. **7***c*, the correct character is presented on the screen, e.g. for a text editing application or a messaging application. Further, in FIG. **7***c*, a plurality of associated characters are presented in the first field. In FIG. **7***d*, the user selects one of the characters presented in the first field, and the selected character is inserted in the presented text on the display. In this way, the user is able to write fast by alternately writing in the first field and the second field. When the user need or want help, suggestions on likely associated characters turn up in the one of the first and second fields that was not used for input.

[0043] To save computing power, or simply not disturbing the user, a predetermined, and preferably user selectable, delay can be applied before associated characters are determined and displayed. Thus, the fast writer can go on writing in the alternate fields, and the mobile communication apparatus do not attempt to help the user until it seems to be needed. The user selectable delay can be anything from no delay to infinity, i.e. the function is disabled. A normal delay set by a normal user is between a fraction of a second and a second. It is feasible that after an associated character is selected, further associated characters can be presented, preferably alternately between the first and second fields, for further selection. The further associated characters can be characters forming a word with the preceding characters input by virtual writing and selection.

[0044] The delay can be implemented by a timer starting every time no touch is detected on the display, stops when touch is detected, and re-starts next time no touch is detected. The disabling is present as long as the timer has not timed out the predetermined time.

[0045] FIG. **8** is a flow chart showing a method according to an embodiment of the disclosed embodiments. In a stroke input step **800**, input strokes performed by virtual writing by a stylus on a touch sensitive display screen are received and gathered by a processor of the mobile communication apparatus. A character likely to correspond with the input strokes is determined in a character determination step **802**. As described above with reference to FIGS. **4**, **6***a*-**6***d* and **7***a*-**7***d*, this step can also comprise presenting a plurality of likely characters, among one is selected. In a timer setting step **804**, a timer is set and started, preferably starting after the last stroke is input, as described above. In a determination step **806** of new input strokes, it is determined if new input of strokes is present before the timer times out. If no new input is determined within the predetermined time-out period, candidates of characters associated with the previously input character are determined in a candidate determination step **808**. For example, the associated characters can form a word association with the previously input character. The candidates can also be determined before or in parallel with the input determination step **806**, as the candidate determination step **808** will require some processing. In case the candidate determination step is performed before or in parallel with the input determination step **806**, the result of candidate determination is achieved earlier, but on the other hand, processing power may have been wasted in vain if the user do not need help from the determined candidates. The candidates are presented in a candidate presentation step **810**. A character among the candidates is selected in a character selection step **812**. As characters are input and selected, they are used in an application in the mobile communication apparatus, e.g. a messaging application. Based on previously input and selected characters further characters can be associated to e.g. form a word. In a determination step **814** for further associated characters with the previous characters, it is determined whether more candidates are present. If more candidates are present the method continues with candidate determination step **808**, otherwise, the method continues with stroke input step **800**.

[0046] Returning to determination step **806** of new input strokes, if it is determined that new input of strokes is present before the timer times out, the method branches off to a determination step **816** of overwriting previous character. Overwriting can be determined by determining in which field the new input strokes are present. For example, if a first character is input in the first field, according to FIG. **5**, and then a second character is input in the second field, overwriting should not be performed. If a first character is input in the first field and then a second character is input in the first field, the first character should be replaced by the second character, i.e. overwriting is present. Other ways of determining overwriting are possible to provide a feasible input method. If overwriting is determined, it is set in a replacement step **818** that the new input character should replace the previous character, and then the method continues to the stroke input step **800**. Otherwise, if no overwriting is determined in determination step **816**, the method continues to a step **820** for addition of characters to e.g. an editor, and then returns to the stroke input step **800**.

[0047] It should be noted that the nature of the technology, and thus also the method, is that real-time constraints are rather strict to provide a feasible user interface. Thus is the sequential description of the method more or less only for descriptive purposes. In practice, the steps are performed in any order, in different orders from time to time, and sometimes performed in parallel, with the only demand that there is required data available for the step to work with. Further, the method is running as long as the operation of input of characters is running.

[0048] FIG. **9** is a flow chart showing an embodiment of determining an input character, as of the character determination step **802** in FIG. **8**. Candidates likely to be a character input by strokes are determined in a candidate determination step **900**. The determined candidates are then presented in a candidate presentation step **902**. The candidates can be presented on the screen, as illustrated in FIGS. **4***a*, **4***b*, **6***b*-**6***d*, **7***c* or **7***d*, or any other way to achieve a feasible user interface. A character among the likely candidates is then enabled to be selected in a character selection step **904**, which character thereby is determined to be the input character.

1. A method for inputting characters to a mobile communication apparatus, comprising:

detecting an input of strokes representing a first character in an input area of a touch sensitive display;

determining the first character from the strokes; and

detecting if further characters are input within a predetermined time period, and if no further characters are detected within the time period:

determining one or more candidates of associated characters for word association with the first character;

presenting the one or more associated candidates on the display; and

enabling selection among the one or more associated candidates.

2. The method according to claim **1**, wherein the input area comprises a first and a second input area, wherein the input method further comprises:

enabling input of further characters in the first and second areas alternately; and

enabling correction of a character by inputting a character in the same of the first and second areas as the preceding character.

3. The method according to claim **2**, further comprising enabling each of the first and second input areas to receive a new character after detecting a selection from the one or more associated candidates corresponding to a respective one of the first and second input areas.

4. The method according to claim **1**, wherein an input is determined to be a stroke if the input is within the input area, and determined to be a selection if the input is outside the input area.

5. The method according to claim **1**, wherein determining the first character from the strokes comprises:

determining one or more candidates of characters likely to be the input character;

presenting the one or more candidates on the display; and

enabling selection among the one or more candidates.

6. The method according to claim **5**, wherein the presenting of candidates of likely characters is performed in a presentation area of the display, and wherein the selection is performed by detecting a pointing at a character to be selected in the presentation area.

7. The method of claim **1** further comprising:

detecting a selection of an associated candidate; and

displaying the first character and the selected associated candidate.

8. The method of claim **7** further comprising that the selected associated candidate is a word.

9. The method of claim **7** further comprising that the one or more associated candidates are presented in a second input area of the display.

10. The method of claim **9** further comprising that the second input area is a separate display field within the input area.

11. The method of claim **10** further comprising providing a third input field associated with the input area and second input area, the third input field enabling a selection of associated candidates.

12. The method of claim **7** further comprising, after detecting a selection of an associated candidate, presenting one or more additional associated candidates on the display, the additional associated candidates corresponding to a combination of the first character and the selected associated candidate.

13. A method comprising:

detecting an input of a character in a first input field of a display;

detecting an input of another character in a second input field of the display;

presenting a default character in a display area of the display corresponding to the character inputted in the first input field;

determining if an further character is inputted in the first input field prior to expiration of a pre-determined time period from detection of the input of the another character; and

presenting one or candidate characters in a third input field of the display, the one or more candidate characters corresponding to characters associated with the another character.

14. The method of claim **13** further comprising highlighting a candidate character from the one or more candidate characters that is most closely associated with the another character as a default candidate selection.

15. The method of claim **13** further comprising detecting a selection of the one or more candidate characters in the third input field and presenting the selected candidate in the display area with the presented default character.

16. The method of claim **13** further comprising, after detecting the input of the character, detecting an expiration of a pre-determined time period prior to detecting an input of the another character, and presenting one or candidate characters in a third input field of the display, the one or more candidate characters corresponding to characters associated with the character.

17. The method of claim **13** further comprising enabling each of the first input field and the second input field to receive a new character input after a selection of a candidate character corresponding to a character inputted in each field, respectively.

18. A computer program configured to execute the method of claim **13** when downloaded and run on a mobile communication apparatus.

19. An apparatus comprising:

a display including at least one input area and display area; and

at least one processor coupled to the display, the at least one processor being configured to:

detect an input of a character in a first input field of the display;

detect an input of another character in a second input field of the display;

present a default character in a display area of the display corresponding to the character inputted in the first input field;

determine if an further character is inputted in the first input field prior to expiration of a pre-determined time period from detection of the input of the another character; and

present one or candidate characters in a third input field of the display, the one or more candidate characters corresponding to characters associated with the another character.

20. The apparatus of claim **20** wherein the processor is further configured to, after detecting the input of the character, detect an expiration of a pre-determined time period prior to detecting an input of the another character, and presenting one or candidate characters in a third input field of the display, the one or more candidate characters corresponding to characters associated with the character.

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